

**A MOVE TOWARD TRANSDISCIPLINARITY:
EXPLORING CHALLENGES AND OPPORTUNITIES OF CROSS-
COLLEGE CO-TEACHING IN THE PURSUIT OF INNOVATION**

by

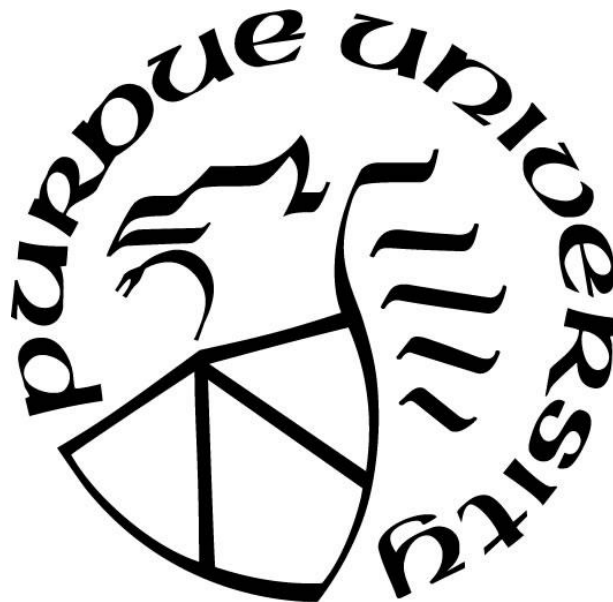
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*Dedicated to my family for encouraging me to take this giant leap, couldn't have done it without
your support.*

Mom, Dad, DJ, Juan, Kwame

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TABLE OF CONTENTS

LIST OF TABLES	8
LIST OF FIGURES	9
PROLOGUE	10
ABSTRACT.....	12
1. INTRODUCTION	13
1.1 Context.....	13
1.2 The Problem.....	15
1.3 Study Purpose	16
1.4 Research Question and Theoretical Framework	17
1.5 Definitions.....	18
1.6 Assumptions.....	19
1.7 Limitations	19
1.8 Delimitations.....	20
1.9 Summary	20
2. REVIEW OF LITERATURE	22
2.1 Introduction.....	22
2.2 Literature Documenting the Problem.....	22
2.2.1 Structure of Higher Education	22
2.2.2 Changes Required of Higher Education Institutions	23
2.2.3 A Move Toward Transdisciplinary.....	25
2.3 Transcending Disciplines through Cross-College Co-Teaching.....	29
2.3.1 Disciplinary Boundaries	29
2.3.2 Collaboration	32
2.4 Relationship Building Toward Transdisciplinarity.....	34
2.4.1 Network Facilitator	34
2.4.2 Singapore University of Technology and Design (SUTD).....	35
2.4.3 Teacher Collaboration and Building Relationships for Communities of Transformation	36
2.5 Research-Intensive Universities and Transdisciplinary Co-teaching	39

2.5.1	Untapped Potential in Higher Education	39
2.5.2	Limitations in Higher Education	40
2.5.3	The Emergence of Transdisciplinarity in Higher Education	42
2.6	Literature Documenting the Purpose	43
2.6.1	Understanding the Complex Challenges Facing the World	43
2.6.2	Seeking Transdisciplinary Experiences	45
2.6.3	The Natural Relation to Design and Innovation	46
2.7	Theoretical Perspective: Communities of Transformation (CoT)	48
2.8	Summary	52
3.	METHODOLOGY	53
3.1	Introduction	53
3.2	Research Design Overview: A Case Study	53
3.3	The Case: The Meaning, Mission, Making (M3) Program Model	55
3.4	Role of the Researcher	59
3.5	Cross-Disciplinary Collaboration: The Catalyst for Innovative Research	60
3.6	Research Question and Data Sources	61
3.7	Data Collection	61
3.8	Data Analysis	63
3.9	Trustworthiness	66
3.10	Summary	66
4.	FINDINGS	67
4.1	Introduction	67
4.2	The Setting	70
4.2.1	The Structure of the Institution	70
	Overspecialization in the Academy	71
	Hurdling Barriers in Academia	74
	Evaluating the Value	84
4.2.2	Administrative Endorsement	92
4.2.3	The Role of Advisors	105
4.3	The Main Characters	113
4.3.1	Teacher Roles	114

4.3.2	Institutional Barriers for Co-teaching	123
4.3.3	Turnover	127
4.3.4	Finding the Teachers.....	130
4.3.5	Co-teacher Relationships	137
4.4	The Performance	145
4.4.1	Student Engagement and Transdisciplinary Learning	146
4.4.2	Beyond Disciplinary Boundaries	158
4.4.3	Innovation	167
4.5	The Encore	181
4.5.1	Professional Development Opportunities	181
4.5.2	Shared Language	185
4.5.3	Teacher Transformations	187
4.5.4	Sustainability	203
4.5.5	Creating a Community of Transformation	216
4.6	After the Show	222
4.7	Summary	223
5.	CONCLUSION, DISCUSSION, & RECCOMENDATIONS	224
5.1	Introduction.....	224
5.2	Conclusion of the study	224
5.3	Discussion of Results.....	230
5.3.1	Can cross-college co-teaching be enacted in higher education today?.....	230
5.3.2	Can cross-college co-teaching emerge as a CoT?	231
5.4	Recommendations.....	233
5.4.1	Future Practice	233
5.4.2	Future Research	238
5.5	Summary	242
	APPENDIX A. CODEBOOK.....	244
	APPENDIX B. INTERVIEW SCRIPTS	249
	REFERENCES	260

LIST OF TABLES

Table 1. This displays the different types of frameworks that are based around collaboration for change. The following table depicts the differences among the different frameworks.	51
Table 2. The number of interviews conducted included in this case study.	63
Table 3. Major themes with descriptions and components.	69

LIST OF FIGURES

Figure 1. M3 Model for the Design & Innovation transdisciplinary program.	15
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PROLOGUE

Embarking on this master's thesis journey has been a compelling experience through the crossroads of disciplines within the research community of our institution. As the researcher in this qualitative case study, my unique perspective, shaped by the combination of personal, academic, and professional experiences, has woven a depiction that transcends the traditional boundaries of academia. This project positioned me at the intersection of being a student, a researcher, and a technology and engineering educator. Each area of my identity serves as a lens through which I explored this study, creating a synthesis of insights that goes beyond a singular discipline.

As I have found myself within a cross-disciplinary research project, working with the M3 program (Mission, Meaning, Making), which combines engineering/ technology, business management, and liberal arts centered around cross-college co-teaching for transdisciplinarity in the Midwest, I ponder the questions of "Why this program?" and "Why this place?". As I went through this research, I was reminded of the power of innovative education and saw firsthand the landscape of research-intensive universities. This institution gave me an opportunity for intellectual exploration and allowed me to follow a passion directly related to my desired career trajectory. My past experiences and the dynamic environment of this institution propelled me towards the forefront of educational innovation. This journey was deeply connected with the broader discourse on the future of education. In dissecting this program's impact, I contemplate its immediate impact on my academic and professional pursuits and its ripple effect on the evolving landscape of education. How does the program contribute to the broader discussions of educational evolution, and where will it chart its course in the years to come, and where will I find myself in future endeavors?

My own undergraduate education influenced my journey to exploring cross-college co-teaching for transdisciplinarity in the pursuit of innovation in higher education. The stark contrast in environments further shaped my teaching philosophy and demonstrated the transformative power of education for faculty and for students. I have gone from being a student in a small corner of the world, to being a researcher and a student in a more complex part of the world. This sentiment is echoed through the pages of my thesis as I wrote about the success and challenges for cross-college co-teaching being enacted in higher education. Finding my place within academic

during the journey of crafting my thesis, showed me the diverse tapestry of academia and portrayed the importance of collaboration across disciplinary boundaries. My journey during this thesis involved finding my place within the myriad of academic disciplines converging for this research project and navigating the intricate interplay of identities based on academic backgrounds and life experiences. Located as a student, researcher, and a trained educator, I reflected on how these identities fit into a cohesive whole. I considered my positionality within this thesis as well as the larger research project. I became the teacher in a space where I was once the student, a researcher in a space where I was once a student, and most importantly, a lifelong learner in a program that I had assumed would be the culmination of my journey as a student. The experiences that arose from attending this midwestern, research intensive university, and researching cross-college co-teaching for transdisciplinarity in the pursuit of innovation, put me in a position to learn, sharing insights, and help to create an environment of innovation through the sharing of this research. In conclusion, this master's thesis encapsulates not only a scholarly investigation but also a personal and professional metamorphosis. It is a testament to the evolving nature of education, the intricate dance of identities amongst the broader landscape of academia and beyond, and the boundless possibilities that unfold at the crossroads of disciplines.

ABSTRACT

The complexity of our world continues to grow as we face new societal challenges, embrace emerging technologies, and become more interconnected than ever before. This complex landscape is believed to require people to think in new ways that transcend conventional boundaries set by established professional and academic fields. Consequently, there have been appeals for a reshaping of undergraduate education, aimed at providing students with enriched transdisciplinary learning experiences that go beyond the traditional educational experiences. The aim of transdisciplinarity is to establish a setting where students can integrate knowledge from diverse fields, thus preparing themselves to address challenges and work on emerging issues and opportunities. Therefore, as universities desire to facilitate transdisciplinary learning journeys, it becomes imperative to gain deeper insights into the implementation of such approaches within the established structures and systems of higher education institutions. This study is focused on a combination of three academic colleges, engineering/ technology, business management, and liberal arts through co-teaching; two instructors from different academic colleges in real-time, jointly guide students in the practices of collaborative design to address relevant problems/opportunities in the pursuit of achieving innovation. To gather insights, a multifaceted approach was taken for this qualitative case study, utilizing semi-structured interviews with university administrators, faculty, and advisors, targeted observations of co-taught courses, and analysis of curricular documents while applying the Community of Transformation (CoT) theoretical perspective. This methodology ensured a holistic grasp of the dynamics, challenges, successes, and potentials associated with cross-college co-teaching for transdisciplinarity in the pursuit of innovation. The findings depict success and challenges from the structure of the institution, advising, implementing co-teaching, and the next steps to ensure the sustainability of the M3 program and the initiatives that arose from it. Overall, this thesis found that cross-college co-teaching for transdisciplinarity can be enacted with passionate faculty members, supportive advisors, and open and ongoing communication from all stakeholders. Cross-college co-teaching for transdisciplinarity in the pursuit of innovation is transforming undergraduate education.

1. INTRODUCTION

1.1 Context

A transdisciplinary approach to teaching and learning is considered a beneficial strategy for equipping students with the skills to solve complex, contemporary challenges (Giulio & Defila, 2017). The challenges societies face today, and in the future, are not neatly confined to a single discipline (Gleason et al., 2022). Therefore, transdisciplinary learning experiences are crucial as solutions to humanity's problems often transcend disciplinary boundaries, necessitating the convergence of knowledge and practices to foster innovative thinking across diverse fields of study. Accordingly, transdisciplinary learning aims to create an environment where students can explore different disciplinary viewpoints, collaborate to discover shared practices, and apply these perspectives and practices to address challenges that arise at the intersections of the disciplines. One perspective suggests that this type of learning can enhance the value of higher education, which has faced increasing scrutiny in recent times. However, higher education institutions, particularly research-intensive universities, often struggle to provide transdisciplinary learning opportunities due to organizational and structural limitations (Horta, 2022). Many of these institutions remain entrenched in traditional academic disciplines, maintaining organizational silos that can hinder valuable cross-disciplinary collaborations within undergraduate education (Horta, 2022). While disciplinary expertise is essential for societal advancement and scientific discovery, representing one of the strengths of higher education, the rigid structures and academic inflexibility associated with disciplinary silos can impede educational progress (Strimel et al., 2022). Higher education features diverse cultures and value systems, creating obstacles when attempting to foster collaboration across boundaries. The boundaries between disciplines have become increasingly rigid, both academically and organizationally, resulting in limited space for transdisciplinary work. For instance, Gleason et al. (2022) suggest that to make cross-college collaborations across disciplines a reality, there could be challenges, particularly regarding resource availability.

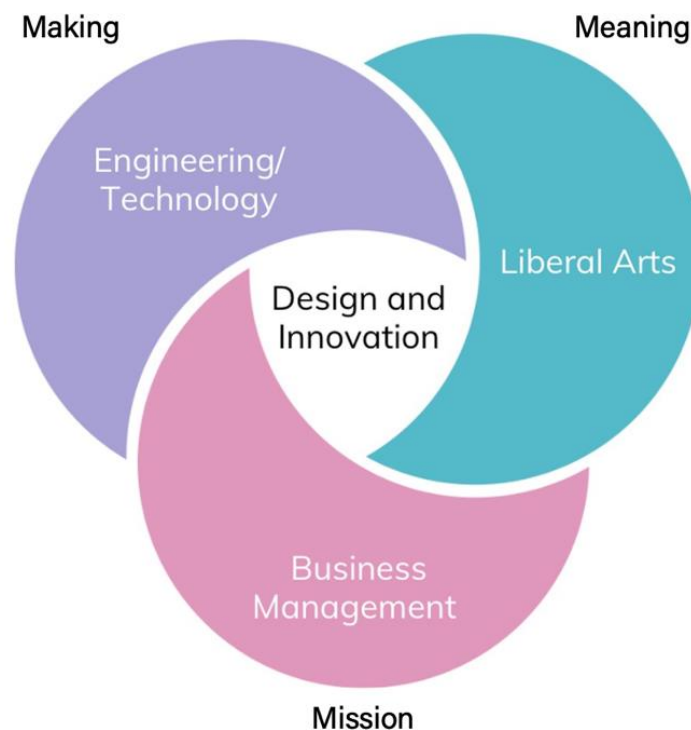
Of course, many attempts have been made to provide transformed learning experiences across disciplines including degree programs or certificates that are marketed as inter or multidisciplinary. However, these programs can fall short of spanning learning across academic disciplines in a manner that enables faculty and students to converge around relevant problems or

topics-particularly problems or topics that exist at disciplinary intersections. For example, creating a degree program that simply involves students enrolling in pre-existing classes offered from different colleges/departments may not achieve the goal of transcending disciplinary boundaries to share differing viewpoints and practices to promote novel strategies to address different problems/opportunities. This holds true because numerous such programs lack the involvement of faculty members from different colleges jointly instructing students from diverse majors in a shared space simultaneously. Cross college co-teaching, which is combining two instructors from different disciplinary backgrounds offers students an experience that could mimic what they could experience after college in the world of work. This idea of cross-college co-teaching to jointly guide students in the practices of collaborative design to address relevant problems/opportunities in the pursuit of achieving innovation is being conducted at one large research-intensive midwestern university. Specifically, this cross-college co-teaching involves the combination of three academic colleges, engineering/technology, business, and liberal arts to form a program focused on design and innovation. However, our knowledge of how cross college co-teaching can 1) exist within the siloed structures of higher education and 2) support valuable transdisciplinary learning experiences is limited. Therefore, this research will investigate a transdisciplinary co-teaching educational model developed through a National Science Foundation grant to help guide the transformation of traditional undergraduate learning to span academics silos. This educational model, referred to as the Mission Meaning Making (M3) program, is specifically focused on co-teaching the cross-cutting practices of design and innovation by a) implementing co-teaching and co-learning from faculty and students across different academic units/colleges as well as b) offering learning experiences spanning multiple semesters that immerse students in a community that can nourish both their learning and innovative ideas. The driving philosophy for this model is 1) everyone can be an innovator, regardless of their background or interests, 2) impactful innovation does not happen in disciplinary silos alone, and 3) teaching in a different, more collaborative way. Therefore, as a collaborative initiative, this model has been designed to synergize key strengths of an institution's engineering/technology, liberal arts, and business colleges/units to create a transformative undergraduate experience focused on the pursuit of innovation—one that reaches the broader campus community, regardless of students' backgrounds or majors. This model emphasizes impactful innovation does not happen in single academic disciplines/majors. Instead, it requires a cross-disciplinary approach to understand the Meaning

behind the problems people face, the Mission for solving these problems, and Making solutions with the people they impact in mind (see Figure 1). This research focusses on the implementation of the M3 program's cross-college co-teaching strategy and how it is enacted in higher education.

Figure 1. M3 Model for the Design & Innovation transdisciplinary program.

The M3 educational model consists of three main academic colleges, liberal arts, business, and engineering/technology. There are two co-taught classes that were created at the natural convergence points of these colleges/disciplines. At the natural convergence of liberal arts and engineering/technology, two instructors (one from liberal arts and one from engineering technology) co-teach in the class Designing Technology for People: Anthropological Approaches. At the natural convergence point of business and engineering technology, two instructors (one from business and one from engineering technology) co-teach in the class Prototyping Technology for People: Making Decisions & Thinking Strategically. Details surrounding the co-taught courses will be explained further in-depth in chapter 3.



1.2 The Problem

This study focuses on the enacting of cross-college co-teaching in a university that has deeply ingrained organizational structures and value systems rooted in disciplinary silos. In order to facilitate transdisciplinary education, cross-college co-teaching in this case, involves multiple instructors from different academic disciplines teaching together to a diverse group of students,

serving as a means to transform undergraduate education. This collaborative teaching approach aims to help students develop new conceptual understandings and innovative ideas by integrating disciplinary knowledge and practices. However, achieving this teaching approach poses organizational challenges (Scholz & Steiner, 2015). Practical issues are expected to arise, including difficulties in gaining faculty support and adoption, challenges related to assigning credit to faculty from different colleges, and physical barriers, such as the separation of buildings, that hinder faculty interactions and impede the realization of a truly transdisciplinary education for students (Lake et al., 2017; Porter & Graham, 2018; Otto et al., 2022). With the growing demand for enhancing and transforming undergraduate education and the increasing integrated learning, there is then an opportunity to explore ways to how a cross-college co-teaching program can be enacted at a large research-intensive university to promote and scale transdisciplinary learning opportunities. Therefore, this study aims to learn from the M3 program as a specific case that features cross-college collaborative co-teaching involving faculty from the liberal arts, engineering/technology, and business colleges. Through this case study, the research sought to gain insights into how cross-college co-teaching programs at a research-intensive university with an established value system and organizational structure can or cannot function. This study aims to allow other universities interested in cross-college collaboration to understand how it is enacted, what “The Setting” of the higher education landscape is like, who the “The Characters” involved in co-teaching can be, “The Performance” of cross-college co-teaching when it is enacted, and what has happened and should happen as a result of the cross-college co-teaching, described as “The Encore”. In conclusion, the exploration of cross-college co-teaching within a university entrenched in disciplinary silos presents both challenges and opportunities for transforming undergraduate education.

1.3 Study Purpose

The focus of this study is on cross-college co-teaching, where two instructors from different academic colleges collaborate to teach classes within the M3 educational model discussed earlier (i.e., the Designing Technology for People: Anthropological Approaches and Prototyping Technology for People: Making Decisions & Thinking Strategically courses). These courses are enacted as the core component of a minor degree in Design and Innovation. The co-teaching teams, stemming from different academic disciplines, are serving as drivers for pedagogical change (Haag

et al., 2023). It has been theorized that transforming undergraduate education through a cross-college co-teaching approach has the potential to prepare undergraduate students as innovators while also meeting demands for a change in higher education pedagogy (Otto et al., 2022). However, higher education is not typically structured to support a pedagogy change of this nature, a true transdisciplinary education program that involves co-teaching across academic colleges (Haag et al., 2023). In order to support and understand how the cross-college co-teaching model can or cannot work, the practices and conversations with different stakeholders around the co-teaching model need to be explored. Therefore, the purpose of this study is to understand how cross-college co-teaching can be enacted in higher education from the perspective of faculty, administrators, and advisors with hopes to inform future efforts aimed toward transforming undergraduate pedagogies at a large university. The research team is experimenting with transdisciplinarity through a co-taught program that involves high levels of collaboration between traditionally siloed knowledge sets (Leavy, 2016). Leavy (2016) stated that “...borders and boundaries can greatly inhibit the kind of innovation and collaboration that are unquestionably necessary if we are to address our many pressing transdisciplinary needs” (p.138) Consequently, it can be seen as essential to understand cross-college co-teaching to further facilitate transdisciplinary experiences rather than inhibit innovation and collaboration.

1.4 Research Question and Theoretical Framework

This research explores how large research-intensive institutions can foster transdisciplinary learning through cross-college co-teaching. The research question that guided this study was:

1. How can cross-college co-teaching be enacted in higher education to support transdisciplinary learning?

This question was answered through a qualitative case study employing semi-structured interviews of co-teaching faculty, administrators, and advisors related to the program, observations of the co-taught courses, and document analysis of instructional materials developed for, and used within, the M3 program at a research intensive university. This study used the Communities of Transformation (CoT) theoretical perspective and found valuable insights into various aspects of the M3 community and explored how the program was undergoing change and development. Through the case study and CoT approach, there were identifiable methods to how cross-college

co-teaching can be enacted, how teaching practices have changed, and examples of teacher transformations. When analyzing the data, the theoretical perspective of (CoT) was used to examine what and how the community was transforming from the enactment of cross-college co-teaching in higher education. In alignment with qualitative research methodologies, the researcher served as the primary instrument to collect and analyze the data. Further details regarding the data sources, data collection, and data analysis used in this case study will be discussed in Chapter 3.

1.5 Definitions

1. **Cross-College Co-teaching:** Multiple instructors from different academic colleges delivering integrated instruction to a diverse group of students also from varying academic colleges in the same classroom at the same time (Cook & Friend, 1995).
2. **Cross-college collaboration:** An organizational structure in which multiple academic colleges interact and collaborate within a university setting (Ralph, 1996).
3. **Communities of Transformation:** A theoretical perspective that can be utilized to examine if a community can emerge from effective integrated teaching practices and achieve deep transformational change in higher education (Shadle Liu et al., 2018).
4. **Collaboration:** “Exchanging information, altering activities, sharing resources, and enhancing the capacity of another for mutual benefit and to achieve a common purpose” (Himmelman, 2002, p. 3).
5. **Co-learning:** A learning style in which students and faculty from diverse backgrounds collaborate, transfer, and share knowledge to solve a problem or achieve a common goal (Otto, 2022; Alt et al., 2020).
6. **Transdisciplinary:** An educational approach that fosters collaboration across disciplines while seamlessly integrating various sets of knowledge to address societal challenges and immerses students in STEM career pathways (Leavy, 2016; Grubbs & Strimel, 2015).
7. **Interdisciplinary:** Coordination of efforts to combine disciplines to give students a well-rounded education (McDonald et al., 2018). The integration of disciplines to produce more insights compared to what would come from a single discipline (Pharo et al., 2012).

8. **Multidisciplinary:** Collaboration between two or more disciplines, however each discipline maintains their own assumptions, values, and methods, essentially keeping the two disciplines separated while being “together” (Leavy, 2016).
9. **Institutional Barriers:** Structures, systems, or phenomena occurring in the university setting that inhibit the implementation of a course, program, or event (McDonald et al., 2019).
10. **Innovation:** The development of ideas through a non-linear process – new and/or improved products, services, or methods that encompass creativity (West, 2002).

1.6 Assumptions

The researcher holds the view that employing a qualitative case study serves as a research technique and is appropriate, as it resulted in a comprehensive and intricate understanding of the case study’s phenomena. The researcher received detailed information on the case through interviews, observations, and document analysis as well as having a teaching assistantship in the co-taught M3 courses for a year prior to data collection. The data obtained, observed, and analyzed is believed to closely mirror participants experiences to the best extent possible by the researcher. Regarding the source of interview data, the researcher operated under the assumption that participants possessed a clear understanding of the interview questions and held institutional knowledge. As for the data source of observations, the researcher posits that the co-teachers under observation behaved in a manner consistent with how they typically would, irrespective of the observation. However, some observations were done via Microsoft Teams recordings, therefore the co-teachers were unaware of which classes the researcher observed. The researcher additionally assumes that the teaching material were not modified from existing iterations for the research study.

1.7 Limitations

One of the limitations to this study includes the diversity of the participants. The participants are faculty, administrators, and advisors, which provides a diversity of roles at the institution but may lack diversity in other aspects such as gender, race, or ethnicity. This factor is limited because this research sought participants who are or have been involved with the M3 program. This case

study is specific to a research-intensive midwestern university and does not necessarily reflect how this program could function in different types of academic settings.

1.8 Delimitations

This study is not to measure the barriers, benefits, and strategies of a cross-college co-teaching model, but to describe and identify what those look like within a large-scale university. This study is meant to understand how co-teaching within the M3 program is enacted in higher education. The participants involved in this case study were stakeholders knowledgeable of the program and its associated goals. This research study is a part of a bigger research project that has been collecting interview data since 2019, therefore new stakeholders might have come into positions and might not be consistent throughout the different rounds of interviews. As for the terminology used in this case study, specifically relating to transdisciplinary and/or co-teaching, different research identifies these terms in different ways. However, both of those terms as they relate to this study are defined in section 1.5.

1.9 Summary

This chapter delves into the research topic under examination, the research objective, purpose, and the research question that guided this study. Furthermore, it examines the assumptions, limitations, and delimitations inherent in this study, along with important definitions that will maintain importance throughout this research. Moving forward, this thesis consists of four additional chapters. Following this is chapter 2, which will encompass a review of the literature on existing information on co-teaching, higher education systems and value structures, and transdisciplinary education. Chapter 2 expands on the theoretical perspective of CoT. However, in Chapter 3, “Methodology”, discusses the data collection and analysis procedures. The research problem is restated, elucidating the purpose and research framework. In Chapter 3, the study's context is detailed in more depth, and the methodologies undertaken for the actual research are delineated. The data collection process along with data analysis are discussed also in Chapter 3. Chapter 4, “Findings”, unveils the outcomes of the analysis through the lens of the CoT theoretical perspective. Lastly, Chapter 5, “Discussion and Conclusions” delves deeper into the implications

of the findings, accompanied by suggestions for educational practice and prospects for future research.

2. REVIEW OF LITERATURE

2.1 Introduction

The call for transforming undergraduate education can influence teaching and learning initiatives that move beyond the classroom to the institutional level. In the context of this study, institutional change efforts are attempted through cross-college co-teaching to provide students with transdisciplinary knowledge focused on promoting authentic learning experiences. Accordingly, this research sought to identify how stakeholders navigate cross-college co-teaching at a research-intensive university. The literature review provided in this chapter intends to establish the basis of this study, the area of interest, and the opportunity for knowledge generation that drives the motivation for this research. The focus of this study is how initiatives such as cross-college co-teaching are working to foster authentic learning experiences in higher education.

2.2 Literature Documenting the Problem

2.2.1 Structure of Higher Education

The formation of universities has largely resulted in the creation of separate colleges or academic units that house their own disciplines within the larger institution. This intuitional formation led to the construct of siloed disciplines to create organizational structures and operational academic systems for the university to function (Horta, 2022). However, Dewey (1938) realized the nature of education as being “a process of overcoming natural inclination and substituting in its place habit acquired under external pressures” (p.5). Dewey (1938) writes about calling for new educational practices, however Oliveria et al. (2022) recognize the educational silos that impede education are present today. While the term silos may not have been used as frequently during 1938, Dewey (1938) asks “What is the place and meaning of subject-matter and of organization within experience? How does subject-matter function?” (pp.6-7). Disciplines and their organizational structure seem to be historically siloed. The term silo can be defined as the seemingly impermeable barriers that prevent instructors from integrating disciplines (Pearson, 2015). While questions around academic disciplines remain, higher education’s organizational structures and systems have been able to produce professionals in academic disciplines and have

led to many qualified academic staff, which has led to the way many universities are run today (Horta, 2022). While these academic silos provide people with social structure and familiarity through bonding in their programs of studies, the silos can limit opportunities for collaborations with other colleges, which can create a competitive environment, hence stifling innovations for teaching and learning across academic boundaries (Horta, 2022; Strimel et al., 2022). According to Horta (2022), what can happen within the individual and siloed colleges of a university is the continuation of historical, social, and cultural constructs. The formation of disciplinary silos in higher education is believed to be a factor toward stifling intellectual development that can emerge through the mixing of disciplinary viewpoints and practices provided by networks of scholarly collaboration. Horta suggests that the siloed structure of higher education may even jeopardize the purpose of universities as they are positioned to contribute new knowledge and ways to address societal problems. Oliveira et al. (2022) believe that the traditional siloed, discipline-based structure of many universities is no longer capable of meeting the needs of the workforce today and in the future. This belief can be attributed to the viewpoint that humanity's problems are not typically discipline specific which requires the convergence of competencies and people to lead to innovative thinking across fields of study (Strimel et al., 2023). However, Moreno-Serna et al. (2022) recognize that the academic practice of siloed disciplines and the university structure do not incentivize transdisciplinary or multi-stakeholder collaboration efforts.

2.2.2 Changes Required of Higher Education Institutions

A National Academy of Engineering report titled, *Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning* (2013) encourages educating students in ways that foster creativity, teamwork, communication, and innovation capabilities as well as enables them to flourish in interdisciplinary spaces. This approach to education can be important as modern problems can exist at the interfaces of disciplines and thus require innovative ways of thinking to develop solutions that emerge when transcending disciplinary boundaries (National Research Council, 2014; Oliveira et al., 2022; Strimel et al., 2023). In addition, the US Department of Education states that “today, more than ever, our students need to be equipped with the critical thinking, communications, socio-emotional and language skills to work collaboratively with their counterparts in the United States and all over the world” (International Affairs Office, n.d.). Therefore, there has been an increased emphasis on the integration of disciplines around relevant

issues/topics—with a more recent trend of seeking transdisciplinary learning experiences for students (American Association for the Advancement of Science, 2019). Furthermore, Kezar et al. (2017) acknowledge that for the past 20 years, there have been a plethora of reports calling for “reform of undergraduate education to improve student learning, persistence, and graduation rates...” (p.217). The authors found that even though there have been these reports, there have not been interventions made. The reports found by authors emphasized the ongoing calls for the development of student-centric learning settings that employ research-based teaching, learning, and assessment methods to enhance student achievement. For example, Kelley & Knowles (2016), stated that there is a pressing need to enhance STEM education due to the 21st century's environmental and social challenges, which threaten global security and economic stability. The issues mentioned in the article go beyond boosting test scores. The authors mentioned that the USA has undergone big education reforms, but educators still lack a unified understanding of education's intricacies. Addressing global challenges like climate change and resource management requires international collaboration and advancements in science and technology. However, interest in STEM learning is waning in Western and affluent Asian countries, despite growing demand for STEM skills in the face of economic challenges (Kelley & Knowles, 2016). Furthermore, universities now consider innovation education experiences essential in equipping students with creative thinking skills to navigate challenges in their personal and professional lives (Strimel et al., 2022). This emphasis on innovation has gained traction, especially with universities emphasizing national rankings tied to innovation metrics like patents and start-ups. However, there is also a growing scrutiny of the overall value of higher education. Strimel et al. (2022) emphasize that even considering these concerns, evaluating the role of innovation education approaches becomes crucial and timely. As well as, transforming teaching and learning approaches at universities to attempt to make innovation education accessible to all students, enhancing the value of higher education. Initiatives such as the M3 program can develop transformative shifts working to culturally reshape universities and preparing students to push boundaries in expansive ways (Strimel et al., 2022). Furthermore, universities can serve as hubs providing resources for students to engage in innovation based on their interests. This learning experience is particularly advantageous during a phase in a student's life when they have freedom and flexibility to experiment, learn from failures, iterate, and make an impact extending beyond the classroom. However, adopting such an approach requires a critical examination of current educational

traditions and institutional structures. As Pruim (2016) notes, students benefit from being in control of their learning which provides opportunities for students to interact with the material in new ways. Therefore, this case study is necessary to get a glimpse of how teaching can span across disciplines also while minimizing the silo effect of disciplines, in order to provide a large number of students with hands-on transdisciplinary learning experiences.

2.2.3 A Move Toward Transdisciplinary

A National Academy of Engineering report titled, *Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning* (2013) encourages educating students in ways that foster creativity, teamwork, communication, and innovation capabilities as well as enables them to flourish in interdisciplinary spaces. This approach to education can be important as modern problems can exist at the interfaces of disciplines and thus require innovative ways of thinking to develop solutions that emerge when transcending disciplinary boundaries (National Research Council, 2014; Oliveira et al., 2022; Strimel et al., 2023). In addition, the US Department of Education states that “today, more than ever, our students need to be equipped with the critical thinking, communications, socio-emotional and language skills to work collaboratively with their counterparts in the United States and all over the world” (International Affairs Office, n.d.). Therefore, there has been an increased emphasis on the integration of disciplines around relevant issues/topics—with a more recent trend of seeking transdisciplinary learning experiences for students (American Association for the Advancement of Science, 2019). Furthermore, Kezar et al. (2017) acknowledge that for the past 20 years, there have been a plethora of reports calling for “reform of undergraduate education to improve student learning, persistence, and graduation rates...” (p.217). The authors found that even though there have been these reports, there have not been interventions made. The reports found by authors emphasized the ongoing calls for the development of student-centric learning settings that employ research-based teaching, learning, and assessment methods to enhance student achievement. For example, Kelley & Knowles (2016), stated that there is a pressing need to enhance STEM education due to the 21st century's environmental and social challenges, which threaten global security and economic stability. The issues mentioned in the article go beyond boosting test scores. The authors mentioned that the USA has undergone big education reforms, but educators still lack a unified understanding of education's intricacies. Addressing global challenges like climate change and resource

management requires international collaboration and advancements in science and technology. However, interest in STEM learning is waning in Western and affluent Asian countries, despite growing demand for STEM skills in the face of economic challenges (Kelley & Knowles, 2016). Furthermore, universities now consider innovation education experiences essential in equipping students with creative thinking skills to navigate challenges in their personal and professional lives (Strimel et al., 2022). This emphasis on innovation has gained traction, especially with universities emphasizing national rankings tied to innovation metrics like patents and start-ups. However, there is also a growing scrutiny of the overall value of higher education. Strimel et al. (2022) emphasize that even considering these concerns, evaluating the role of innovation education approaches becomes crucial and timely. As well as, transforming teaching and learning approaches at universities to attempt to make innovation education accessible to all students, enhancing the value of higher education. Initiatives such as the M3 program can develop transformative shifts working to culturally reshape universities and preparing students to push boundaries in expansive ways (Strimel et al., 2022). Furthermore, universities can serve as hubs providing resources for students to engage in innovation based on their interests. This learning experience is particularly advantageous during a phase in a student's life when they have freedom and flexibility to experiment, learn from failures, iterate, and make an impact extending beyond the classroom. However, adopting such an approach requires a critical examination of current educational traditions and institutional structures. As Pruim (2016) notes, students benefit from being in control of their learning which provides opportunities for students to interact with the material in new ways. Therefore, this case study is necessary to get a glimpse of how teaching can span across disciplines also while minimizing the silo effect of disciplines, in order to provide a large number of students with hands-on transdisciplinary learning experiences.

Additionally, there are limited studies that attempt to understand the experience of the co-teachers in transdisciplinary spaces, making these spaces intimidating to navigate (Oliveira et al., 2022). Most studies around these areas are descriptive studies that do not include critiques of the process or outcomes of the approaches involved in developing transdisciplinary curriculum, especially in higher education. As Klein (2023) alluded, the combination of disciplinary backgrounds creates a web of spatial and organic properties that occur uniquely within each program. Moreover, there are limited examples and guidance related to co-teaching and co-learning with more than two disciplines converging. This opportunity could allow this study to

provide insights into cross-college co-teaching programs to support transdisciplinary learning. This study is occurring at a research-intensive institution, and these institutions are seen as key in knowledge production; however, these universities in recent decades may not be viewed as meeting their potential to create problem solvers through modern instructional practices (The Boyer Commission, 2022; Thompson Klein, 2004). As mentioned earlier, cross-college approaches to co-teaching across multiple disciplines are challenged by the siloed organizational structures and systems in higher education, limiting transdisciplinarity and co-learning opportunities. As Thompson Klein stated, “If knowledge acquisition, selection, management, and collaboration are to grow at all levels, deficits of human, structural-organizational, customer, and stakeholder capital must be overcome, and disciplinary, institutional, and community resources be integrated” (p.523). While co-teaching is a practice that has existed in higher education for many years, the influence of co-teaching across disciplinary silos, especially co-teaching in the same location in unison for a semester and the effect it has on the individual is not well understood (Haag et al., 2023). Haag et al. refers to the practice of co-teaching as a collaborative environment where two or more instructors from the same discipline work together to create all the coursework and class materials, as well as teach together. However, this study is looking at co-teaching with two instructors from different disciplines. Haag et al. specifically acknowledge that their paper does not look at co-teaching with instructors from different disciplinary backgrounds. Similarly, it was written how co-teaching occurs and who is involved plays a major role in the impact of co-teaching. Therefore, understanding how co-teaching plays a role in institutional transformation for faculty, administrators, and advisors provides the opportunity to generate knowledge that can determine how and when co-teaching can, and should, occur across disciplines to provide potentially valuable transdisciplinary learning experiences to students. Additionally, many research studies centered around cross-college co-teaching did not occur for a prolonged period or more than a semester or two, and most of them focused on the co-teachers, commonly consisting of one novice and one expert, or a pre-service teacher and an established classroom teacher. It is also known that collaboration in academia between people who think, and act differently comes with its challenges (Freeth & Caniglia, 2020). Cross-disciplinary collaborations push researchers and educators to leave their disciplinary comfort zone, forcing discomfort but fostering collaboration. (Di Giulio & Defila, 2017). Therefore, this study hopes to illuminate how cross-college co-teaching can be enacted in higher education to provide transdisciplinary learning

experience to undergraduate students. The study presented in this thesis includes faculty from liberal arts, business, and engineering/technology, interacting through cross college co-teaching on the topic of design and innovation for three years. This study aims to understand how cross-college co-teaching at a research-intensive university can support and help sustain a transdisciplinary program within deeply entrenched value systems, organizational structures, and academic traditions. By doing so, the knowledge generated can be one step toward providing more authentic learning experiences at disciplinary intersections that can strive toward a more transformative and valuable undergraduate education experience.

In conclusion, the traditional siloed structure of higher education, with distinct disciplinary boundaries, has long been recognized as a challenge to fostering innovation and addressing complex societal issues. The historical construct of separate colleges and academic units has perpetuated these silos, hindering collaboration and the development of transdisciplinary competencies among students. While calls for reform have been persistent, the rigid structure of higher education, coupled with institutional barriers and faculty resistance, has impeded widespread organizational change. The current research project endeavors to break through these silos by embracing transdisciplinary practices, particularly through cross-college co-teaching. By actively engaging faculty from diverse disciplines—liberal arts, business, and engineering/technology—this study aims to unravel the cross-college co-teaching initiative. The exploration of this three-year program provides valuable insights into the challenges and opportunities inherent in transcending disciplinary boundaries within research-intensive universities. Recognizing the transformative potential of transdisciplinary education, the study aligns with the evolving needs of the workforce and the demands of the 21st century. It responds to the imperative for students to develop skills such as critical thinking, teamwork, and problem-solving that cut across traditional disciplinary lines. Additionally, the emphasis on collaborative learning and co-teaching in this research aligns with the growing recognition that meaningful education occurs at the intersections of disciplines. While the challenges of navigating siloed structures and resistance to change are acknowledged, the study seeks to contribute to the ongoing discourse on redefining higher education. By addressing the gaps in existing literature, this research aims to provide practical insights into the dynamics of cross-college co-teaching and its potential to transform undergraduate educational experience. Ultimately, the knowledge generated

from this study may pave the way for a more authentic and valuable undergraduate education that prepares students for the transdisciplinary challenges of the future.

2.3 Transcending Disciplines through Cross-College Co-Teaching

2.3.1 Disciplinary Boundaries

As education reform calls for authentic learning experiences, transdisciplinarity has emerged with the intention of transcending disciplinary boundaries (Leavy, 2016). The notion of transdisciplinarity goes back to Jean Piaget and Erich Jantsch between the 1960's-1970's posited that although learning is often perceived as a collection of individual experiences contributing to a broader understanding, he contested this notion by arguing that the organization of learned information into coherent sequences fosters superior development and education. According to Piaget, establishing connections among singular events or acquired knowledge can enhance the learning process. In his 1964 text, Piaget presents several questions, two of which are particularly pertinent to the focus of this research. Piaget (1964) articulated, "How much generalization is possible? What makes learning interesting is the possibility of transfer of a generalization" (p. 184). This quotation underscores Piaget's belief that the ability to apply concepts across various domains is the captivating aspect of learning. Furthermore, Piaget revisits this inquiry by asking "In the case of each learning experience what was the operational level of the subject before the experience and what more complex structures has this learning succeeded in achieving? In other words, we must look at each specific learning experience from the point of view of the spontaneous operations which were present at the outset and the operational level which has been achieved after the learning experience" (p. 184-185). This quote highlights the importance of assessing individual learning experiences in terms of the subject's initial cognitive abilities and the advancements made through learning, emphasizing the progression of cognitive structures. The consideration of subjects' value and their limitations in learning and development has long been a topic of discussion. Jantsch (1970) proposed that the university's evolving role might lie in the convergence of reason, suggesting it could redefine its purpose autonomously, detached from the intentions of its individual constituents. Expanding on Jantsch's notion, transdisciplinary was elucidated as "multilevel coordination of entire education/innovation systems" (p. 410). Transdisciplinarity can be envisioned as the overarching aim of orchestrating "multilevel multigoal education/innovation

system in a meaningful way--if we do not search for and bring into play values and norms, a policy for mankind, to guide education and innovation. This task is, on the one hand, an aspect of policy formation and institutional renewal--and thus part of the domain of policy sciences and on the other hand its very motor, if education and innovation are supposed to be geared to the self-renewal of society” (p. 410). Essentially, this quote emphasizes the importance of integrating values and norms into educational and innovative endeavors, highlighting their role in shaping societal progress and institutional evolution. Furthermore, the importance of incorporating social science within innovation initiatives has been acknowledged, as it enables the exploration of human freedom, creativity, and responsibility. Effective transdisciplinary endeavors necessitate coordination across all levels, with universities identified to cultivate their transdisciplinary initiatives across three distinct sectors. The sectors were identified as:

1. “Systems design laboratories (in particular, sociotechnological systems design laboratories), bringing together elements of the physical and the social sciences, engineering and management, the life sciences and the humanities, law and policy sciences” (p. 422).
2. “Function-oriented departments, taking an outcome-oriented look at the functions technology performs in societal systems, and dealing flexibly with a variety of specific technologies which all might contribute to the same function” (p. 422).
3. “Discipline-oriented departments of a more familiar type, but with a somewhat different scope, comparatively smaller and more sharply focused on the interdisciplinary potential (or "valency") of the disciplines. These departments will be mainly set up in the basic scientific disciplines at the empirical level of the education/innovation system and in the structural sciences, including such new fields as computer science. The three layers of organizational structure focus on the interdisciplinary coordination of the purposive/normative, normative/pragmatic, and pragmatic/empirical levels of the education/innovation system” (p. 424).

As evidenced by the works of Piaget (1964) and Jantsch (1970), transdisciplinarity has been a longstanding concept explored in research and in addressing global challenges. However, Thompson Klein (2004) emphasizes the pivotal role of education in shaping future transdisciplinary endeavors, advocating for the integration of transdisciplinary practices across all

levels of schooling. Transdisciplinarity necessitates deconstruction, acknowledging that objects, ideas, or notions may exist across various levels of reality within different disciplines, often containing contradictions, paradoxes, and conflicts. Therefore, transdisciplinary collaboration involves integrating diverse sets of knowledge from different disciplines (Leavy, 2016). For the M3 program, transdisciplinarity occurs naturally at points where disciplines converge. The essence of transdisciplinarity lies in fostering collaboration and integration among diverse fields of knowledge, acknowledging the complexities inherent in transdisciplinary work. Within the M3 program, there are co-taught courses such as *Designing Technology for People: Anthropological Approaches* and *Prototyping Technology for People: Making Decisions & Thinking Strategically*. In *Designing Technology for People: Anthropological Approaches*, the fusion of design and innovation with anthropology occurs at their inherent intersection, while *Prototyping Technology for People: Making Decisions & Thinking Strategically* integrates design and innovation with business, also at its natural convergence point. Grubbs and Strimel (2015) underscored that “traditional or “siloe” approaches to teaching STEM subjects has been a major contributor to the lack of student interest in STEM activities and careers” (p.80). In essence, this quote highlights how the conventional isolated teaching of STEM subjects has hindered student engagement and interest in STEM-related pursuits and professions. Therefore, integrating disciplines could cause educational transformation.

While the focus of this study is on how co-teaching is enacted in higher education to support transdisciplinarity, it is crucial to acknowledge the validity of other integration approaches in education, as emphasized by Leavy (2016). Various methods exist to denote the convergence of disciplines, as delineated by Han et al. (2023), who categorizes them into disciplinary, multidisciplinary, interdisciplinary, and transdisciplinary. Drawing on the definitions provided by Vasquez et al. (2013), these approaches can be summarized as follows: “(1) Students learn concepts and skills separately in each discipline (Disciplinary); (2) Students learn concepts and skills separately in each discipline but within a common theme (Multidisciplinary); (3) Students learn concepts and skills from two or more disciplines that are tightly linked so as to deepen knowledge and skills (Interdisciplinary); (4) By undertaking real-world problems or projects, students apply knowledge and skills from two or more disciplines and help to shape the learning experience (Transdisciplinary)” (p. 73). Moreover, referencing Leavy (2016) again,

multidisciplinary collaboration involves two or more disciplines, with each maintaining its own assumptions, values, and methods, essentially operating in parallel. Borders persist, and disciplinary autonomy is preserved. In contrast, interdisciplinary collaboration, while also involving two or more disciplines, exhibits a higher level of interaction between them compared to multidisciplinary collaboration. There is ongoing debate regarding the preservation of disciplinary autonomy in interdisciplinary work; however, it is theorized that more often than not, questions rooted in disciplinary assumptions are challenged, leading to the emergence of new practices and knowledge. While these approaches offer distinct advantages, they may fall short in their ability to fully integrate and synthesize disciplinary knowledge. The M3 program is designed to offer students authentic, transdisciplinary learning experiences through cross-college co-teaching. By focusing on co-teaching at the natural convergence point of disciplines, the program emphasizes the presence of two instructors from diverse backgrounds, a crucial element in delivering classes that go beyond a singular discipline. The M3 program is motivated by a commitment to respond to the imperative of transforming undergraduate education, with an emphasis on pedagogical This research defines co-teaching as two instructors from different academic colleges delivering integrated instruction to a diverse group of students also from varying academic colleges in unison in the same location (Cook & Friend, 1995).

2.3.2 Collaboration

Collaborative work, such as co-teaching can successfully work through by encouraging networking, coordinating, and cooperating that scaffold on each other throughout the development of the co-teaching process (Himmelman, 2002). These elements can only occur based on the teachers' abilities to establish trust, respect each other's turf, but still collaborate, and the key component of time. These strategies can be effective when the co-teachers have a shared purpose, meaningful collaboration of resources, the mentality of being life-long learners, and accountability. The members working in co-teaching settings should be willing to celebrate group and individual achievements, take risks, share responsibilities and rewards, all while working to achieve their shared goal. The following definition reflects the co-teaching process of the teachers in terms of their internal organizational methods within the M3: from Himmelman (2002) as "a process in which organizations exchange information, alter activities, share resources, and enhance each other's capacity for mutual benefit and a common purpose by sharing risks, responsibilities, and

rewards (p. 3). Without the co-teacher's willingness to go through the process of working together outside of the classroom, the dynamic of the co-teaching integrated subject matter might not be as authentic within the classroom. The integration of the subject matters in this program is done through transdisciplinary, where "...the prefix "trans" connotes transcending disciplines" (Thompson-Klein, 2018, p.11). Through co-teaching within the M3 program, the instructors are looking to achieve educational transformation through transdisciplinarity and recently, there have been four pillars identified that are seen as vehicles for positive pedagogical change through co-teaching: 1) adopting an interactive approach to teaching, 2) developing a critically reflective teaching practice, 3) developing teaching knowledge, and 4) shifting instructors' thinking about students and teaching (Haag et al., 2023). Through these pillars, the authors found that pedagogical change can occur. These pillars can be applied to the M3 model because the program is looking to transform undergraduate education by transcending disciplines through transdisciplinary education. Collaboration in teaching manifests in diverse ways, traditionally structured around academic disciplines, and grade levels, however in this study we will see a crossover of unique disciplines with students spanning grade levels (Carpenter et al., 2022). Some advantageous factors can occur for faculty who involve themselves in programs such as this one, making co-teaching something that maybe should be encouraged, if not adopted by other institutions. For example, Carpenter et al. (2022) mentions that co-teaching can enhance teachers practices with supporting student learning, offer opportunities for group inquiry, fostering professional development, and has been associated with an increased willingness to take risks and learn from mistakes among educators. Additionally, research indicates that collaboration can positively impact teacher self-efficacy and job satisfaction (Carpenter et al., 2022). While collaborating across disciplines can be difficult, Carpenter et al. (2022) have found that teacher collaboration that had a strong link to pedagogy was more effective than other approaches to collaboration. Through the iteration of disciplines, faculty are working to produce meaningful learning experiences for students. By providing a platform for exploration beyond existing structures, the facilitation of movement in a bidirectional dynamic, as discussed by Klein (2023), opens avenues for renegotiating identities and meanings. This concept becomes tangible in a practical context during a workshop mentioned in Strimel et al. (2022), where faculty involved in a co-teaching initiative actively engaged in evaluating and enhancing course content. The workshop not only fosters a collaborative environment but also identifies barriers to transformative teaching, strategizing ways to address

challenges. The focus extends to addressing student needs and values, adopting pedagogical approaches across colleges, refining co-teaching methods, and developing learning community activities that nurture students' innovative capabilities. The synergy between Klein's theoretical perspective on renegotiating identities and the practical application within the workshop highlights a unified trajectory towards innovative and collaborative educational practices that can transcend individual disciplinary backgrounds. This recognition aligns with the broader exploration of integration approaches, ensuring a comprehensive understanding of the transformative potential within educational initiatives.

2.4 Relationship Building Toward Transdisciplinarity

2.4.1 Network Facilitator

The importance of building relationships is a common theme when creating a transdisciplinary program, specifically a cross-college co-teaching and co-learning program. A suggested strategy mentioned by McDonald et al. (2018) is to cultivate relationships with the partners involved in the creation and function of the program, which can lead to a sense of joint ownership, swift problem-solving processes, and willingness to compromise. The authors found cultivating relationships to be extremely beneficial to the interworking of the cohort of people responsible for creating an interdisciplinary program. The relationship building process extended to administrators as well, allowing for a fair proposal review, and then an advocate for the program and interdisciplinary teaching. Along with that, it is suggested that one person be responsible for the relationship building with administrators and other stakeholders. This idea, when developing and sustaining a program at a research-intensive institution, can prevent misinformation of the program and keep administrators and stakeholders up to date with the program's successes, which is important at large complex universities. Additionally, Pharo et al. (2012) conducted a case study in Australia where eight teachers collaborated to give 570 students an opportunity to solve a real-world problem through a climate change focused instructional unit, due to institutional reforms that demanded interdisciplinary education. Using written reflections from the participants, the authors found that success, barriers, and challenges were identified in creating this interdisciplinary program. The teachers developed an enhanced sense of community, employed a network facilitator, and created useful integrative lessons. As for the challenges, individual

workloads and university expectations were the main problems faculty encountered. The importance of teacher networks is emphasized by Pharo et al. (2012) for sustaining continued professional relationships, and in this study the network facilitator assisted in organizing the collaboration meetings. The logistical and administrative role is maintained by the network facilitator who also has an interdisciplinary background, allowing teachers to focus on their academic duties (Pharo et al., 2012). Delegating a member of the team only to relationship building and team management is described to potentially overcome or work on some of the barriers faced with relationship building when developing and sustaining interdisciplinary programs. However, in this research project, the people who are facilitating the relationships toward transdisciplinarity, are also the ones instructing the classes, therefore the upkeep on important relationships, could look different from the ones described in other studies that have delegated people for those roles.

2.4.2 Singapore University of Technology and Design (SUTD)

Additionally, Graham (2018) conducted case studies in different universities that were chosen to represent newly developed programs that have ambitious systematic reform and have taken a continual and iterative approach to developing their educational standards. One of the case studies found that Singapore University of Technology and Design (SUTD) approach is working and is largely accredited to the idea of connectivity. However, prior to diving into the concept of connectivity in higher education, understanding the foundation of SUTD is essential. Singapore's government called for a fourth university for economic growth and to foster talent and applied research in these following areas: "(i) engineering and applied sciences; (ii) business and information technology; and (iii) architecture and design. With an emphasis on interdisciplinary, hands-on learning, and a strong connectivity to industry, the university would also offer "a new future-oriented [educational] approach" designed to nurture technology-driven entrepreneurs and inspire further generations to follow careers in science and engineering" (Graham, p. 20). The Massachusetts Institute of Technology (MIT) created the blueprint for SUTD. SUTD's structure was based on design and maker centered pedagogy, a collaborative culture, a multidisciplinary approach, innovative education, and academic rigor in regard to engineering principle. One thing that has been noted about SUTD is the ability to foster connectivity between cross-disciplinary faculty teaching teams, the courses in the curriculum, and between students from different academic disciplines. SUTD is thriving because of the drive and passion from the leadership, its

support for MIT, and the appointed, handpicked leadership team that have pushed the boundaries in the design-based education space. The educational mission is what motivates the faculty and the leadership to keep pursuing innovative education and pursue their one shared vision. Connectivity and a shared vision among faculty and administration can answer the call for transforming higher education and fostering a relationship can be a catalyst for educational innovation.

2.4.3 Teacher Collaboration and Building Relationships for Communities of Transformation

Furthermore, scholars conducting research around Communities of Transformation (CoTs) has noted that faculty relationships were an important part of the educators maintain their practices (Kezar & Gehrke, 2015). For example, the authors wrote “Networks also provide social capital that facilitates the change process by providing access to relationships and knowledge about how to overcome barriers” (p.6). Ensuring the success of a cross-college co-teaching initiative in an R1 institution hinges on addressing prevalent barriers. Cultivating a robust network and fostering relationships play a pivotal role in optimizing resource allocation and minimizing impediments. Recognizing the impact of collaborating in diverse groups to tackle challenges is not only relevant but imperative. This approach aligns with the evolving nature of collaboration in professional settings, marked by increasing frequency and complexity (Colton et al., 2022). Moreover, it acknowledges the growing diversity and fluidity of our communities and lives beyond institutional boundaries (Colton et al., 2022). The National Staff Development Council (a non-profit established in 1969 to foster school improvement in the United States) reported that in U.S. schools, the emphasis on quality staff development is emphasized by the promotion of teacher collaboration and the establishment of trusting relationships (Kolleck et al., 2021). Kolleck et al. (2021) acknowledge various forms of teacher collaboration, existing along a continuum from independence to interdependence. This continuum spans from basic material exchange to collaborative efforts aimed at achieving goals that cannot be realized independently. Successful collaboration among teachers involves effective communication, a foundation of trust, the assumption of a certain level of autonomy among participants, and a commitment to reciprocity norms. These prerequisites are crucial for collaborative practices demanding high effort and intense work, such as co-constructive practices among teachers. Kolleck et al. (2021) recognize

that one of the most immersive forms of teacher collaboration is co-teaching. Co-teaching entails two or more teachers jointly preparing, conducting, evaluating, and teaching together (Kolleck et al., 2021). Co-teaching can be viewed as an instructional model rooted in Johnson and Johnson's cooperative learning theory (2005), which is grounded in the social interdependence theory from social psychology. However, teacher collaboration within school environments is a multifaceted phenomenon shaped by diverse factors, with individual attributes like age, gender, and experience exerting notable influence (Kolleck et al., 2021). The pivotal role of cohesion within teachers' communities surpasses the importance of individual factors when determining the levels of collaboration. The positive association between self-efficacy, learning goal orientation, and teachers actively seeking feedback underscores the importance of these personal qualities in fostering collaborative and improvement-oriented strategies. Additionally, the formation of dense teacher networks emerges as a catalyst for positive attitudes towards inclusion and the adoption of more differentiated instruction, particularly in inclusive settings. Notably, teachers exhibit a preference for collaborative forms that preserve their autonomy, reflecting a strategic approach in their collaborative endeavors. The motivation for collaboration can be driven by subjective values and personal relevance, and influence teachers' perceptions of principals and their intrinsic tendencies to collaborate. domains (Klein, 2023). The positive correlation observed between teachers' self-efficacy, collective efficacy, and their engagement in extra-role behavior underscores their voluntary dedication to supporting team goals. This commitment reflects a deeper understanding of the intricate nature of collaboration within educational settings. As educators navigate real-world challenges, the importance of relationships across various levels emerges as a crucial factor in accessing and assimilating knowledge (Klein, 2023). This necessity has spurred the development of innovative frameworks, exemplified by integration and implementation sciences and the evolution of transdisciplinary action research (Klein, 2023). The concept of balance, depicted in diverse contexts like maintaining physical stability, achieving harmony between personal and professional spheres, evaluating cost-benefit trade-offs, and understanding the interplay of disciplinarity and crossdisciplinarity, serves as a unifying thread in this multifaceted exploration. This holistic perspective on balance not only reinforces the nature of managing various aspects of life and knowledge domains but also highlights the interconnectedness in the pursuit of educational collaboration within the teaching community (Klein, 2023).

Communities of transformation, which are derivatives of communities of practice, function on interpersonal support and key foundational relationships. The stakeholders involved in the M3 program, are key in fostering and sustaining the relationships that enable transdisciplinary learning and help overcome barriers to cross-college co-teaching. However, those stakeholders experience different challenges when it comes to working on a transdisciplinary project at a research-intensive university. Throughout the literature there are suggested ideas around how cross-college collaboration can flourish. For example, Brodin and Avery (2020) write that working across disciplines is difficult but can be strengthened through working in the same building and communicating daily. Building relationships with the team members from different disciplinary backgrounds can improve as each member will better come to know and understand their peer's communication style, schedule, and personality. found that forming personal connections among team members in setting such as transdisciplinary teams, the collaboration can become successful (Colton et al., 2022). Collaboration from stakeholders in transdisciplinary initiatives is important as Klein (2017) had found that around half of collaborative ventures in higher education fail. However, Klein (2023) highlights the transformative potential of transdisciplinary initiatives in reshaping power dynamics within higher education institutions. This transformative impact extends to conventional power structures in academia, encompassing relationships among faculty, advisors, administrators, and other stakeholders. Fostering strong connections and effective communication among team members within transdisciplinary projects is pivotal for success. Furthermore, the relevancy of comprehending the individuals engaged in collaboration within higher education, recognizing the potential of transformative outcomes (Klein, 2017). In the context of co-teaching, this insight holds relevance as it speaks to the necessity of understanding the dynamics among educators involved in cross-disciplinary ventures. The prospect of achieving something truly transformative through collaboration in transdisciplinary research prompts an examination of co-teaching practices within the M3 program. Felt et al. (2023) advocates for exploring the transformative impact of cross-disciplinary work on individual practices, emphasizing it as a valuable pathway. This resonates with the co-teaching context, where educators with diverse disciplinary backgrounds converge to create a collaborative teaching and learning environment. Notably, the observations of Brodin and Avery (2020) highlight the differing orientations of experiences and emerging researchers towards transdisciplinary identity. This

insight can be applied to co-teaching scenarios, acknowledging that educators may bring established practices from their specialized disciplines, while newer educators may demonstrate greater receptivity to embracing a transdisciplinary approach. Understanding and navigating these individual dynamics are crucial for the success of co-teaching initiatives, as it involves merging diverse perspectives, teaching philosophies, and willingness to create new relationships.

2.5 Research-Intensive Universities and Transdisciplinary Co-teaching

2.5.1 Untapped Potential in Higher Education

Research-intensive universities prioritize research and discovery in their core missions. While these universities offer master's and doctorate degrees that enable faculty and graduate students to work collaboratively on research, these institutions also cater to undergraduate students who should gain experience with convergence learning. According to the Association of American Universities (AAU, 2023), undergraduate students at research universities can benefit from engaging with leading scholars in their fields and being exposed to cutting-edge research. These experiences can foster a culture of inquiry, discovery, and creativity around compelling questions and exciting frontiers for learning (Boyer, 2023). However, there remains untapped potential to cultivate early collaborative learning experiences, especially in emerging and convergent fields. Jantsch (1970) raised questions around the perception of education solely as a catalyst for economic growth, and the university merely as a cog in the production machinery, suggesting that this viewpoint overlooks potential frameworks for academia. Economic planning tends to adhere to a linear approach, focusing on quantifiable variables like student enrollment rather than the broader structural aspects. This often results in universities being steered towards a rigid societal model with predefined patterns of specialization, hindering the integration of feedback from social innovation into scientific endeavors. Despite their proven efficacy, the adoption of innovative teaching practices in undergraduate STEM education can encounter obstacles. In essence, this quote highlights the need for a more flexible and adaptable approach to education that fosters interdisciplinary collaboration and responsiveness to societal needs.

2.5.2 Limitations in Higher Education

In Strimel et al. (2023) the study found various limiting factors including entrenched customs, faculty reward structures, competitive pressures to stay productive in research, and the need for faculty and students to adapt to new approaches. The complex and decentralized nature of research universities makes it challenging to implement instructional reforms solely targeting individual faculty members. While disciplinary expertise is necessary and vital feature of universities, the structures that come along with this can prevent modifications/improvements to the roles of academic units/disciplines that could better prepare students for the future of both work and learning. The balancing of disciplinary structure with transdisciplinary approaches to solving problems and learning is a challenge that must be continually addressed. To address this, reforming STEM education requires institutions to reconsider their structures and culture (AAU, 2011; Fairweather, 2008; Austin, 2011; Boyer, 2023; Aoun, 2017; Serdyukov, 2017; Haldane, 2018). The Boyer 2030 Commission emphasizes the importance of investing in undergraduate education to prioritize students, increase revenue, restore public trust, and prepare a diverse workforce for the 21st century. The previous information highlights the importance of translating the convergence paradigm into the teaching enterprise, providing undergraduate students with more than disciplinary specialization. In higher education, academic promotion and tenure are centered around three pillars, teaching, research, and service (Jessani et al., 2020). With changing and more complicated requirements by funders to demonstrate wider impacts of research, it could be beneficial to explore the financial and non-financial incentives for academic faculty to engage in research and teaching. Higher education faces artificial disciplinary boundaries that prevent transdisciplinary collaborations. These boundaries that impede experimentation with novel or even research-backed pedagogies are often chalked up the common phrase of “this is the traditional nature of the institution.” What the traditions are really based upon are issues such as faculty teaching loads, research expectations, tuition dollars attached to class enrollments, and the siloing of disciplines into separate buildings, and sometimes even separate campuses (McDonald et al., 2018). Additional barriers faced when working to enhance teaching across disciplines can include how courses are listed in the course catalog, questions about who “owns” the course, and the power dynamic between co-teachers and their disciplines with respect to the level of integration (McDonald et al.; Strimel et al., 2022).

Additionally, McDonald et al., (2018), mentions that culture between academic schools can produce contention about definitions and opinions about what falls under the class content. Known challenges about collaboration between departments as identified by the authors include remaining true to the common goal of the program, dealing with competing interests, and everyday faculty pressures faced in higher education. Competing interests are classified in this case as official demands of teaching, research, and/or department committee work. In a case study by Graham (2018), two important ideas came out of a cross-faculty program. The first one is the importance of maintaining an effective balance between establishing the cross-faculty educational structure based on research activity and ensuring that each department's discipline is present are key in shaping the configuration of a program. The second is around the faculty's priorities when taking a role such in a cross-faculty collaboration. Some interview data from this case study revealed "that there was a transition away from teacher-centered delivery of 'engineering content' and a shift toward project-centered learning had the "research-focused staff, who would have taught the traditional lectures, doing less teaching" and "staff that are more interested in teaching taking on a much greater load" (Graham, p.23). The author believes that educational transformation can reshape the faculty's academic roles and research interests.

Furthermore, Jessani et al. (2020) recognize that navigating higher education is neither simple nor universally ideal. This is particularly true when faced with institutional pressures, such as managing bureaucracies' processes and procedures, and interacting with individuals such as administrators and academic stakeholders, who are responsible for making decisions about interdisciplinary programs. McDonald et al. (2018) acknowledges that barriers might not be encountered at every institution when attempting to implement a collaborative program but does mention that there will be some barriers faced, and West (2002) suggests that the organizational climate, support systems, and the work environment highly contribute to implementation of innovative ideas. For transformational change to occur in higher education, support from different stakeholders seems necessary. An institution that is actively seeking to answer the calls of transforming undergraduate learning has to implement the resources necessary to meet the demands of this reform. Franks et al. (2007) recognizes that even though the idea of transdisciplinary is strongly supported, it does not mean that every university has the right structure or faculty to sustain its focus. "The Boyer 2030 Commission heard from higher education experts, faculty, and university leaders that aligning the faculty rewards structure with the stated

educational mission of the university is the most important reform we can make to ensure sustained, authentic institutional change in the quality of undergraduate education” (The Boyer Commission, 2022, p.33). The Boyer Commission (2022) additionally stated that around 70% of faculty are non-tenure track, therefore teaching is their priority, and want to do well by their students. Transforming undergraduate education requires buy in from multiple stakeholders to navigate the rigid structure of higher education.

2.5.3 The Emergence of Transdisciplinarity in Higher Education

Moreover, interdisciplinarity emerged in the early 20th century, linked to the pursuit of knowledge unity, social science research, educational integration, frameworks like American and Area Studies, and defense needs exemplified by the Manhattan Project (Klein, 2023). Throughout the century, new fields emerged, disciplines became more diverse, and transdisciplinarity gained prominence, introducing new conceptual frameworks and inclusive approaches to problem-solving. The concept evolved as a descriptor of science, becoming intrinsic to scientific inquiry, and today's archipelago of inter- and trans-disciplinarity reflects diverse motivations, practices, and structures. Science-policy bodies and funding agencies note the acceleration of cross-disciplinary and cross-sector work, emphasizing the continued importance of disciplinarity alongside prioritizing problem-solving. While some endorse the preservation of disciplinarity, others challenge, disrupt, or seek to displace traditional practices and systems. Klein (2023) underscores the diverse spaces where cross-disciplinary and cross-sector interactions occur, challenging dichotomies and highlighting the importance of a transdisciplinary border character in addressing global challenges. it is crucial to acknowledge Klein's (2023) argument that spaces promoting an emancipatory or decolonial orientation should be more accurately conceptualized as transdisciplinary rather than interdisciplinary. However, it is essential to note that not all transdisciplinary ventures can decolonize disciplines. Klein (2023) drew a comparison between decolonial consciousness and border consciousness, asserting that they contribute to the advancement of transdisciplinary border thinking. This form of thinking traverses' disciplinary boundaries in knowledge, action, and creation, allowing a decolonizing subject to challenge the rigid confines of disciplines and methods. Furthermore, the author employs the term "transdisciplinary critical social theorists" to characterize thinkers and theorists who surpass disciplinary expectations, operating beyond conventional requirements. The M3 model highlights a pathway for transdisciplinarity in higher

education through people who can be seen as transdisciplinarity critical social theorist as the faculty seem to be operating beyond the conventional requirements of faculty in higher education institutions.

In conclusion, the focus on cross-college collaborative teaching and transdisciplinary pedagogical approaches is paramount in addressing the complexities of fostering innovation across academic units (Strimel et al., 2022). The challenges of assigning credit, coordinating schedules, and fostering effective communication among collaborating instructors underscore the nature of implementing cross-college co-teaching. The stakeholder-driven initiative proposes a novel approach, allowing courses from different colleges to "meet with" each other within the university system without the pitfalls of cross-listing. This innovative strategy seeks to align learning objectives, provide full credit to collaborative instructors, and offer a more intuitive scheduling process for students. However, the endeavor faces hurdles in finding faculty willing to embrace these collaborative approaches and garnering community support for transdisciplinary programs. Overcoming these barriers is crucial to cultivating a learning environment that nurtures innovative thinking, transcending traditional disciplinary boundaries and preparing students to navigate the complexities of a transdisciplinary world..

2.6 Literature Documenting the Purpose

2.6.1 Understanding the Complex Challenges Facing the World

Working toward creating a sustainable program that involves cross-college co-teaching to transform undergraduate education, knowledge around collaborative practices in education can be deemed beneficial. Pharo (2012) wrote that the concept of using social challenges that exist at the interfaces of disciplines as the context for relevant and engaging learning experiences is a construct that has been around for some time. However, that idea, mentioned by Pharo (2012), can be more necessary now than before. As Bettencourt et al. (2023) mentions, current undergraduate students are the generation that will be working towards planetary crises such as climate change, food insecurity, and housing insecurity that will require the convergence of knowledge across multiple fields and require transdisciplinary teamwork. Transdisciplinary practices have been shown to work in problem spaces where social, technical, and economic developments interact with elements of value and culture—these spaces include, but are not limited to aging, energy, health

care, nutrition, sustainable development, landscape, housing and architecture, and urban land and waste management (Thompson Klein, 2004). The challenges that humanity faces can benefit from the integration of multiple approaches with the consideration of human centered design. With that, multiple institutions are developing interdisciplinary undergraduate programs to meet the demands of workforce readiness and to answer demands of the ever-changing world (Bettencourt et al., 2023). Within these programs, teamwork amongst people with different disciplinary backgrounds can offer different perspectives when working to solve problems. West (2002) mentions that a team with members who have diverse skills and knowledge approach problem-solving and innovation dynamically through offering broad perspectives that might not have been explored in solidarity or confined to one school of thought. The workforce is operating within a globalized digital world, attempting to solve problems and challenges that are not limited to boundaries (Buchmiller et al., 2021). Therefore, the authors mention that students could benefit from interacting with stakeholders from different domains and regions, from novice to experts, in order to enhance their knowledge base, technical skills, and designs so they could address various problem spaces, target groups, and markets. Furthermore, suggestions around curriculum and pedagogies to prepare students for these scenarios can foster global, international, and intercultural understanding, which the authors recognize as inter- and transdisciplinary competencies. Transdisciplinary approaches are seen as promising ways to deal with meeting such competencies in higher education as it requires people from different backgrounds to converge and share knowledge, as well as interact with stakeholders across disciplines. The existing research has suggested that “...diversity of professional background is associated with higher levels of innovation” (West, p. 363). Therefore, there are notable benefits to be gained from transdisciplinary work, as it allows for further idea generation that will be necessary to solve societal problems as they expand across multiple disciplines (Paulus, 2000). Incorporating these practices into higher education encounters various obstacles. Collaborating across different academic departments poses challenges in terms of accreditation and faculty responsibilities. These responsibilities vary among colleges, encompassing teaching loads, research obligations, student organization commitments, and personal duties, all of which factor into a faculty member's schedule.

2.6.2 Seeking Transdisciplinary Experiences

However, from the student perspective, McDonald et al. (2018) surveyed students and found that students are interested in interdisciplinary collaboration but admitted that it was not common practice at their institution. “One student said, in my major there are very few classes where I can collaborate. Another agreed, saying, I think the opportunities [for interdisciplinary work] are there, but they are not within the normal curriculum. You have to go out and find them. While some respondents mentioned that their instructors gave them opportunities to engage in group work, they also pointed out that group assignments typically were not interdisciplinary, nor were they even truly collaborative” (McDonald et al., p. 443). It is often found that programs that claim they are engaging their students in interdisciplinary and collaborative work, have been rather requiring students to complete group projects that get divided into assignments for each student to finish their own part on their lonesome, lacking the communication, and teamwork aspect students should be engaging in when doing any kind of cross discipline work. Working with other people does not immediately mean being collaborative. Students desiring this type of collaboration with their peers will seek to find opportunities that will present them with a true interdisciplinary experience, like enrolling in multiple programs and completing a plethora of minors. McDonald et al. recommend that interdisciplinary programs should not be confined by a singular discipline but should provide different perspectives and allow students and faculty from all departments and colleges to collaborate. The authors found that these needs led to the proposition of an interdisciplinary minor around developing design thinking and collaboration competencies, consisting of the following composition: introduction tool design thinking, design knowledge, design tools, and a capstone project. The goal is to provide students with the opportunity to design and innovate with students from multiple disciplines and create projects that answer a problem or a need.

Furthermore, another study looked at students' experiences in an interdisciplinary program where students that were admitted into the program were split into two cohorts, biomedicine and renewable energy (Bettencourt et al., 2023). Students came from a wide range of majors and interacted with the same cohort during their program. Through interviews the study found that once the students entered the workforce, they were able to identify the importance of interdisciplinary education more than when they were during their academic career. The authors also found that several participants mentioned that their majors were too discipline specific and they were craving experiences to broaden their knowledge. Some of the barriers that emerged from

that study include missing foundational skills, unappealing and unrelated content for some students, inability to fully engage, and some students considered it extra work rather than important work. There seems to be challenges around the convergence of disciplines and creating opportunities for transdisciplinary teamwork where the students are working toward solving a problem.

2.6.3 The Natural Relation to Design and Innovation

A study from McDonald et al. (2018) found that the concept of prototyping emerged naturally for the creation of an interdisciplinary program. Designing and innovating is a concept that can be applied when disciplines converge. “Promoters of integrative pedagogical approaches emphasize how professions related to the different academic subjects have transformed into transdisciplinary ventures. This transformation has created a need for integrative STEM practices that focus on real-world contexts and student questions related to local or global issues” (Grubbs & Strimel, 2015, pp. 80). Furthermore, there is a new wave of disciplines converging in engineering programs that have been the catalyst for educational reform in a plethora of institutions that are drawing on innovative teaching methods including project-based learning that further shows that STEM is the natural convergence point (Graham 2018). Graham identifies that these innovative programs are shaped by specific regional needs and constraints, and their success relies on them being embedded in a faculty culture of educational innovation. Stakeholders and the culture of the educational environment can impact the implementation of a program such as this one. In this case study, there is an opportunity to learn more about the strategies and barriers faced with transdisciplinary programming that involves cross-college co-teaching rather than solely interdisciplinary or multidisciplinary programming. This research will hopefully support other universities in providing students with opportunities to develop new conceptual understandings and innovative ideas by blending disciplinary knowledge and practices. Furthermore, Colton et al. (2022) has found that while transdisciplinary education could have facilitated a connection between policy and implementation, their study has revealed that the disparity between the two is more extensive. Therefore, there is a higher need for effort to create trust between administration and faculty in central roles who indirectly aim to provide support. The authors further identified that for faculty member to contribute to transdisciplinary efforts, navigating academic structures, administrative procedures, and location issues have to and can be overcome, especially for cross-college co-teaching. However, “it also showed that doing so requires significant additional labour

by the participating academics – labour which is often not recognised by the University” (Colton et al., 2022, p. 524). For change to occur, the stakeholders in the program can benefit from “collaboration by dismantling institutional barriers and recognising the work involved at the level of the individual” (Colton et al., 2022, p.524). In the M3 program, the guiding philosophy centers on the belief that impactful innovations do not occur in disciplinary silos. Embracing a transdisciplinary approach is essential for comprehending the underlying meaning of the challenges people encounter (Strimel et al., 2022). The mission is not only to address these issues but also to contribute positively to individuals and communities, shaping solutions with the people they affect in mind. By adopting this approach, the program establishes a community of campus resources dedicated to nurturing student learning and fostering an innovative culture and spirit. The M3 model comprises three distinct elements. Initially, there exists a community encompassing individuals and resources dedicated to supporting students in achieving innovative outcomes and acquiring relevant skills through collaborative efforts. The second element involves the domains within the college, facilitating collaboration among instructors from diverse departments to share areas of interest and address key issues pertinent to co-teaching innovation-focused courses. Finally, the curriculum of the model underscores shared practices and discourse, promoting innovation through collaborative learning experiences. The educational model establishes a distinctive collaboration among partnering colleges, aiming to amalgamate expertise in areas such as functional performance in engineering/technology/design, the human interface within liberal arts/social sciences, the economic perspectives of business management, and a global/cultural appreciation.

In conclusion, this study underscores the pivotal role of regional considerations and faculty culture in shaping the success of innovative programs. The impact of stakeholders and the educational environment's culture on program implementation is evident, particularly in the context of transdisciplinary programming that involves cross-college co-teaching. Valuable insights into the strategies and challenges associated with similar initiatives are gleaned from this case study. For meaningful change, it is imperative that stakeholders engage in collaborative efforts to dismantle institutional barriers. The interviewees from the Strimel et al. (2022) paper identified strategies to address barriers to the transformation of teaching and learning. These include leveraging university "pet projects" to garner support and funding, understanding

university processes from the perspective of students, finding collaborative faculty for cross-college co-teaching, engaging with various stakeholders when planning new programs, and establishing a Community of Transformation to provide resources and support for teaching and curricular innovation. Furthermore, the community of transformation strategy emerges as a potential overarching solution to these concerns, possibly evolving into a university educational innovation center/hub for teaching and learning with a dedicated team to assist in the development, organization, and scheduling of cross-college/transdisciplinary programs (adapted from Strimel et al., 2022). Ultimately, this case study hopes to contribute not only to comprehending the dynamics of cross-college co-teaching programming but also advocates for a collaborative and supportive environment that nurtures innovation and collaboration across academic disciplines through transdisciplinarity.

2.7 Theoretical Perspective: Communities of Transformation (CoT)

The M3 program is centered around 1. Co-teaching and co-learning from faculty and students spanning academic backgrounds as well as 2. Learning experiences across multiple semesters where students can become a part of a community that can encourage learning and innovation (Strimel et al., 2022). This type of cross-college educational model requires the transformation of practices, goals, structures, and communities surrounding the stakeholders involved with the M3 program (Ghnemat et al., 2022). The M3 model can potentially reduce the knowledge gap between undergraduate students and career skills. Shadle Liu et al. (2018) wrote that educational programs and teachers can benefit from opportunities to interact with other educators as they try new teaching methods in an environment that challenges and supports the educators and has the potential promote change. This approach is believed to be one way to establish innovative spaces that do not currently exist with the potential to shift institutional and disciplinary norms. Understanding how a community stemming from the M3 program can be leveraged to create a university environment that will bridge across academic units to 1. break the isolation of “islands of innovation” within individual academic discipline sectors and 2. enable the brainstorming of to revise teaching practices and facilitate the adoption of new educational approaches (Kezar & Gehrke, 2015; Shadle Liu et al., 2018; Strimel et al., 2022). Accordingly, this case study around the co-teaching model used the Communities of Transformation (CoT) framework as a theoretical perspective for the investigation. As defined in Shadle Liu et al. (2018)

CoTs are similar to Communities of Practice (CoP) in that both share a common concern or goal and deepen their understanding of the shared concern or goal through interacting with other faculty members on an ongoing basis. However, CoTs have some aspects that CoPs do not have, which include: “1) a compelling philosophy, 2) a living integration of the philosophy to create a new world of practice, and 3) a network of peers to break isolation and brainstorm revisions in practice” (Shadle Liu et al., p.476). Kezar and Gehrke (2015) wrote a nearly identical list of key characteristics of CoTs as well. Furthermore, CoTs involve a group of individuals who want to come together with the shared goal of collective growth and change. This community may gather around specific themes such as spirituality, self-improvement, social justice, or environmental sustainability. Members of a community of transformation often engage in practices such as meditation, group therapy, workshops, or activism to facilitate personal and societal change. These communities provide a supportive environment where individuals can explore new ideas, challenge existing beliefs, and develop skills to effect positive change in themselves and the world around them. The concept emphasizes the power of community and collective action in fostering personal and social transformation. CoTs involve understanding how students are receiving this pedagogical intervention and how they are embodying the new practices that depart from the traditional methods aligned with higher education (Strimel et al., 2022). This approach could allow for the creation of innovative spaces that break institutional and disciplinary norms. CoTs tend to naturally separate themselves from existing teaching and learning practices found within the home institution while also fostering an innovative culture and reality (Kezar & Gehrke, 2015). CoTs have been shown to improve teaching practices, reenergize faculty, develop leadership skills and improve planning for STEM education (Shadle Liu et al.). While it has been theorized that networks of educators are the key to improving education, studies that surround communities working together to transform teaching and learning could have the possibility to help others interested in STEM education reform. As Shadle Liu et al. alluded that, the educators are the core of CoT framework, which helped this study focus on the topic of co-teaching.

This research study used a CoT framework in order understand if there is “deep, transformational change in higher education teaching practice” (Shadle Liu et al., 2018, p. 475). While it has been theorized that networks of educators are the key to improving education, studies that surround communities working together to transform teaching and learning could have the possibility to help others interested in STEM education reform. As Shadle Liu et al. (2018) referred

to the educators are the core of CoT framework, which helped this study focus on the topic of co-teaching. The CoT framework brought a unique perspective as it focuses on teaching, and this study is taking place at research intensive university. This framework provided insights into if the co-teaching practices are causing transformation. Strimel et al. (2022) wrote that “A CoT can then provide institutional support (including both funding as well as knowledge of institutional structures/policies) to test innovative ideas across academic units and scale the promising teaching results while potentially reducing the academic bureaucracy remaining from traditional educational structures/models” (p.14). Taking a CoT approach could involve faculty from across academic colleges to engage in innovative teaching pedagogy and in turn, can produce innovations for students as well (Strimel et al., 2022; Shadle et al. 2018). While there is limited research on how a CoT can work to transform undergraduate education when looking at educational stakeholders beyond the students, this case study might be able to help address some of the challenges facing higher education learning (Strimel et al., 2022). As Strimel et al. (2022) recommend, this study is investigating how such approaches like CoT can continue higher education transformation efforts. The author used a case study approach to examine how a CoT could be fostered, and this study took the same approach to gain general insights of the M3 project. This case study applied the CoT framework to see if a CoT can emerge from the M3 program. Lastly, CoTs can carry innovative approaches to teaching across theory and practice, and it is defined by core values and a driving philosophy (Kezar & Gehrke, 2015). In Table 1, there are defining characteristics of Communities of Practice (CoP), Professional Learning Communities (PLC), and Communities of Transformation (CoT) to differentiate the terms and types of communities that can emerge.

Table 1. This displays the different types of frameworks that are based around collaboration for change. The following table depicts the differences among the different frameworks.

The research project was guided by the CoT framework, which facilitated the development of novel codes for data organization and cultivated a thematic structure for the findings. The integration of CoT within the M3 program will be explored in both chapter 4 and chapter 5.

Characteristics of Communities of Practice (CoP), Professional Learning Communities (PLC), and Communities of Transformation (CoT)

Type	CoP	PLC	CoT
Definition	People who share common ground and interact with the goal to enhance their passion and their practice (Kezar & Gehrke, 2015).	Group pf people working on collecting information and doing action research collaboratively (Kezar & Gehrke, 2015).	Individuals from different backgrounds using a philosophy to drive new practices that can be used at different institutions (Kezar & Gehrke, 2015).
Features	- A domain - Located in the same place - Share information and build relationships (Kezar & Gehrke, 2015).	- A well-defined - Not a clear shared practice - Bringing together teachers and administrators - Efforts toward school improvement (Kezar & Gehrke, 2015)	- Innovation that is lived through a community and a practice - Joint activities and discussion - Less organic than CoP and less structure than PLC (Kezar & Gehrke, 2015)
Actions	- Problem solve - Track knowledge - Find and foster expertise - Visit colleagues (Kezar & Gehrke, 2015)	- Discuss faculty and student work, student data, and professional text (Kezar & Gehrke, 2015)	- Hold events - Develop leadership and philosophy for new practices - Create a guiding document (Kezar & Gehrke, 2015)
Domain	- Current practices - Members are practitioners - Shared resources and ways of addressing problems (Kezar & Gehrke, 2015).	- Leader in charge of the community where the groups main goal is student success (Kezar & Gehrke, 2015)	- Shared interest that does not commonly exist in practice and the group is driven to bring their idea to practice. - Membership is organic like Cop (Kezar & Gehrke, 2015).

2.8 Summary

Moving toward transdisciplinary learning experiences and developing a cross-college co-teaching program can hold potential for fostering 21st century skills and enhancing the value of higher education. However, this review of literature indicates how the structure of higher education presents institutional barriers to creating cross-college programs and how disciplinary boundaries and faculty/institutional value systems at research-intensive universities barriers can hinder the creation of new transdisciplinary learning experiences. Yet, this review highlighted how relationships and organized team management can be leveraged to support cross-college co-teaching while creating a community of transformation to address institutional barriers toward transdisiplinarity. Lastly, this chapter highlighted the opportunity to for research related to the faculty, administration, and staff involvement in implementing a transdisciplinary program involving three partnering colleges—as most studies only investigate the implementation of interdisciplinary and/or multidisciplinary programs. Chapter three will then discuss how a case study approach will be used to address this opportunity for knowledge generation.

3. METHODOLOGY

3.1 Introduction

This chapter focuses on the methods to collect and analyze the data necessary to address this study's research question. First, the qualitative case study design will be discussed as an appropriate approach to meeting this study's objectives. Next, this chapter provides more context related to the cross-college co-teaching program, referred to as the M3 model, that is this case study's focus. The M3 model has been developed to address demands for transforming undergraduate education and enhancing the value of higher education. Therefore, a deep dive into how the model functions is provided to establish the context for the study. Then, the procedures used to gather and analyze the case study's data are described. Lastly, the chapter will address research biases and the trustworthiness of the study.

3.2 Research Design Overview: A Case Study

To answer this study's research questions, a qualitative case study approach was employed. This case study is looking to understand how cross-college co-teaching at a research-intensive university can be enacted to provide undergraduate students with transdisciplinary experiences. The case study approach was selected as qualitative research occurs in settings that allow the researcher to examine phenomena that need to be investigated from a new angle, and this research typically contains research questions looking to answer how and why (Hays & Singh, 2012). The researcher recognized that qualitative research is exploratory in nature and looked to provide rich descriptions of phenomena. The descriptions for this study came from data resulting from semi-structured interviews (faculty, administrators, and advisors), observations within the collaboratively taught courses, and an analysis of the curricular documents developed for, and used within, these co-taught courses. Case studies are "Unlike experimental designs in which validity and reliability are accounted for before the investigation" (Merriam & Tisdell, 2016, p. 191-192). Instead, "rigor in qualitative research derives from the researcher's presence, the nature of the interaction between researcher and participants, the triangulation of data, the interpretation of perceptions, and rich, thick description" (Merriam & Tisdell, 2016, p. 191-192). This case study took an inductive reasoning approach or a bottom-up approach by collecting data to deeper

understand barriers rather than testing a hypothesis (Hays & Singh). More specifically, this research was analyzed through a case study approach as this is an established practice to examine individual, group, organizational, social, political, or other related phenomena (Yin, 2003). Hays and Singh (2012) define a case as a specific, unique, bounded system, which in this study is the M3 program. Furthermore, a case study is referred to as phenomena or processes that occur within a bound system. Conducting a case study allowed the researcher to maintain the holistic and meaningful characteristics of real-life events and allow for an analysis of how cross-college co-teaching can be enacted in higher education (Yin, 2003).

Data for a case study can come from multiple different sources, and for this research, the researcher is using interviews, observations, and document analysis (Yin, 2003). As for document analysis, Yin (2013) mentioned that it can be relevant to mostly all case studies with the purpose of corroborating and augmenting evidence from different sources. Therefore, this case study utilized document analysis and analyzed the co-teachers' teaching materials. This data source of document analysis was used to help answer the research question by providing insight into some barriers that might be encountered during co-teaching based on the lesson plans. On top of document analysis, Yin (2013) wrote that interviews are also one of the most important sources for a case study as they can derive information through what appears to be a guided conversation as opposed to a line of questioning. This case study examined multiple interviews from a variety of stakeholders that were conducted across three years of the program's implementation. These interviews were semi-structured in a conversational manner with faculty, administrators, and advisors and were examined following the case study protocol. The interview data source helped to answer the research question by providing stakeholders perspectives of the how they perceive cross-college co-teaching within and beyond the M3 program. The third data source for this case study is observations, where the researcher made field visits to the case study "site" for the co-taught courses as well as made reviewed online recordings of class sessions. The researcher was observing classes within the bounded system of the M3 program; therefore the "site" for the case was the M3 classrooms. According to Yin (2013) the evidence gathered from observations is useful in providing a richer context to the case. The data source of observations aided in answering the research question by providing information on what was happening inside the classrooms regarding cross college co-teaching.

The use of multiple sources of evidence in a case study is more important than in other research styles as it develops converging line of inquiry which is a process of triangulation (Yin, 2003). Research that includes multiple sources is also more likely to be convincing and accurate when it contains multiple different sources of information. A case study that lacks multiple sources would be lacking essential pieces that make a case study identity. Yin (2013) stresses the importance of a case study database, where all the information for the case study can be housed, in this case a place for the interviews, documents, and direct observation information can “live”. For this study, the database was housed in the NVivo qualitative analysis software for ease of analysis and triangulations. Also, some graduate programs typically focus on one perspective when it comes to data collection/analysis. Accordingly, Yin (2013) mentions that a way to overcome these conditions is to seek multidisciplinary research groups rather than being restricted to one academic department. Therefore, this case study involved support of a team of researchers from different academic departments, including liberal arts, business, and engineering/technology, allowing for multiple perspectives and inputs surrounding the research.

3.3 The Case: The Meaning, Mission, Making (M3) Program Model

This study focuses on understanding how cross-college collaborative co-teaching at a research-intensive university can be enacted to provide transdisciplinary learning experiences for undergraduate students in the pursuit of innovation. This cross-college co-teaching for transdisciplinary program being examined is called the Mission, Meaning, Making (M3) program. This program focuses on guiding students through the practices of collaborative design to address relevant problems/opportunities in the pursuit of achieving innovation. This guidance is provided specifically through cross-college co-teaching involving faculty across the university’s business, engineering/technology, and liberal arts colleges. Co-teaching involves two instructors sharing the same classroom space and time, merging their expertise from different disciplines to the extent that disciplinary boundaries become blurred. Therefore, this study is looking to get a better understanding of how this cross-college co-teaching program can be enacted from the perspective of multiple stakeholders in higher education.

Along with co-teaching, co-learning is also a fundamental part of the M3 program. Co-learning in the M3 program happens in design teams where students from a variety of majors and

backgrounds collaborate, resulting in knowledge transfer between students and faculty (Otto et al., 2022). This program is centered around the idea that impactful innovation does not occur within disciplinary silos, instead it requires a transdisciplinary approach to solving problems (Otto et al., 2022). In the classes offered as a part of this M3 program, the main goal is to allow students to understand the Meaning behind the societal problems, the Mission for solving these problems to make positive contributions to people/communities, and Making solutions for the people/community—which also plays to the different strengths of the colleges/disciplines involved in leading the collaborative initiative. With this goal, the aim of the M3 program is to foster innovation through making valuable resources available to all students in the program to encourage active learning. As students engage in co-learning with each other, faculty members also participate in mutual learning experiences. This reciprocal learning dynamic extends as students learn from faculty members, and conversely, faculty members learn from students. Thus, the co-learning process transcends beyond student cohorts to encompass broader educational interactions. Co-teaching and co-learning are rooted in collaboration, which in turn can foster innovation.

Within the M3 program, there are five key components which are organized into a minor degree in design and innovation, available to all students across campus. These five components include: 1) an introductory course to serve as an disciplinary-specific “on-ramp” to the design and innovation program, 2) a unique set of co-taught courses to provide students with opportunities outside of siloed education and knowledge sets that expand across multiple semesters, 3) global/cultural experiences to provide students with varying perspectives into innovation practices, 4) a selective list of courses to explore and specialize within to build the skill set necessary for students innovations to come to fruition, and 5) additional connections campus resources for supporting student innovation outcomes such as technology commercialization, protecting intellectual property, launching startups or non-profits, and engaging in scholarship around their interests (Otto et al., 2022). These areas encourage collaboration among students, among faculty, and utilization of design spaces. However, within the design and innovation minor, there are two-co-taught classes, that this research is focusing on: Designing Technology for People and Prototyping Technology for People. The descriptions for the classes listed on the institution's website are below. Designing Technology for People: Anthropological Approaches, description is as follows:

Innovating in our complex world requires understanding people and the issues and challenges they face. This unique course brings together perspectives from technology and anthropology to address this by exploring ethnographic studies of people and technology interactions. Through this process, students will practice the problem scoping skills necessary to identify and define problems and begin to generate appropriate design solutions. In addition, students will learn how to observe and talk with people about technology and discuss a range of ways people use technology. Accordingly, the course will focus on human-centered design and how to empathize with people during the design process. This will allow students to learn how to identify opportunities for innovation that emerge when designers carefully observe and listen to humans using technology and/or experiencing problems with current technology. Note: This class engages the material in both the classroom and innovation labs.

This class immerses students in design and ethnographic approaches to aid in solving an identified problem. Students work to define a problem for a user group, conduct interviews and observations, create design matrices, learn to brainstorm, and evaluate their design choices, and work as a team to develop a mock-up to communicate their ideas to help their user group. During the semester students are working in the lab to develop their design solutions. This course has one instructor whose background involves design from engineering/technology and one whose background is social science from liberal arts. There are two sections of this class: the engineering/technology professor was the same instructor for both, but the liberal arts instructor in each was a different faculty member. One combination of instructors has co-taught this course and had the longest standing co-teaching relationship, prior to this program being developed. However, over the summer of 2023, the instructor from engineering/technology had been promoted, which shifted the roles of this faculty member for the classes they taught for the fall 2023 semester. Therefore, during the observations for this course, only the liberal arts professor was present during their respective classes. However, to help with the design aspect, a teaching assistant with a design background was present in both sections of this course. As a participant observer, while I was observing Designing Technology for People: Anthropological Approaches, I got involved working with student groups for these classes, as well as teaching a lesson of my own in both sections of that course. The description for that course is as follows as listed on the institution's website; Prototyping Technology for People description is:

Innovating in our complex world requires us to think strategically and make the best decisions possible for both designing and business development. Accordingly, this unique course brings together perspectives from technology and business management to iteratively prototype innovative solutions to student-selected

problems. This process will include creating prototypes in a variety of media, using the appropriate methods/tools, as well as exploring the processes and biases related to how people process information and make decisions. This type of work will help to guide the innovation process by gaining insights from testing prototypes and interacting with people to deepen one's understanding of customer needs, market segments, costs of goods, competitor operations, and market strategies. At the conclusion of the course, students will pitch a viable design solution and business model for a validated problem to a variety of potential investors and/or stakeholders. Note: This class engages the material in both the classroom and innovation labs. Students of all levels of experience, will explore tools/programs related to computer aided design, 3D printing, app development, and digital prototyping.

This class immerses students in hands-on learning, exploring material selection, operations planning, and intellectual property considerations while developing prototypes and business plans. Students work in diverse groups to innovate and design a solution to a problem or opportunity of their choice. This course involves one instructor from engineering/technology, and the other instructor is from the school of business. There was one lecture section, and two labs sections that were observed for this research.

Overall, this study delves into the dynamics of cross-college co-teaching within the Mission, Meaning, Making (M3) program, aiming to provide valuable insights into fostering transdisciplinary learning experiences for undergraduate students in pursuit of innovation. Through an exploration of co-teaching and co-learning, this research sheds light on the transformative potential of collaborative pedagogical approaches in higher education. By examining the fundamental components and unique features of the M3 program, including its emphasis on cross-disciplinary collaboration and integration of design thinking. Despite the evolving dynamics resulting from faculty transitions and instructional adaptations, the M3 program exemplifies a commitment to fostering innovation, collaboration, and student-centered learning across disciplinary boundaries. As institutions continue to embrace innovative pedagogical models, the findings of this study contribute to the ongoing dialogue surrounding the transformation of undergraduate education and the cultivation of collaboration in the pursuit of innovation in higher education.

3.4 Role of the Researcher

Qualitative case studies offer researchers a unique opportunity to delve deeply into the complexities of a particular phenomenon. Unlike quantitative approaches, which often rely on detached observation and statistical analysis, qualitative research places the researcher squarely at the center of the investigation. In this type of research, the researcher's subjectivity becomes not just a potential bias to be controlled for, but a valuable tool for understanding the intricacies of the case under study. Qualitative case studies, as with other forms of qualitative research, share the fact that the primary instrument in the research is the researcher themselves (Merriam & Tisdell, 2016). Hays and Singh (2012) advocate for researchers to view subjectivity as a way to be connected with their research. Subjectivity is a vehicle to understand the case more deeply and is a key component to qualitative research that should be acknowledged and shown in a positive way. This research requires the researcher's subjectivity as some data will be collected from observations. However, Merriam and Tisdell (2016) wrote that the researcher is never fully just observing nor participating, it is usually a mixture of both, however the ideal perspective is to be fully participating. The researcher being involved as an instrument for the data collection and analysis is seen as a key characteristic of qualitative research. Therefore, the researcher interacted and was involved in most if not all aspects of the research study. This could be beneficial because the researcher can obtain a first-hand account of the phenomena instead of relying on someone else's interpretation of the phenomenon. "We are thus "closer" to reality than if a data collection instrument had been interjected between us and the participants. Most agree that when rigor is viewed in this manner, internal validity is a definite strength of qualitative research. In this type of research, it is important to understand the perspectives of those involved in the phenomenon of interest, to uncover the complexity of human behavior in a contextual framework, and to present a holistic interpretation of what is happening" (Merriam & Tisdell, p.243-244). Through this approach the researcher obtained a form of a reality that occurred within the M3 program.

The researcher is a student, a trained technology and engineering educator, and the primary data collection tool. Their background as a long-time student is relevant for the context of this study. This implies that the researcher has experience of being a student which can provide insights into the dynamics of teaching and learning. The researcher's journey as a student may make them empathetic to the experiences of those that were observed and studied, which can enhance the quality of the research. Additionally, being trained as a technology and engineering educator

equips the researcher with knowledge in the subject area. This allows the researcher to engage with the classroom environment and participants more informedly. Furthermore, the researcher adopted the role of an ethnographer during classroom observations. This approach involved immersing oneself in the research setting to gain a deep understanding of the culture, behaviors, and interactions within that setting. As an ethnographer, the researcher was a participant-observer, which means that they not only observed but also engaged with the subjects of study and other people in the setting. This approach allowed for a holistic and context-rich understanding of the classroom dynamics. Overall, the researcher's unique positionality is a crucial aspect of their role. In this case, the researcher's positionality was shaped by the background of a degree in technology and engineering education and their experiences as a student. While there are other ways to research and observe co-teaching, these decisions reflect the nature of the cross-college research team.

3.5 Cross-Disciplinary Collaboration: The Catalyst for Innovative Research

The heart of this master's thesis beats within the collaborative nature of a cross-disciplinary research team. Diverse backgrounds, skills, and perspectives converge to form a collective force that transcends the boundaries of individual disciplines. Each team member, distinct in their expertise and experiences, contributes to the research outcomes. Spanning from engineering/technology, liberal arts, and business, the identities of the members in researcher team has proven to be an essential element in shaping the trajectory of this study. The interplay of the various backgrounds fostered creativity and innovation within this project. Therefore, it can be said that as the researcher entered this team at the onset of their master's program, driven by the desire to immerse themselves in a rich tapestry of perspectives that extended beyond the boundaries of their primary field of study. As the researcher engaged with team members, the interactions became a catalyst for intellectual growth. The exchange of ideas, the sharing of diverse methodological approaches, and the mutual influence on team members' work became integral to the research process. In these circumstances, the researchers' understanding of qualitative research methodologies deepened.

During this research study, the cross-disciplinary nature of the team is even further highlighted in the co-teaching component. This co-teaching aspect symbolizes the fusion of perspectives inherent in transdisciplinary education. In transdisciplinary research, the boundaries

of a single disciplinary thesis become porous. The thesis itself takes on a blended format, mirroring the multidimensional nature of the researcher's process. It is not merely a reflection of the researcher's individual journey but a collective narrative that encapsulates the collaborative spirit of the research team as well. In conclusion, the importance of this collaborative venture becomes evident, shaping not only the qualitative study at hand but also illuminating the broader landscape of collaborating for innovative research.

3.6 Research Question and Data Sources

This research explores how large-scale research universities can foster transdisciplinary learning through cross-college collaborations. The research question that guided this study was:

- How is cross-college co-teaching enacted in higher education to support transdisciplinary learning?

3.7 Data Collection

Data for this study was collected through interviews, targeted observations, and document analysis. As for the interviews, scripts to recruit participants were sent through email to all potential participants, and the scripts are Institutional Review Board (IRB) approved. Participants were stakeholders involved at some capacity with the M3 program. All participants completed an IRB consent form. The participants chose when to schedule interview times, for either in-person or online interviews. Interviews were audio recorded and then transcribed for analysis. Transcriptions were then uploaded to NVivo, and emergent coding was used to analyze the interview data. As for the coding for this project, a priori coding was utilized. If video footage was obtained during this process it was deleted for participant confidentiality. The researcher and the research team read and listened to all the transcripts and used the emergent codebook for thematic analysis, the codebook can be found in the appendix A. The codes, along with their subcodes, were used to help answer the research question.

On top of using interview data, observations and document analysis were used as well. Observations were carried out in the classrooms where co-teaching occurs. The two classes observed were Designing Technology for People: Anthropological Approaches and Prototyping Technology for People: Making Decisions & Thinking Strategically. Both of those classes have

two faculty members from different colleges, teaching in one classroom in unison. Classroom observations of Designing Technology for People: Anthropological Approaches were conducted during the fall semester of 2023. The researcher was in person sitting in the classroom, interacting with the faculty and the students. As for the observations of the other co-taught class, Prototyping Technology for People: Making Decisions & Thinking Strategically, the researcher observed those classes via Microsoft Teams recordings. However, the researcher did sit in Prototyping Technology for People: Making Decisions & Thinking Strategically for a year as a teaching assistant from fall 2022 to spring 2023 but was not conducting observations. The co-teaching teams agreed to allow for observations in their classroom. For Designing Technology for People: Anthropological Approaches there was no audio or video recordings, just written observation notes. As for Prototyping Technology for People: Making Decisions & Thinking Strategically, there were no additional video or audio recordings outside of the ones already being done for class implementation purposes. The data from written observation notes were then analyzed along with the interview data to support the understanding of how cross-college co-teaching occurs in the classroom.

As for the document analysis, the co-instructors' teaching materials from all co-taught classes across multiple semesters such as the course calendars, the syllabi, and the pathways through the Design and Innovation minor, were utilized as data to analyze the nature of the transdisciplinarity embedded into their written materials. The materials created by the co-teaching teams were checked for themes surrounding the convergence of disciplines and the operation of such through their teaching activities. The observations and the document analysis aided in providing a holistic idea of what the co-instructors were doing and how co-teaching across disciplines can function.

The participants in this case study included faculty, administrators, and advisors who are stakeholders of the M3 program. Data was collected from 15 faculty interviews; 16 administrator interviews, and 4 advisor interviews, totaling around 2,000 minutes of interview data, or 33 hours. The interviews scripts are in Appendix B. This case study is a part of a larger National Science Foundation funded research project; therefore, data has been collected since 2021. The breakdown of the interviews can be seen in Table 2 below.

Table 2. The number of interviews conducted included in this case study.

<i>Year</i>	<i>Position</i>	<i>Number of Interviews</i>
2021	Faculty	9
	Administration	5
	Advisor	0
2022	Faculty	6
	Administration	0
	Advisor	4
2023	Faculty	0
	Administration	9
	Advisor	0

3.8 Data Analysis

Interviews

The interview data served as the main source of data for this case study. After Institutional Review Board approval and consent from participants, graduate researchers conducted semi-structured interviews with faculty, administrators, and advisors. Participants were given the option to be interviewed in person or online, both of which were recorded using Microsoft Teams and transcribed using Otter.ai. The transcripts were cleaned by the research team and uploaded to a secure, shared drive dedicated to M3. Once the information is uploaded to the shared drive, all data that was collected on personal devices was permanently deleted. The transcripts were uploaded to NVivo for thematic analysis using an emergent coding process to identify relevant statements and reflections to determine themes and patterns of participant perspectives to provide insight into cross-college co-teaching for transdisciplinary education (Saldaña, 2015). Two lead researchers, a Co-PI and graduate researcher, reviewed the transcripts, developed the codebook, and oversaw the coding process. The research team followed a two-step process for analyzing the transcripts. First, they developed a codebook to guide their analysis which can be found in the appendix. Then, they used the codebook to code the transcripts. When there are disagreements or discrepancies in the coding, the team met weekly to discuss and reach a collective agreement on the coding approach. The researcher implemented a priori coding for the codes added for this project. This iterative process ensured that the analysis was rigorous and consistent. The use of a codebook and collective decision-making helped to increase the trustworthiness of the research findings.

Observations

For this study, the researcher conducted targeted observations between three different co-teaching teams, and focused on how co-teaching can happen and if the co-teachers reflect practices aligned with CoTs. Designing Technology for People: Anthropological Approaches and Prototyping Technology for People: Making Decisions & Thinking Strategically are the two courses that are co-taught across colleges. The researcher was a participant observer, as the researcher interacted with other individuals within the setting being observed, as well as taught within the observed classes. Designing Technology for People: Anthropological Approaches was the course the researcher observed live and in person. This class had two sections, both who are trained anthropologists. Due to a leadership position change, the co-instructor from engineering/technology who would normally co-teach with both faculty mentioned just previously, was unable to teach either of those sections during the semester of observations. In place of the engineering/technology co-teacher, a teaching assistant with a background in design was hired to help fill the role, as the main component of these classes is having two instructors from different disciplinary backgrounds. The teaching assistant helped out during both the morning and the afternoon sections. The classroom observations were done in notes in Microsoft Word, names were excluded for confidentiality. After the classes, the notes were uploaded to the secured shared drive, as well as uploaded into NVivo for coding. The notes were coded using the existing codebook themes as well as the codes added for this project to try and get a better perspective on what co-teaching is like in the classroom, and if a CoT can emerge. As for Prototyping Technology for People: Making Decisions & Thinking Strategically, the co-teaching team consisted of an instructor from engineering/technology and an instructor from business. This co-teaching team has been teaching together for over two years, spanning over four semesters teaching this course together. I observed this course by watching the class recordings that are on the classes Microsoft Teams Page for the students to go back and watch. Overall, the researcher watched twenty classes, some of them including lab sections, which consisted of approximately seventy hours, from the fall semester of 2023. The classroom observations were done in notes in Microsoft Word, names were excluded for confidentiality. After the observations were done, the notes were uploaded to the secured shared drive and into NVivo for coding. The notes were coded using the existing codebook themes as well as the codes added for this project to try and get a better perspective on what co-teaching is like in the classroom, and if a CoT can emerge.

Document Analysis

To supplement the interviews and the observations, document analysis of the co-teaching teams instructional materials was utilized. The analysis utilized the CoT perspective when going through practices as detailed in the co-teaching teams instructional materials. The documents were coded with the theoretical perspective in mind. Document analysis of the co-teaching teams instructional materials can allow for further insight into the implementation of transdisciplinary practices through co-teaching. Documents from *Designing Technology for People: Anthropological Approaches* and *Prototyping Technology for People: Making Decisions & Thinking Strategically* were analyzed as well as a document about the design and innovation minor. The classes syllabus and course calendars were used as well as a detailed lesson outline from *Prototyping Technology for People: Making Decisions & Thinking Strategically*. Overall, there were nine documents that were used. There were syllabi from different semesters and different co-teaching teams analyzed for *Designing Technology for People: Anthropological Approaches*, as this course, during the time of observations had two different teachers for different sections. An older model of *Designing Technology for People* syllabi was analyzed as well to assess if there were any differences when the co-teaching dynamic changed. The researcher utilized the existing codebook and the codes added for this project to analyze the documents.

Communities of Transformation Lens

The semi-structured interviews, observations, and document analysis were utilized to evaluate if a CoT can emerge from the M3 program. The key characteristics of a CoT, as covered in Chapter 2, explore the concepts that Shadle Liu et al. (2018) mentioned more in depth, such as a CoT needs a “compelling philosophy, to have a living integration of the philosophy to create a new world of practice, and a network of peers to break isolation and brainstorm revisions in practice” (p.476). Codes were added to the codebook surrounding the CoT framework in order to understand the relationship between the framework and the M3 program. The codes were taken from Kezar and Gehrke (2017) and Shadle Liu et al. (2018) text and were added to the codebook with the respective definition from the text, the codes added were driving philosophy and living integration of philosophy. Prior to this project, the codebook already included the codes: Faculty Transformation and Developing a Community of Transformation. These codes were utilized to apply the theoretical perspective as well. The researcher additionally used existing codes within the research team’s codebook.

3.9 Trustworthiness

In this qualitative case study, the researcher's perspective was recognized for its value. To ensure trustworthiness, triangulation was employed. Triangulation, a methodological approach involving the use of multiple data sources to confirm findings, was employed to enhance the credibility of the study's outcomes. Acknowledging the inherent subjectivity of qualitative research, the study recognized the potential for the researcher to inadvertently inject their personal beliefs and interests into the research process. (Birt et al., 2016). In the project's broader scope, and to aid in this tendency, the involvement of graduate coders and a research principal investigator (PI) was involved in coding the interview data. This collaborative coding process not only diversified perspectives but also contributed to the robustness of the data analysis, to uphold the integrity of the research, the primary researcher devoted significant attention to coding not only the interview data but also data derived from document analysis and observation. This comprehensive approach enabled a thorough exploration of the research question across different data modalities, thereby enhancing the study's dependability. Data collected from an interview can be checked against data from the document analysis, which can be checked against what the researcher observed (Merriam & Tisdell, 2016). By employing triangulation across various data sources, the study sought to ensure the trustworthiness of its findings. This methodological rigor, informed by the insights of scholars such as Birt et al. (2016) and Merriam & Tisdell (2016), demonstrates the commitment to upholding trustworthiness in this study.

3.10 Summary

This chapter described how the researcher answered the study's research question and the methods for data collection and analysis. The data sources for this study include semi-structured interviews with various stakeholders that span across three years of implementing the cross-college co-teaching within the M3 program. The interview data is supported by observations and document analysis of teaching materials. This chapter ended with a discussion of how this study's trustworthiness will be enhanced through triangulation of the data points and the researcher being implemented in the study.

4. FINDINGS

4.1 Introduction

The purpose of this case study was to explore how cross-college co-teaching is enacted in higher education to answer the following question: How is cross-college co-teaching enacted in higher education to support transdisciplinary learning? This study utilized research methodologies and data analysis to connect themes and communicate the findings from the interviews, observations, and document analysis. The data collected underwent thematic analysis using NVivo software, with initial coding informed by a larger research project and further refinement to align with the study's theoretical perspective of Communities of Transformation (CoT). The analysis of interviews, observations, and instructional material offers insights into stakeholders' experiences, showcasing the challenges and opportunities. The theoretical perspective of Community of Transformation (CoT) guides the interpretation of findings, revealing how cross-college co-teaching can and cannot support transdisciplinary education within a research-focused institution. The CoT perspective will allow to see if there are profound changes in teaching practices within higher education (Shadle Liu et al., 2018). Theoretical discussions suggest that collaborative networks among educators are pivotal for enhancing education. Research exploring communities collaborating to revolutionize teaching and learning can offer insights that could benefit others seeking educational reform. The findings portray a dynamic academic ecosystem where educators embrace change, students are engaged in meaningful learning experiences, and transdisciplinary collaboration was driving innovation. In higher education, the implementation of cross-college co-teaching could be a catalyst for fostering transdisciplinary learning experiences in higher education institutions looking to explore the convergence of disciplines. This study sought to explore the enactment of cross-college co-teaching in higher education, with a specific focus on its role in supporting transdisciplinary learning.

From the administrative structures that shape college and department decision-making to the invaluable role played by advisors, the structure of the institution sets the stage for the transformative experiences that unfold within the M3 program. The findings section, as seen in Table 1., has been broken up into four major themes: The Setting, The Characters, The Performance, and The Encore. Central to this study that explored cross-college co-teaching is the

place, or The Setting, where this research has unfolded. While there are different systems and structures across the nation for how higher education institutions are organized and run, it can be beneficial to provide background on what the nature of this institution is like. In addition to understanding The Setting, its equally, if not more important, to be introduced to The Characters at this institution who have supported and taught in the M3 program. The Characters section displays the stakeholders' dynamic roles, the challenges and opportunities around the innovative approaches employed by faculty members to bridge disciplinary silos and foster transdisciplinary learning. Through co-teacher relationships and novel teaching methods, the M3 program strives to create an environment where student engagement flourishes and learners transcend traditional disciplinary boundaries. The section titled The Performance discusses what happens with cross-college co-teaching in terms of opportunities and challenges with student engagement and learning, transcending disciplinary barriers, and fostering innovation. The Performance is looking to highlight what is actually happening as a result of the co-teaching being enacted in the classroom. Additionally, the last section is titled The Encore. The Encore shows what happens after the cross-college co-teaching is enacted in terms of opportunities and challenges. The Encore will cover ideas on professional development, shared language, teacher transformations, sustainability, and Communities of Transformation. Lastly, there is a section labeled After the Show, that is the researchers reflections on their time conducting observations. In essence, the findings paint a picture of a dynamic academic ecosystem where educators are empowered to embrace change, students are engaged in meaningful learning experiences, and innovation serves as the cornerstone of transdisciplinary collaboration.

Table 3. Major themes with descriptions and components.

Themes	Description	Components
The Setting	This section portrays the nature of the institution that has been navigated by the faculty involved with the M3 program.	The Structure of the Institution Administrative Endorsement The Role of Advisors
The Characters	This section explores the co-teachers, how they operate across colleges, and how they are viewed by other stakeholders in the M3 program.	Teacher Dynamics Turnover Finding the Teachers Co-teacher Relationships
The Performance	This section explores how cross-college co-teaching actually happens, and the innovation arising from the co-teaching.	Student Engagement and Transdisciplinary Learning Beyond Disciplinary Barriers Innovation
The Encore	This section offers insights into how the M3 program has transformed stakeholders, as well as things that can happen to support the program in the long run. The section ends by exploring how this program has fostered a community of transformation.	Professional Development Opportunities Shared Language Teacher Transformation Sustainability Creating a Community of Transformation

4.2 The Setting

Setting the scene is crucial, akin to the opening act of a captivating play, where every detail contributes to the audience's understanding of the narrative's direction and thematic essence. In this scene, the stage is set at a midwestern research-intensive university, where the academic landscape is shaped by the physical environment, the social conditions, and the traditional systems and structures in higher education. The audience is transported to the university where sprawling grounds and imposing buildings echo the institution's commitment to generating knowledge and producing impactful innovation. However, beyond the facade is where the dynamics of administration, advisors, and faculty play a crucial role in shaping the educational landscape. There are backstage whispers around power struggles, funding, support, collaborative efforts, and other bureaucratic hurdles. The stage is set, and the audience is immersed in the environment where co-teachers embark on their journey to break down disciplinary silos through cross-college co-teaching for transdisciplinarity.

4.2.1 The Structure of the Institution

The dynamics of power, monetary capabilities, and disciplinary paradigms intersect within the arena of higher education, shaping the opportunities and challenges of transdisciplinary cross-college co-teaching initiatives. At a midwestern research-intensive university, faculty members have embarked on a journey to pioneer cross-college co-teaching, striving to break down disciplinary silos and foster innovation in through transdisciplinary education. Central to this endeavor is the recognition of the limitations posed by the traditional structures of the institution, where disciplinary expertise often reigns supreme, yet risks leading to overspecialization and narrow perspectives. However, as seen at this institution when initiatives are created to combat disciplinary silos, they do not always succeed, therefore it has historically been easier for faculty, administration, and other stakeholders to continue working in their respective disciplinary homes, not collaborating.

Overspecialization in the Academy

The lack of cross-college collaboration has led to the continuation of siloed disciplines. From across the interview data, the importance of teaching students through the fusion of disciplines was seen as an important educational venture, as stakeholders recognized that:

“We're over specialized in the academy and people find themselves in a narrow slice and they become an expert in that skill, and they don't have the opportunity to actually see other spaces and build other connection points.”

Building the connection points between disciplines can foster further innovative practices, which can bring new perspectives to problems. This can be relevant in the field of teaching, administrative duties, and advisor's work. This institution is much like many other large institutions, with its complex network of individuals who find themselves operating on a hierarchal system that has been the status quo. There are classes run within the respective colleges, that offer classes for their respective discipline, taught by one professor from that discipline, teaching to students enrolled in that college. This is the traditional nature of institutions, where communicating across colleges around educational initiatives is few and far between.

However, stakeholders acknowledge the value of disciplinary homes while advocating for spaces that encourage convergence and cross-pollination of ideas because students and faculty still need to belong to a department and organizations but should also experience new ways of thinking and doing. This section describes the structure of the institution the co-teachers have been navigating to successfully co-teach across colleges. Below is an excerpt that details this midwestern research intensive university setting:

“One of the criticisms was that you know, we're very specialized kind of housed in one specific area and we know one thing, but we don't we don't know across other disciplines as well as we should. When I came across campus, I walked underneath a banner and think it said something about transdisciplinary education, and I think we talked about that kind of stuff. But there's not many of those examples happening on campus.”

This quote is one example of many explaining that in the pursuit of transdisciplinary ventures, faculty members aim to cultivate environments where students and educators alike can explore

ideas freely, unbounded by the limitations of traditional disciplinary silos. While universities may showcase their initiatives through banners and promotional material, the true essence of these endeavors, such as transdisciplinarity, lies in the execution and the locations where they occur. During interviews and discussions with stakeholders, the importance of disciplinary expertise often takes center stage. Yet, there is a recognition that the ability to collaborate across disciplines, to learn from diverse sources, and communicate across boundaries is equally crucial. This acknowledgment shows the value of cultivating not only specialized expertise but also transdisciplinary skills within the academic community. Despite the university's stated commitment to fostering such educational initiatives, their implementation can prove elusive. Regardless of the desire to provide students with opportunities for transdisciplinary learning experiences, initiatives like the M3 can encounter roadblocks along the way. However, the goal was to:

“give students a multi-year experience, we wanted to bring in different disciplines that traditionally also don't have that experience so bring bringing in anthropology and to design bringing in entrepreneurship and business development into design and doing those together, is one way that we cannot diminish disciplinary expertise, but have a common place to bring it together and build a common language...it's still housed within the polytechnics so it's still considered a polytechnic degree with instructors from different colleges”

This quote provides insight into the challenges inherent in developing a program aimed at confronting disciplinary barriers. Although there are now classes, labs, and various venues for both students and faculty to convene, the notion of ownership often surfaces, as the minor and its associated classes need a designated home. Nevertheless, this structure offers the advantage of exposing students to transdisciplinary education, where they collaborate within diverse teams to tackle complex problems. The goal is to bring people together and cross the rigid boundaries in place in academia.

In addition, the need to transform education becomes evident in an era where the internet offers access to virtually all the information typically disseminated through lectures, as well as free college level courses online. Given this reality, it begs the question: why wouldn't faculty members from diverse fields encourage students to pursue ambitious endeavors within a campus environment steeped in innovation and entrepreneurship? Indeed, universities should serve as

ground for learning from failure and persisting in the pursuit of ideas, especially when so much information is at our fingertips.

While acknowledging the importance of disciplinary expertise in skill development, it prompts a reflection on the intrinsic value of higher education. With resources readily available online for technical problem-solving, the unique role of universities lies in providing a space where students can engage in hands-on experimentation and innovation, experiences not easily replicated in virtual environments. This approach, rooted in the belief that universities should serve as hubs for innovation and entrepreneurship, seeks to redefine the role of higher education in an era where information is readily accessible online. For example, a faculty member had mentioned:

“While I think disciplinary expertise is important, because you’ve got to develop, you know, you can’t just say, oh, I’m a good problem solver, and I can do anything. Like I think it is good to get some specialty in something. But I think, you know, what is the value of higher education? Because we can find some of those things online. If I want to figure out how to do, you know, an equation to figure out why my 3d printers not working? I can, I can find it somewhere, right? But what I don’t have is a space where I have there is a young person to actually try something and fail and try again, within something that in an area that I’m somewhat passionate about”

In summary, the prevailing issue of overspecialization in academic institutions underscores the potential for transcending disciplinary boundaries to foster innovative practices and new perspectives. While acknowledging the importance of disciplinary expertise, stakeholders advocate for spaces that encourage convergence and cross-pollination of ideas. Despite the challenges in implementing transdisciplinary initiatives, such endeavors aim to provide students with multi-year experiences where diverse disciplines come together to tackle complex problems. In an age where information is abundantly available online, universities must redefine their role as hubs for innovation and entrepreneurship, offering students opportunities for hands-on experimentation and learning from failure. As the academic landscape evolves, it becomes increasingly imperative to prioritize the development of transdisciplinary skills alongside specialized expertise, ensuring that higher education remains relevant and impactful in preparing students for the challenges of tomorrow.

Hurdling Barriers in Academia

As alluded to in the previous section, there are barriers encountered at the institutional level that can make implementing a cross-college co-teaching program challenging. Going from what was stated about over specialization, stakeholders recognize that it's not:

“a mindset for certain areas because classes don't always speak to each other. And because of that they get siloed and some of the ideas that could bleed across and help each other, don't always have the option to do that to breathe, to grow to cross germinate”

Understanding the systems in place that prevent cross-college collaboration from being easily enacted can pave the way for innovative approaches to work toward a solution to sustain collaborative efforts in higher education. While this is a research-intensive university, the students and their learning are the driver of the institution in the sense that the students are an essential piece in how the institution functions on a faculty, administrative, and advisory level. The focus of this institution is research, however, the frontier of education in the past couple of years is one that has been explored more inadeptly because there seems to be barriers set up that halt the dissemination of knowledge from research sectors to educational initiatives. This is commonplace when at a research-intensive university, even though it is still the responsibility of the faculty to care for undergraduate students' education, that is not always the case. As identified by faculty the perspectives and focuses have been shifting due to this institution receiving students at a time where other universities are facing a declining enrollment:

“I think that has become more prominent at [the university] over the last few years and putting effort in “what is the classroom experience or the learning experience of students?”. We have lots of students coming in, but other institutions don't. An R1 should have research and discovery should be a focus, but still, they need to bring students in, and we know what things can work we just still don't do them. Like some things are set up for failure in the classroom like some of the way the rooms are still built. Like you have a classroom in the basement and it's a tiered lecture hall and 300 students in there. It's not going to be a great experience. But I think there are things that R1 institutions are looking at, like in this teaching excellence and equity type of approach and trying to do that because more people are going to question the value of higher education.”

While universities can identify good pedagogy versus teaching for the sake of efficiency and cost-benefit, the actual structure of the institution is a barrier in this manner. There are lecture halls that can seat a plethora of students, which is necessary at a school with a large student population upward of 35,000 undergraduate students enrolled. It makes sense because the classrooms already exist, a lot of students get placed into introductory learning courses, and it does not require a lot of faculties as 300 students can sit in one lecture hall, therefore freeing up other faculty for research or other promotion/tenure required work. The institution is simply not set up to support cross-college co-teaching at intersections where disciplines have a natural convergence point, especially when there are no incentives for the faculty to be engaging in this work, and doing what could be seen as “extra work” to only receive the same or no recognition. Therefore, an administrator had said:

“Think about ways to create incentives for quality and not just quantity right. Most of our funding models are sort of like quality subject to kind of minimum constraints. The way we handle quantity and quality completely differently in the universities, right we have baseline funding models that reward you for quantity. And then we have special programs like the provost has a special prize for this or we give you know, some teaching award or like something like at the margins which know in the relative to the overall budget are tiny, tiny, tiny little, you know, tasting snacks, you know, to sort of try and do something on the quality from, but you know, it's a fraction of the total it's miniscule.”

Finding a way to balance quantity and quality at a place that is turning out graduates like a factory seems like a tall order, and it is because quality of pedagogy is not measured for promotion and tenure, and it is not rewarded with financial compensation. The stakeholder highlights the disparity in how universities handle quantity and quality, noting that while baseline funding models prioritize quantity, incentives for quality remain relatively minimal. This misalignment underscores a fundamental issue: the lack of robust mechanisms for recognizing and rewarding pedagogical excellence. Quality is additionally subjective, therefore the metrics surrounding quality will not be able to compare to the numbers that can be easily objectively evaluated with quantity. Without clear metrics or incentives tied to quality, efforts to enhance the educational experience may be overlooked or undervalued. The subjective nature of quality complicates its assessment, making it harder to measure and compare against the easily quantifiable metrics of quantity. This metric can contribute to the funding associated with the course, and ultimately, it's

easier to assess the quantity and success, rather than the quality which would require other forms of validation. As a result, the emphasis on delivering quantity often overshadows the imperative of ensuring high-quality education. Institutions must rethink their approach to evaluation and resource allocation, striving to strike a balance that prioritizes both quantity and quality if the future really is moving toward work that is and/or mirrors transdisciplinary ventures. However, this is challenging because the structures in place at this institution have been there for a long time as one faculty member had pointed out:

“These structures in place that have been in place for a really long time, they're traditional around the credit hour around who gets credit for teaching which courses, you know, how do we teach across colleges, how do we integrate disciplines. There's a lot of barriers in place. They originally were put there for a reason, right, but now how do we change those or break down those barriers so that we can do stuff that's more relevant today, and more engaging to students and more authentic to the workplace”.

As institutions navigate the complexities of delivering education in an ever-evolving landscape, the challenge of balancing quantity and quality becomes increasingly evident. While the future seems to embrace transdisciplinary ventures as the norm, institutional structures entrenched in traditional practices pose barriers to progress. As one faculty member astutely observed, these longstanding structures, rooted in conventional approaches to credit allocation and disciplinary boundaries, were once implemented for valid reasons. However, in today's dynamic educational environment, there is a pressing need to reassess and dismantle these barriers to foster more relevant, engaging, and authentic learning experiences for students. Achieving this transformation requires a concerted effort to rethink evaluation methods and resource allocation strategies, prioritizing quality education while embracing the transdisciplinary nature of workforce demands. The value of how instruction is traditionally done also comes into question when there are:

“...these people who supposedly have done great things, right. So, think of all the dropouts of college that went on to start big things, right? Why did they leave college? Well, they didn't. It got in the way of them doing what they wanted to do. So, I think we need to have a vision to rethink the value of higher education. And going back to our President's letter to the university. More and more people are questioning the value of higher education.”

Contemplating the journeys of those who have achieved extraordinary success offers insight into the evolving landscape of higher education or what it can strive to be. Considering the numerous individuals who, despite dropping out of college, went on to spearhead groundbreaking initiatives, the idea of learning from failure and innovating often is at the core of many success stories. Therefore, higher education institutions find themselves at a point in time where they can transform to create those spaces that increase the value for innovators in the higher education landscape. Their departure from academia wasn't due to a lack of ambition but rather stemmed from a disconnect between institutional norms and their aspirations. This necessitates a paradigm shift in our perception of higher education.

As articulated in the university, an increasing number of individuals are scrutinizing the traditional value proposition of higher education. Nonetheless, pursuing transformative ideas encounters barriers entrenched within the institution's traditional structure. Barriers emerge in the form of bureaucratic hurdles, competing interests, and structural inequalities across colleges. While the value of collaborative teaching is recognized, the mechanisms for equitable recognition and distribution of resources remain elusive. This is noted in the following excerpts:

"I think it's the most valuable. I think having more than one voice in the room teaching the students and to teaching students from a variety of backgrounds in a variety of majors. It's the best thing we could be doing. It is also because of the rules, regulations and obstacles that we've put up. It's the hardest to do to make happen.."

Some of the barriers in place that make this hard as mentioned by administration if the financial aspect:

"I think when you when you get, so who's going to who's going to pay? How's that load going to load? But those are mechanical questions. Now, mechanical questions can stop the conversation dead, because mechanical questions can also be seen barriers"

Despite the recognized value of collaborative teaching in fostering enriched learning experiences, challenges persist in achieving equitable recognition and resource distribution. As highlighted by faculty members and administrators, the presence of multiple voices in the classroom, representing

diverse backgrounds and disciplines, is hailed as invaluable for students. However, entrenched rules, regulations, and administrative obstacles pose formidable barriers to the implementation of collaborative co-teaching pedagogy. Particularly, financial considerations loom large, with questions surrounding funding allocation and workload distribution often stalling progress. While these concerns are indeed mechanical in nature, they hold the power to impede meaningful discourse and hinder progress towards more inclusive and innovative educational practices. Overcoming these barriers requires a concerted effort to address systemic inequities and rethink traditional approaches to resource management. By prioritizing the value of collaborative teaching and actively engaging in dialogue to navigate logistical challenges, institutions can pave the way for a future where collaborative pedagogy thrives, benefiting both educators and students alike. The above quotations demonstrate that although the importance of co-teaching in the M3 program is acknowledged, obstacles within higher education hinder the implementation of cross-college co-teaching, particularly with the presence of internal competition as well:

“There's one group will be building a new Makerspace when there's a huge multimillion dollar Makerspace a street over that no students use frequently. Imagine if you bought one or paid for one extra faculty with that now you can cut the class size down, you could have a co-teaching thing, and that would have been money better spent. I think that's one way you can look at it because you have all this academic territory and units and internal competition. Each group wants to have their own thing rather than collaborating well. And that I mean could free up a lot of resources too. So, I think every college is now going to have their own Makerspace at some point. That's going to be outdated”.

It is evident that while advocating for transdisciplinary education, democratizing design spaces and fostering cross-disciplinary collaboration could serve as a strategy to promote transdisciplinary education across various disciplinary sectors. However, the context of the quoted information sheds light on an underlying issue: the allocation of resources in higher education institutions. The example provided about the construction of multiple makerspaces, despite the underutilization of existing ones, highlights a trend where academic units prioritize individual endeavors over collaborative initiatives. The creation of new spaces, such as the one mentioned above, not only perpetuates internal competition but also hinders the efficient use of resources. Instead of investing in redundant infrastructure, reallocating these resources towards initiatives like co-teaching or transdisciplinary programs could yield greater benefits for students and faculty

alike. Thus, the decision-making process regarding resource allocation within universities becomes crucial, as it reflects the institution's commitment to fostering collaboration and innovation versus perpetuating siloed academic pursuits. Ultimately, the choice between showcasing institutional prowess through extravagant facilities and genuinely prioritizing collaborative efforts shapes the trajectory of higher education towards either a competitive or collaborative paradigm.

Furthermore, there are other internal tensions that arise in response to what classes can or cannot count as an entry way into the M3 Design and Innovation minor, as a faculty member had said:

“I put very few [pre-requisites] down because if you put too much down, it raises a red flag for somebody else across campus. That's like, what are you doing? Why did you put my course down on this list? And so, we think that a campus course catalog is open to everybody, for everything, you know, like you could take a class anywhere, but there are implications to that as well.”

The trajectory of higher education is shaped by a critical choice between showcasing institutional prowess through lavish facilities and genuinely prioritizing collaborative endeavors. This dichotomy underscores broader tensions within academia, such as the debate over which courses should count towards entry into programs like the Design and Innovation minor. Faculty members grapple with the delicate balance of inclusivity and practicality when determining prerequisites, mindful of potential implications for enrollment and program integrity, however, to make it accessible to a diverse set of students, there needs to be multiple entry points across academic colleges. Despite efforts to maintain transparency and consensus, internal tensions persist, highlighting the complexity of navigating institutional dynamics and stakeholder interests. This challenge reflects a broader struggle within academia to reconcile competing priorities and foster a culture of collaboration amidst diverse perspectives and objectives. Furthermore, the internal struggles are noted across the board as one faculty mentioned:

“I do get disappointed. When we run into barriers like this person got all upset and it you'll see an email and things will just blow up on you, and now there's a better understanding because somebody was able to go and tell the bigger story...but some days you want to run out in the center of campus and yell out, can't we all get along?”

Those quotes discuss the complexities surrounding the proposal of classes and potential prerequisites within a university setting. It highlights the challenges of suggesting courses from various departments, as it may inadvertently affect enrollment numbers and program areas. Which is true as advisors point out that if one section of the cross-listed co-taught class is full, they can add students who are normally housed in the engineering/technology school into the section that is under the business or the liberal arts school, which is detailed from the advisor perspective:

“We were trying to get students into [Designing Technology for People: Anthropological Approaches], as an engineering technology advisor, and realized that there was a cross listing in the lookup classes function in my [the university] and realized the anthropology 384 was cross listed with it. And because the tech seats were full, we got people into ant 384, because it was the same exact class just offered by a different department. Sometimes, if there's not a process already outlined, we will find holes that we can exploit for their behalf because we're all trying to just get our students into what they need and want to for their degree.”

The complexities surrounding the proposal of classes and potential prerequisites within a university setting are multifaceted, as evidenced by internal struggles and conflicting perspectives among faculty and advisors alike. These challenges have an intricate balance between academic flexibility and administrative constraints, with decisions regarding course offerings and cross-listings often carrying noteworthy implications for enrollment management and program integrity. The frustrations expressed by faculty members regarding barriers and misunderstandings reflect a broader idea of discontent with the bureaucratic hurdles inherent in higher education. Similarly, advisors navigate these complexities, seeking creative solutions to accommodate student needs while navigating institutional structures. The anecdote of cross-listed classes exemplifies the approach taken by advisors to optimize student access to required courses, even without formal protocols. In essence, the process of course selection and prerequisite determination embodies the ongoing tension between institutional regulations and the imperative of meeting student demand, highlighting the need for collaborative dialogue and proactive problem-solving within higher education.

Additionally, there are other institutional barriers encountered on the bureaucratic side of a cross-college co-teaching program which was described from an administrator as:

“I think that it's the best way to learn. And it's the thing we're the worst at. I think that the way the higher education system is set up is one teacher to one class, you have to be in your major, you have to complete your courses and your major as they've been identified by its very lockstep you know, we can, even in the co-teaching that is going to happen, only one professor is going to get credit for teaching that class. They may have the other one may have permission from their dean or their head to teach the class.”

The institutional barriers highlighted by the administrator shed light on the systemic challenges inherent in traditional higher education structures, where the emphasis on individualized instruction and disciplinary silos often impedes collaborative approaches. The discrepancy between the perceived value of transdisciplinary teaching and the existing credit allocation mechanisms shows the need for systemic reform. Furthermore, the co-taught classes were struggling with the registrar system, therefore, to fix the listing for the course the faculty did the following:

“We did a thing where you can, through the registrar, you can meet with another class, so that you don't have to cross list them so it's my class is still my class and his class is still his class, and we're meeting with each other”.

This quote exemplifies the navigation of institutional systems and structures by the co-teachers, emblematic of the institution's traditional nature. Creating a course with two teachers simultaneously blending their expertise poses a challenge, given the established norms. Consequently, the M3 program participants utilized the strategy of cross-listing co-taught courses to circumvent these obstacles. In addition to navigating the registrar, every semester, the faculty who run the M3 program have to continually:

“Send our scheduling people, “don't cancel this class”. We have to tell the provost don't cancel this class because it's not only eight students that are taking it because it's cross listed.”

The main challenge lies in reconciling traditional norms of individualized instruction with the innovative approach of co-teaching. To address this, the M3 program opted to cross-list co-taught

courses, allowing them to navigate institutional barriers and offer interdisciplinary learning opportunities. However, this strategy requires ongoing advocacy from program faculty to ensure that these cross-listed classes are not canceled, emphasizing the need to continually communicate the value of these courses to scheduling personnel and university leadership. Between advocating for their classes, and navigating the registrar, the faculty and the administration, are going above the expectations for teaching initiatives in higher education. The journey toward fostering cross-college collaborations within academia is fraught with challenges that necessitate a reevaluation of budget models and incentive structures. Along with sustaining the program from semester to semester, finding the classroom for these cross-college co-teaching collaborations was another barrier encountered:

“I joked we need to have somebody that's wealthy die and leave us a foundation or whatever. That is because that is another way in which things happen at [the university], you know, we were in a dorm teaching last semester for the am section because we couldn't find any other space. And right next door to us, was a fully remodeled space. And they say, no one else can be in that space, but those individuals and we were in a little conference room next door where we squeezed in.”

The quote emphasizes the challenges and inequity faced by educators in securing adequate resources and space for teaching within the university setting. The faculty member humorously suggests that a substantial endowment or financial windfall could alleviate some of these constraints, citing examples of how endowed spaces have provided dedicated facilities for certain purposes. The anecdote highlights the disparity between available resources, with one area benefiting from ample funding while others struggle to find suitable accommodation. Despite the obstacles, the faculty member emphasizes the importance of perseverance and strategic planning in navigating financial barriers to ensure the continued success of educational endeavors within the university.

In addition to resource constraints, the structures around credit hours and how classes are evaluated pose constant barriers to enacting cross-college co-teaching initiatives. For example, a faculty member mentioned that:

“[Co-teacher] and I both were evaluated separately by students. So, those separately go into our portfolios that are then evaluated in general, but I think that the university is not going to be on board with funding a bunch of classes like that. I think, overall, like they want people they want more classes being offered by more professors individually.”

This highlights a systemic preference for individualized teaching rather than collaborative efforts. Despite this, there remains untapped potential within the university for students and faculty to collaborate and learn from each other, fostering new innovations and advancements across disciplines. However, the co-teachers come from different disciplinary backgrounds, creating a fusion of perspectives within the classroom. The systems are not set up for evaluation of cross-college initiatives leaving responsibility on the students to recognize the transdisciplinary efforts. The co-taught classes are unique and reflect a future direction of education. However, while not every class is meant to interact, there is some untouched potential within the university where students and faculty can collaborate and learn from each other on other levels. This can lead to new innovations and advancements across the board.

Overall, the path toward fostering cross-college collaborations within academia comes with its challenges and opportunities. Between advocating for their classes and navigating the registrar, faculty and administration alike are going above and beyond the expectations for teaching initiatives in higher education. The systemic barriers entrenched within traditional credit hour structures and individualized teaching evaluations perpetuate a preference for individual efforts over collaborative endeavors. However, the co-taught classes, despite facing numerous obstacles, stand as beacons of innovation, reflecting a future direction of education where disciplinary boundaries blur, and transdisciplinary perspectives flourish. Despite the limitations of institutional systems, there remains untapped potential within the university for students and faculty to collaborate, fostering new innovations and advancements across disciplines. As academia navigates these challenges, there lies an opportunity to redefine the metrics of success, prioritizing pedagogical excellence and collaborative scholarship to create a more inclusive and impactful educational landscape.

Evaluating the Value

The dynamic of a large institution, esteemed for its research, often struggles with acknowledging the pioneering efforts striving to revolutionize undergraduate education. Despite ongoing efforts to highlight the importance of transdisciplinary programs, the impetus lies with decision-makers to prioritize and invest in these initiatives. This sentiment underscores a broader challenge within R1 institutions, where educational priorities can sometimes take a back seat to research imperatives. As a faculty member had mentioned and multiple administrators corroborated, this program has potential, however:

“we are spoken about positively and held up as a model and look how great this is, but it is it is challenging, tiring to have to fight for every little piece and justify it and like even when people know it's valuable, it's like, Well, okay, well then support it, and you know, like, support it properly”

While there's potential for change in higher education, it hinges on influential figures recognizing the value and necessity of such initiatives. People understand the having two people from different backgrounds working together is important, however the value placed on navigating the structures to really bring this program to its full potential may not be realized. The program is asking the administration to reinvent the wheel, but maybe start somewhere. Interestingly, outside academia, the concept of embracing diverse voices and collaborative ventures is commonplace, particularly in community settings. However, within the university ecosystem, these endeavors are frequently hampered by bureaucratic entanglements and financial constraints, perpetuating traditional norms and practices.

“Decision makers deciding to invest in these kinds of projects and seeing value in them to the extent that they're willing to invest in them right, that they really feel like, you know, this is worth it. Because a downside to R1's is that very rarely is education fundamentally put first...I think it's going to take the people with power deciding that it's worth it...I think like in kind of community spaces, like places I've taught outside of the of universities, I think like having multiple voices is very common...it's just at the university that it gets tied up and in rules and bureaucracy and finances, and this is the way things are done”

The dichotomy between academia and community settings in embracing diverse voices and collaborative ventures is an interesting comparison. While community spaces often thrive on the contributions of multiple voices and collaboration, universities frequently encounter obstacles rooted in bureaucratic entanglements and financial constraints. Decision-makers within academia must recognize the inherent value of these collaborative initiatives and prioritize investment in them accordingly. However, the prevailing culture within research-intensive institutions often prioritizes research over educational innovation. To truly foster a Community of Transformation, it will require a paradigm shift where those in positions of power prioritize the educational experience and are willing to challenge entrenched norms and bureaucratic hurdles.

Despite the challenges, the potential for transformative change exists, as evidenced by the success of collaborative endeavors in community settings. A strategy proposed by administration to combat the administrative challenges was the following suggestion:

“I think you've got to get the department heads involved right away. Because from a faculty standpoint, what they're going to be concerned about is the workload, right? Especially if they're on tenure track, they don't want to get bogged down in a bunch of teaching percentage wise against you know, the rest of their workload if they're supposed to be doing research and publishing in order to get tenure. So, department heads are the ones who can help make sure that workload is balanced the way it should be, and that you get credit where credit's due”

Addressing the administrative challenges associated with implementing collaborative endeavors requires proactive engagement from department heads, as suggested by administration. By involving department heads early in the planning stages, faculty concerns regarding workload allocation and recognition can be effectively addressed. This proactive approach not only ensures that teaching responsibilities are balanced in alignment with other professional obligations such as research and publishing but also facilitates proper recognition for faculty contributions to collaborative initiatives. Department heads play a pivotal role in advocating for the value of collaborative teaching and ensuring that faculty members receive the appropriate credit and support for their efforts. Faculty members, particularly those on the tenure track, are understandably concerned about workload distribution, balancing teaching commitments with research and publishing obligations critical for tenure considerations. Department heads play a pivotal role in ensuring equitable workload distribution and appropriate acknowledgment of

faculty contributions. This aligns with the broader challenge of harmonizing promotion and tenure criteria across disparate colleges, especially in the context of cross-college collaboration in co-teaching initiatives. Through this collaborative approach, universities can overcome administrative barriers and foster a culture that prioritizes innovative pedagogy and transdisciplinary collaboration. The way finances are handled at the institution rely upon the deans' values as an administrator recognized below:

“The university doles out a certain amount of money to each college but it's up to the dean to spend it however they want to...the first thing that most of the faculty were mentioning about incentives is like, well, how do we get money to put toward these innovative cool things we want to do and it turns out the answer is, well, you have to convince your dean”.

The financial management system at the institution is surprising to faculty attempting to procure money because it grants deans discretion over how allocated funds are spent. Faculty members find it challenging to access funds for innovative projects as they must persuade their deans, who have autonomy over the spending decisions. The quote highlights a decentralized approach to financial management within the institution, where each college receives a set amount of money, but the dean has the authority to allocate these funds as they see fit. This system presents challenges for faculty members who seek funding for innovative initiatives, as they must navigate the dean's priorities, and as faculty mentioned continually work to prove the value of an educational initiative that may seem unordinary. The lack of direct control faculty has over financial decisions and the need to persuade deans to allocate funds towards their desired projects fosters ideas around having a liaison dedicated to championing the M3 program. It reflects a dynamic where institutional values can vary between different colleges, potentially hindering the implementation of cohesive strategies and funding from each college. The funding challenge could be contributed to the lack of understanding on how to evaluate this type of work, as identified by a faculty member.

“The problem that you run into is that people don't know how to evaluate it.”

The funding challenge within the institution is further compounded by a fundamental issue identified by a faculty member: a lack of understanding on how to assess the value of innovative

work. This observation sheds light on a critical barrier faced by faculty seeking financial support for their initiatives. Without clear criteria or metrics for evaluating the impact of cross-college co-teaching, decision-makers may struggle to justify allocating funds to these endeavors. This lack of understanding not only complicates the process of securing funding but also underscores a broader need for clarity and guidance in assessing the potential contributions of innovative endeavors within the academic context. Addressing this gap could not only streamline the funding process but also create a culture that values and supports innovation in research and teaching initiatives. While achieving consensus on these matters may present challenges, it's essential for fostering faculty engagement and prioritizing the student educational experience. The alignment of values among co-teachers and their respective leaders immensely influences the trajectory and effectiveness of collaborative efforts aimed at promoting transdisciplinarity within higher education.

Cross-college co-teaching face other barriers because the faculty who come from different colleges are still controlled by their respective college, therefore when the faculty crosses over into another college, they are not getting part to teach in that other college.

“Will a faculty member get credit for teaching in another college, because you're not actually getting paid for teaching in the other college they were hired to teach. That is a huge impediment. That is why we must break down these silos. It has to be a university. And you get your faculty assignment based on what the needs of the student in the curriculum are. Because as a dean or a department head, I have a certain number of classes I need to have covered, right? And if you're off teaching in another college, well, that might work for them. But what do I do now?”

The intricacies of faculty time allocation, encompassing their teaching responsibilities and student engagement metrics, are predominantly governed by their home college. However, once faculty members venture into teaching across colleges, the established norms are disrupted, leading to uncertainties regarding credit attribution and workload management. This poses a serious obstacle to breaking down institutional silos and fostering a more cohesive university environment. The crux of the matter lies in reconciling faculty assignments with the overarching needs of students and the curriculum, a formidable task given the departmental imperatives and budgetary considerations. Consequently, there's a pressing need to provide faculty with the flexibility to collaborate across colleges, necessitating a fundamental reevaluation of institutional structures and

resource allocation mechanisms. The imperative for faculty members to remain anchored within their academic home can impede cross-college co-teaching initiatives, particularly when certain areas within departments are left uncovered or underfunded. This underscores the rigidity of existing structures and the reluctance to deviate from established norms. Despite recognizing the entrenched nature of these practices within higher education, faculty members are increasingly advocating for change in the interest of enhancing student education and future prospects. Additionally, the value can be understood theoretically, as “*it sounds always great and fantastic*”, but questions arise when power dynamics come into play.

“No one does any arguing about the cause of the transdisciplinary co-teaching, but if as school wants to get more power or a system or someone wants to have more influence to the curriculum or who will be in charge of or who, who has more money and who is the owner?”

While the merits of transdisciplinary co-teaching are widely acknowledged, concerns emerge regarding the governance and ownership of collaborative curricula. Questions surrounding power dynamics, financial influence, and administrative control invariably arise when multiple colleges contribute to curriculum development. This raises pertinent queries about the management and stewardship of such initiatives, including decision-making authority. The collaborative nature of curriculum development necessitates clear delineation of responsibilities and equitable distribution of influence among participating colleges to ensure effective governance and sustainable growth. The quote above echoes the rationale behind the establishment of the innovation hub; if there were a centralized resource to address these inquiries, it could alleviate some of the challenges associated with education that transcends disciplinary boundaries. Despite the recognized value, the existing structures and systems serve as impediments to the implementation of innovative educational approaches. The reason for the innovation hub, if there was one place to go to that could be the answer to these questions, then some of the headaches around an education that transcends disciplinary homes. Again, the value is known, but the structures and systems are barriers to innovative educational practices. Navigating ownership, maintenance, and responsibility within a large institution presents challenges. These issues reverberate across various departments and personnel, sparking questions about the distribution of credit for teaching

and the establishment of clear teaching loads. One observation from an administrator at the university sheds light on the disparities in defining teaching loads across different colleges:

“I think one of the interesting things at [the university] is that not every college has a well-defined teaching load. We do over here in the business school but when we work with other units, and we try to get like the definition of what's in load versus out of load sort of behavior, it's very, it can be very slippery. And that also creates problems for hiring, because we're trying to get a definition around that stuff. We're hiring somebody jointly with computer science and we're like, what exactly is your load over there? And so, there's a bit of a challenge.”

As higher education institutions think through these complexities, it becomes evident that standardizing practices and ensuring equitable treatment across colleges is imperative. The remarks of the administrator show the pressing need for clearer guidelines and definitions regarding teaching loads to foster transparency and fairness in cross-college co-teaching practices. Addressing these challenges is essential for promoting collaboration and innovation in education across disciplinary boundaries. This transition in perspective within the faculty could serve as a catalyst for transformative change in traditional educational practices. The challenge now lies in synthesizing these ideas into programs that not only resonate with college-aged students but also equip them with the skills relevant to today's workforce.

Furthermore, there is no financial equity across colleges for this type of program, however an administration proposed a strategy that:

“if that course is co taught by one or two other faculty from these other colleges, their colleges are not getting the financial credit for those student headcounts...even having a separate financial pot of money from the financial branch of the provost office that says, hey, if you're doing transdisciplinary things this is where the money is going to get distributed to the colleges from so that we can be fair and in distributing it because the only way I think that would be fair is equally split it up and three, you know, divided by three, right? Because you've got three teachers, three colleges teaching the same class, you have 30 students, you should only get money for 10 you get money for 10 you get money for 10”

The quote highlights a key financial disparity: when a course is co-taught by faculty from different colleges, only the home college receives financial credit for the student headcounts. To address

this inequity, an administrative proposal suggests establishing a separate financial pool earmarked for transdisciplinary initiatives. This would ensure fair distribution among the colleges involved, with funds divided proportionally based on the number of faculty and colleges contributing to the course. While this seems like a feasible solution, there at this universities honors college there are courses being co-taught at some capacity, and in order to combat the registrar, they have figured out a solution that works for them:

“When Honors College became its own thing, there are some courses that are literally designated like just honors and it's HNRS or something is the prefix so that way the registrar knows who it belongs to. They know what's unique, so it's not going to have duplicates, and causing all kinds of problems when students are trying to graduate”

However, a viable solution might already exist, as demonstrated by the Honors College. By assigning a unique prefix to designated courses, such as "HNRS," the registrar can easily identify the courses and their respective owners, mitigating potential issues like duplicate entries. This strategy, while effective for the Honors College, poses a challenge for the M3 program, which involves three distinct colleges collaborating for the design and innovation minor. Unlike the Honors College, which could establish its own administrative structure, the M3 program must navigate the complexities of multiple college affiliations without the ability to create a new college and change prefixes. Thus, adapting this approach requires innovative solutions tailored to the unique circumstances of the program. The boundaries between academic disciplines are becoming porous, giving rise to transdisciplinary engagements that bridge traditional departmental divides. However, while such cross-college collaborations hold potential for innovation and holistic learning experiences, there are barriers. While connecting research to teaching is a difficult task, it can promote a cross-college collaborative setting that can advance student learning. In connecting those pivotal pieces of higher education ideas for innovation can arise, however when looking at how to makeover a traditional educational structure, the funding from departments to recreate that could be challenging but there are new initiatives to fund ideas such as these, as noted by a faculty member below:

“I can put one person in a room with 300 students that saves me a lot of money. Good things are happening. Things are being invested even like the innovation hub.

They're not investing in research. Specifically, they want to do the stuff to try curriculum, educational innovations. You can do the scholarship on it later, but there's never been funds for doing that. [The University] is providing all that you could get internal funding to do research projects, but there were limited internal funds for I want to redo my classroom, or I want to redo this course, or you know I want to try something totally crazy. That wasn't there."

Even though the monetary compensation comes mostly from research as recognized by participants in this study, there is tuition money coming from the students as well. Students are a major part of this university, which can be a driving reason for the need of places like the innovation hub. The challenge of securing funding for transformative initiatives aimed at overhauling traditional educational structures is noteworthy, particularly given the financial constraints faced by departments. However, there are emerging initiatives to support such endeavors, as highlighted by a faculty member's insight. They emphasized that traditional cost-saving measures, such as large lecture halls, might not align with the evolving educational landscape's needs. The faculty member pointed out the emergence of initiatives like the innovation hub, which focus on investing in educational innovations and curriculum experimentation. This shift demonstrates a recognition of the importance of investing in pedagogical advancements alongside traditional research endeavors, or a combination of these as evidenced by the M3 program. While the institution historically prioritized research funding, there's now a growing acknowledgment of the need to allocate resources for classroom and curriculum innovations. This sentiment is reinforced by the acknowledgment of the notable contribution of tuition fees from students, underlining their stake in fostering a dynamic and innovative learning environment. The emergence of initiatives like the innovation hub reflects a broader institutional commitment to supporting experimentation and innovation in teaching methodologies, signaling a shift towards a more student-centered approach to higher education.

The journey towards transformative change requires an effort to reconcile disparate priorities and institutional structures, particularly within research-intensive universities. The dichotomy between the value placed on research and the necessity of prioritizing educational innovation poses a fundamental dilemma. While initiatives like the innovation hub offer promising avenues for investment in pedagogical advancements, addressing the systemic barriers to cross-college collaboration remains a priority. The administrative proposal to establish a separate financial pool for transdisciplinary initiatives is a step towards equitable resource allocation, but further changes are needed for that strategy to be feasible. The lessons learned from initiatives like

the Honors College also show the importance of adaptable administrative strategies tailored to the unique needs of collaborative programs like the M3 initiative. As these challenges are explored, it is crucial to remain mindful of the programs driving philosophy of teaching and learning in a new way, no educational silos, and anyone can be an innovator. By leveraging the collective expertise and passion of faculty, administrators, and students alike, these obstacles can be hurdled and the full potential of collaborative innovation in higher education can be realized.

4.2.2 Administrative Endorsement

The discussions among stakeholders around the challenges and potential benefits of transdisciplinary collaboration and co-teaching in academia emphasize the administrative complexities of implementing innovative educational programs. Administrative endorsement can sustain or halt a program, especially one that requires collaboration between three different academic colleges. The need for department heads to manage faculty workload and ensure proper credit during cross-college co-teaching initiatives are problems that were brought to the forefront of the discussion around this educational model. Hence, various stakeholders stress the importance of securing resources and support from decision-makers to invest in such initiatives. There are concerns regarding workload distribution, faculty incentives, and financial considerations tied to teaching responsibilities. However, faculty members express enthusiasm for transdisciplinary projects but note obstacles such as siloed departments, rigid curriculum structures, and logistical issues in coordinating teaching responsibilities across colleges. The value of diverse perspectives and collaborative teaching approaches can sound valuable however, there needs to be clear expectations and support for faculty engagement from the administration. There is a shared recognition of the potential benefits of collaboration across disciplines but also an awareness of the structural and administrative challenges that need to be addressed for successful implementation. Common themes in this section include the need for administrative support, faculty workload management, resource allocation, transdisciplinary opportunities, and the importance of clear communication and expectations in collaborative co-teaching efforts. There have been challenges and impediment as identified by administration such as:

“Cross disciplinary co-teaching. It ties up teaching capacity or teaching load from multiple instructors. So now you have two people essentially doing the work of

one...which means I'm getting half the value of the teaching load from these people, unless I double the size of this one."

The quote highlights a common misconception surrounding the value of cross-college co-teaching in the context of transdisciplinary education. The concern raised by administration reflects a belief that having two teachers in the same room simultaneously may inefficiently allocate teaching resources, thereby reducing the overall teaching capacity available. This perspective implies that the workload of two instructors might equate to that of one, potentially diminishing the perceived value of their teaching contributions. However, this viewpoint fails to acknowledge the unique benefits that arise from collaborative teaching approaches. While it may seem like doubling the teaching load, cross-disciplinary co-teaching enriches the learning experience by bringing diverse perspectives, expertise, and teaching styles into the classroom. It fosters dynamic interactions among students and instructors, encouraging transdisciplinary dialogue, and enhancing students' ability to navigate complex real-world problems. Therefore, rather than viewing it as a duplication of effort, cross-disciplinary co-teaching should be recognized as an investment in providing students with a more comprehensive and holistic educational experience. However, there is something to be said at the department level for covering classes:

"One of the bigger problems is just making sure that the university is getting enough work out of their instructors to cover the load that's necessary".

This quote demonstrates that the administration needs to justify co-teaching. Ideas surrounding distribution of workload across a department to teach the number of students within the department are important, as well as making sure faculty across the board are treated fairly. While co-teaching can be seen as half the work, it requires more preparation and collaboration from the faculty that engage in cross-college co-teaching. However, even with literature that suggests collaborative efforts require more work, administration identified drawbacks as well:

"But the drawback is, is that when you engage in team teaching, are they truly doing team teaching? Or are they simply splitting the class into two, where I take my hat, and you take your hat, that's not team teaching, okay? It's important that sometime be taken, to really understand what team teaching is about so that you truly get that diversity of thought."

The question posed around the co-teachers are truly blending their expertise in a way that requires both teachers is a valid question to consider before funding a class that requires twice the resources compared to a traditionally run lecture. As observed, the co-teachers blend their lessons together in a way that usually requires both instructors to participate in the lecture. However, in the class that had a faculty switch, the teaching roles were skewed, and the liberal arts professor was the primary teacher, and the other co-instructor's role was more of a teaching assistant. In the other co-taught class, the teachers demonstrated a harmony of the two disciplines and their shared roles. The co-teachers were actively engaged in teaching lessons and parts of lessons that both were and were not representative of their disciplinary background. These observations allowed the researcher to see the value firsthand, whereas some administrators may not be able to sit down and see an example of the cross-college co-teaching in person, hence questioning its necessity and value. Therefore, conveying the success and relevance of co-teaching becomes even more important. The value of diversity of thought is recognized. The administrators seem to sympathize that maybe one disciplinary lens might not be the answer or the final solution to transform higher education, rather the sum of multiple disciplinary perspectives can become a well-rounded answer. However, the idea again of what the faculty actually is doing in these settings seems to weigh on the minds of administrators. Funding for the staff, and the students in the college deserve equity, however the systems and structures are not in place to make this type of model easily justifiable for administrators. Hence the ideas seen here:

"I sort of wonder if there's a if there's a sort of design, since it's the focus here is design and if you sort of said, the design objective here is to maximize the number of collisions that take place while minimizing the amount of downtime where downtime is just defined as a faculty member sitting there twiddling their thumbs because they're not actively contributing to the exchange in the classroom. And I would imagine that with some thought and foresight design, one could say, what is the environment that will maximize the value of having two people with distinct backgrounds in the same room at the same time, interacting and colliding with students?"

Once more, the rationale behind teacher allocation holds merit, especially in ensuring class coverage and student instruction. Nevertheless, the quality of education and the substance of students' learning experiences are both vital considerations. Efficiency of resources, time and

funding come to the forefront of many situations. However, it seems as if the M3 program has created a program to run as efficiently as it could with the structures and systems in place. Looking back to the literature the idea of having an additional team member dedicated to relationships and the program organization was common, however among the members of the M3 program, everything is done with the faculty that are managing their teaching, research, and other institutional responsibilities, not even to mention personal obligations. While administration questions the efficiency and the validity of this cross-college co-teaching, they do recognize the benefits as well:

"I think the department head should leverage the tools that they have to support the faculty right. If a faculty member came to me and said, I'd like to team teach with someone, my response would be yes, and this is, let's figure out how to support this. I talked about the half load, because there's two of them in the classroom, and... it's not that they're divided. I'm giving 100% of the class and I'm collaborating with another 100% person, that is where the machinery is a little bit different."

While some stakeholders may question the efficiency and validity of cross-college co-teaching, quotes like the one above demonstrates the perceived benefits, and the administrator identified that the benefits for co-teaching outweigh the concerns when considering questions around the value of co-teaching initiatives. The co-instructors are facilitating students learning at the convergence of disciplines through problem solving and innovating. However, when the teaching load and other expectations of faculty members are considered, the benefits wear thin on the people responsible for the teaching, which will be discussed in The Characters section. Furthermore, the willingness of department heads to support faculty initiatives demonstrates a commitment to fostering collaborative environments. As one administrator pointed out, the challenge lies not in dividing efforts but in recognizing the dedication each faculty member brings to the table to co-teach. By leveraging available tools and embracing collaborative teaching models, institutions can continue to innovate while ensuring that resources, time, and funding are utilized efficiently to enrich the educational experience for all involved. The value is once again recognized; however, the mechanics are what constantly brings ideas like this one to a halt:

"I've always seen the value of diversity and transdisciplinary initiatives...this type of effort will bring to the surface opportunities that we are not thinking about right

now...maybe there will be a research project coming up because there's opportunity that we didn't expect, but because we are working like this, we already in in the pole position, just because we are already doing it, you know...we put faculty in a privileged position to respond to opportunities like that... I will be supportive and of course, it's up to the head if we can figure out how to cover the classes that are packed."

This quote demonstrates that having administrators who embrace innovative approaches to teaching and learning, positioning their department, faculty, and peers at the vanguard of future endeavors and collaborations. Yet, the recognition of the value of transdisciplinary experiences by administrators hinges on individual perspectives and priorities, which matters in this case, as administrators determine funding and teaching load for their faculty. Institutional history and departmental norms also shape the perceived worth of endeavors like transdisciplinary collaboration.

Reflecting on previous sections, such as the lack of design opportunities in the College of Engineering, reveals the influence of teaching methodologies and institutional advancements. Established values within academia often pose challenges to crossing disciplinary boundaries. Therefore, administrators who prioritize collaboration are leading the charge in revolutionizing undergraduate education through cross-college co-teaching for transdisciplinary learning. However, for this program the deans from each of the respective colleges, engineering technology, liberal arts, and business, one of them had mentioned that:

"We all looked at our experiences for our students, and, you know, [the business school] wanted to give their students more exposure to the technologies and some of the tools that you can use for innovation. They also wanted to give their students a little bit more experience with creativity. Then liberal arts said the same thing, and Polytechnic wanted to have more of a business side of innovation. It's allowing students to really gain experiences that they could never do, because we're siloed so much, and there's very little flexibility in the curriculum. The Dean's got together and we talked about, and we say it would be great if we could come up with a learning experience that really helped all of our students fill the gaps that they have in their current education".

However, there are concerns of incentivizing the faculty to want to be interested in this type of work:

“More and more faculty are going up for promotion of teaching, but it's always, the word I want to use in scholarship, a scholarship of teaching. And the same thing with engagement. Now we have a scholarship of engagement. We do have people who are going up for tenure on social engagement. I'll just be honest; you can incentivize them with money. But that only goes so far.”

The collaborative initiative spearheaded by the deans from various colleges, including engineering technology, liberal arts, and business, underscores a shift in undergraduate education. By recognizing the limitations of traditional siloed approaches, these administrators have embarked on a transformative journey to bridge disciplinary divides and cultivate transdisciplinary learning environments. Their collective vision reflects a commitment to equipping students with the multifaceted skill set needed to thrive in an increasingly complex world and trust faculty to engage in cross-college activity. Through cross-college co-teaching initiatives, students are afforded unique opportunities to explore the intersections of disciplines. Brought through the fusion of academic disciplines. By fostering collaboration across disciplines, this program addresses the gaps in education and cultivates a new generation of thinkers poised to tackle the challenges of tomorrow. However, the faculty members must teach students and work with other faculty to create classes that transcend disciplines. Faculty pursuing promotion based on their contributions to teaching and engagement can foster innovative teaching approaches. While financial incentives can motivate faculty, the intrinsic value of scholarly engagement and its impact on student learning and community involvement surpasses monetary rewards, highlighting the multifaceted nature of academic recognition, teachers want accolades, but in turn must want to teach outside of the traditional norms in a research-intensive university. The ideas on cross-college co-teaching can be viewed as important. Some administration view this as:

“...a good thing. I think you know, if you take [an instructors] course for example, they have an anthropology faculty member in the classroom co-teaching it I think they bring something and then he brings something and those some of some things are greater than the individual something. I think it's good.”

The endorsement of cross-college co-teaching by administrators as "a good thing" reflects a broader recognition of the value brought forth by transdisciplinary collaboration within the educational landscape. Embracing integrating diverse perspectives and expertise, allows for

instructors to enrich the learning experience, offering students multifaceted insights that transcend traditional disciplinary boundaries. This endorsement underscores a fundamental belief in the power of collaboration to enhance pedagogical practices and foster innovative thinking among faculty and students, as people never stop learning. It highlights a strategic alignment with the evolving demands of the modern workforce, where versatility and the ability to navigate complex challenges are increasingly prized attributes. Thus, the administration's support for cross-college co-teaching represents not only a validation of its efficacy but also a testament to its potential to shape the future of education.

However, there are still logistical concerns such as:

“If teaching is more important to you than research, then there must be an avenue for you to get credit for that. And your department head can help, they are the ones who are supposedly assigning workload to their employees. And the faculty who teach are their employees. We need department heads that are involved to make sure that the work is counted, and that the work is the appropriate workload, balance for their faculty. I think you do have to talk to the scheduling people on campus. It's a physical resource like there's either classroom space or there's not. But at least the scheduling deputies are aware of what classroom space there is, and they could have some creative ways potentially on how to remix up the space so that it because on paper, it might look like that this is three different classes. When really, it's just one class and you've got three different teachers who are sharing the teaching.”

The shared perspective among administrators demonstrates the importance of acknowledging teaching efforts within the academic realm, highlighting an aspect of fostering a supportive environment for faculty engaged in cross-college co-teaching initiatives. The suggestion of establishing a consortium comprising department heads from the diverse arms of transdisciplinary programs represents a proactive approach to ensuring equitable recognition and allocation of workload among faculty members. By leveraging the expertise of department heads, who play a crucial role in assigning workload and advocating for faculty interests, this proposed consortium could serve as a vital conduit for streamlining processes and addressing concerns related to workload balance and credit attribution for teaching contributions.

Furthermore, a typical classroom or lecture hall accommodates one instructor, making it challenging for two teachers to co-teach due to the setup. The notion of engaging scheduling deputies in discussions about optimizing classrooms and resources reflects a commitment to

maximizing the efficiency of educational spaces to accommodate collaborative teaching endeavors. This strategy could benefit the classes as the rooms for the co-taught courses were either in the basement of a residence hall or always switching because there are not too many rooms set up with enough space for this type of class. The approach mentioned above, encompassing considerations of workload, credit allocation, and resource optimization, represents a concerted effort to nurture a supportive ecosystem conducive to the success of cross-college co-teaching initiatives and ultimately enhancing the overall quality of undergraduate education. There was another suggestion given by administration which was to have departments have activities where different disciplines are interacting:

“To have cross pollinating activities, or resources or centers that allow some organization or department to interact with another organization or department. And it organically generates. And then I think it's on department heads or wherever the schedule deputy to kind of figure out the machinery, I think it's a lot better done bottom down, bottom up, and then top down because I think faculty know what they're doing.”

The proposal to foster cross-pollinating activities, resources, or centers, facilitating organic interactions between diverse departments, serves as a strategic step toward nurturing transdisciplinary collaboration within the academic community. By encouraging bottom-up initiatives driven by faculty members themselves, departments can capitalize on the inherent expertise and insights of their members to cultivate meaningful transdisciplinary engagements. These strategies proposed to further develop cross-college co-teaching can serve as the next step to expanding these initiatives around campus. If administrators see their ideas in action, it could potentially inspire these types of collaborations to grow across the campus. This decentralized approach not only empowers faculty to leverage their knowledge but also fosters a culture of innovation and creativity essential for transdisciplinary learning. Moreover, by entrusting department heads and scheduling deputies with the task of operationalizing these initiatives, universities can ensure that such endeavors are seamlessly integrated into the academic fabric, further enriching the educational experience for students. Embracing this collaborative ethos from the grassroots level up to administrative leadership reinforces the commitment to holistic educational excellence and underscores the university's dedication to preparing students for the multifaceted challenges of the future.

In navigating the realm of cross-college co-teaching within academic institutions, confronting the dynamics surrounding faculty workload and recognition has been seen throughout the findings thus far. Continually, as administrators and educators grapple with the multifaceted nature of cross-college collaboration, they are confronted with the reality that faculty members bring to the table diverse lived experiences and perspectives that can influence the cross-college co-teaching. This diversity, while rich in potential, poses unique challenges that demand careful consideration. One critical aspect is the question of how faculty workload is managed and recognized across departments and disciplines. As administrators reflect on the efficacy of collaborative endeavors, they must address fundamental questions about the nature of team teaching and transdisciplinary collaboration. Are these initiatives truly fostering a synergistic exchange of ideas, or are they inadvertently diluting the essence of collaboration by fragmenting courses into disjointed segments? As it was reflected in the interviews:

"The drawback is, is that when you engage in team teaching, are they truly doing team teaching? Or are they simply splitting the class into two, where I take my hat, and you take your hat, that's not team teaching, okay? That is taking a course and split it in half. It's really important that sometime be taken, to really understand what team teaching is about, so that you truly get that diversity of thought. And so, every topic is team taught every unit of instruction, every learning outcome is designed together, okay, and not in isolation."

Concerning the efficacy of team teaching and transdisciplinary collaboration within academic settings is understandable as one may view co-teaching as half the load. It prompts administrators and educators to reflect on whether collaborative endeavors truly embody a synergistic exchange of ideas or devolve into fragmented approaches. The distinction between genuine team teaching and mere division of course responsibilities is emphasized, highlighting the necessity for a deeper understanding of collaborative pedagogies. True co-teaching entails comprehensive collaboration in designing every aspect of instruction, ensuring that diverse perspectives are integrated seamlessly into every facet of the course. This holistic approach not only enriches the learning experience but also fosters a cohesive and interconnected educational environment where all stakeholders contribute meaningfully to student success. The following quote delves into the nuances of collaboration within educational settings, pondering the value of diverse perspectives in problem-solving approaches. It prompts consideration of whether collaboration is optimally

facilitated by individuals from different disciplinary backgrounds or those with differing lived experiences within the same field:

“But their lived experiences are so different that they would approach a problem in a different way. I always sort of wonder if there's value in collaboration. If the right organizational principle, is it faculty from two different departments, or is it people from the same disciplinary area but different lived experiences...so I almost kind of wonder what type of collaborative innovation could be more effective in those terms.”

By acknowledging the potential influence of diverse perspectives on problem-solving methodologies, the speaker raises thought-provoking questions about the optimal organizational principles for effective collaboration. They ponder whether the most fruitful collaborations emerge from transdisciplinary partnerships, where individuals from different departments bring unique expertise to the table, or from intra-disciplinary collaborations, where shared experiences within the same field offer nuanced insights. This reflection highlights the complexity inherent in fostering collaborative environments and underscores the importance of deliberate organizational strategies that maximize the synergistic potential of diverse perspectives in educational endeavors. These questions are fair, however, many challenges facing society are solved with the combination of disciplines, therefore the administration may think logistically placing intradisciplinary collaboration highlights. Intradisciplinary does have its place and can be another initiative to offer students, however the M3 is working to provide varying viewpoints from different modes of thinking entirely.

Moreover, the issue of recognition looms large as faculty members navigate the complexities of teaching across disciplinary boundaries. The administrative structures within universities often dictate teaching assignments and workload allocation based on departmental affiliations. This can result in a weighty impediment to cross-disciplinary collaboration, as faculty members may face obstacles in receiving due credit and acknowledgment for their contributions outside their home departments.

“Faculty, faculties time, how they spend their day, the number of classes they teach, the number of students that they have, are totally controlled by their home college. So, a faculty member is assigned by someone in [the business school] in the administration as far as their teaching time is. As soon as you enter another college,

then all bets are off because a faculty member will get credit for teaching in another college because you're not actually getting paid for teaching the other college. They were hired to teach at their home college. And so somehow, we must fund this and allow faculty, the freedom to work across colleges, so that they can do these kinds of things."

The issue of credit allocation and workload distribution across departments adds barriers to cross-college co-teaching. Faculty members typically have their teaching schedules and responsibilities determined by their home college, which can create barriers when they seek to collaborate with colleagues from other departments or colleges. Since their teaching commitments are tied to their home college, teaching in another college may not be officially recognized or compensated, leading to uncertainties regarding credit for their contributions. This dilemma is exacerbated by the economic considerations of department heads and deans, who must ensure adequate class coverage within their own departments. Consequently, the quote underscores the need to dismantle institutional silos and create mechanisms that incentivize and support cross-college collaboration, allowing faculty the flexibility to engage in transdisciplinary initiatives without compromising their professional obligations or recognition.

Furthermore, the financial implications of collaborative initiatives cannot be overlooked. As administrators contend with budgetary constraints and the imperative to demonstrate cost-effectiveness, they grapple with the challenge of justifying the allocation of resources towards collaborative efforts. The need to reconcile the perceived inefficiencies of co-teaching with the broader benefits of transdisciplinary collaboration presents a formidable task. As seen here:

"The people who control the purse strings are wondering, wait, why would you do something like this? Because it's not cost effective in any way? That is because we have two people paying them fully for the work. You know, like, I could be paying one person for this but now I'm paying two people and going back and trying to convince people that this is beneficial, that it means something it's worthy work."

In essence, the exploration of faculty workload and recognition within the context of cross-college co-teaching underscores the intricate dynamics between administrative policies, academic culture, and institutional priorities. As stakeholders navigate this complex landscape, they are tasked with finding solutions that balance the demands of efficiency with the imperatives of fostering

transdisciplinary engagement and recognizing the diverse contributions of faculty members. Initiatives like the M3 program that is working to promote transdisciplinary education, have been seen before as mentioned below:

" I participated in an experimental program several years ago in polytechnic, where I was a fellow and on an interdisciplinary learning program. I don't know what it's called nowadays, and that worked a lot, and I loved it. I loved it. Because we had a lot of leeway. And I did get the support from our department you know; I got course release I if I remember that course counted toward my allocation"

The account of participating in a past experimental program in the polytechnic highlights the potential effectiveness of initiatives aimed at fostering interdisciplinary learning environments especially for teacher's workload, however this is one instance, and does not detail how it was equitable for members across colleges. However, such programs, like the one described, offer faculty members the flexibility and support necessary to engage in transdisciplinary education effectively. By providing resources such as course release and allocation adjustments, institutions can incentivize faculty involvement in these initiatives, encouraging innovation and collaboration across disciplinary boundaries. The positive experience recounted demonstrates the value of investing in programs that prioritize transdisciplinary learning, as they not only empower faculty members to explore new pedagogical approaches but also enrich the educational experience for students by exposing them to diverse perspectives and methodologies.

However, it seems that this type of cross-college co-teaching does not always go as smoothly administratively because:

"That is not a course that any individual department has requested and as a result, the people who are doing this course are not likely to get this counted as credits toward their teaching load. But I think it'd be really cool course, right"

Whereas, on the opposite side of the coin, the M3 program is also seen as:

"Administratively intensive, when you're doing something innovative. It's hard enough to get one unit to commit to it to get multiple units to commit to it, you know, gets even more challenging."

The sentiment regarding the M3 program being administratively intensive resonates with the broader challenge of implementing transdisciplinary initiatives across multiple academic units. While the benefits of such programs are evident, the logistical complexities involved in coordinating collaboration among multiple units pose hurdles. Indeed, the M3 program amplifies the administrative demands and exacerbates challenges related to equity and resource allocation. Despite these obstacles, the recognition of transdisciplinary work as valuable once again highlights the importance of persevering in efforts to overcome administrative barriers and foster meaningful collaboration across diverse academic domains. By addressing the logistical challenges head-on and advocating for equitable distribution of resources and support, institutions can work towards realizing the full potential of transdisciplinary education in preparing students for success in an increasingly interconnected and complex world.

Furthermore, the faculty engaging in this work can benefit from collaboration as well. Some faculty mentioned how being at a research-intensive university allocate their creativity to research, however:

“When it comes to curriculum, it kind of takes a backseat. And so philosophically, they might agree that we need to do more transdisciplinary, innovative kinds of things. The question is, are they actually investing in that?”

The ideas expressed here show a challenge within research-intensive universities: while there may be philosophical alignment with the notion of transdisciplinarity in education, the actual allocation of resources and institutional support often lags behind. The practical execution of these initiatives requires serious investment in terms of faculty time, administrative support, and financial resources. Without tangible commitments to fund and prioritize transdisciplinary educational programs, the gap between philosophical aspirations and practical implementation may persist, hindering the realization of innovative pedagogical practices aimed at preparing students for the complexities of our world. Maybe if the faculty were able to see the deliverables of the program in a concise manner, as suggested:

“You need to set out what the outcomes are ahead of time. And then as you're creating that curriculum or that program, you're checking in, as you put courses in and things that it's still hooking back to weapons outcomes, where that the students have the opportunities to reach those outcomes through the coursework and the

assignments and the homework, so that you can kind of safely say at the end, this is what a graduate from our program looks like.”

Establishing clear program outcomes and ensuring alignment with curricular components are crucial steps yet require careful coordination and ongoing assessment to maintain consistency and effectiveness. Overall, the exploration of cross-college co-teaching initiatives within academia reveals a complex landscape shaped by administrative policies, institutional priorities, and faculty perspectives. While there is a shared recognition of the potential benefits of transdisciplinary collaboration, crucial challenges remain in navigating faculty workload, recognition, and resource allocation. The administrative complexities involved in implementing innovative educational programs demand careful consideration, as mentioned by the administrative perspectives on the efficiency and validity of such initiatives. Despite logistical hurdles and concerns about workload distribution, the value of cross-college co-teaching is evident in its potential to enrich the educational experience for students and foster innovative pedagogical practices. The M3 program serves as a testament to the dedication of faculty members in navigating these challenges and underscores the need for ongoing support and advocacy to realize the full potential of transdisciplinary education. Moving forward, fostering a collaborative ethos from the grassroots level up to administrative leadership will be essential in overcoming barriers and advancing cross-college co-teaching initiatives to prepare students for the complexities of a rapidly evolving world. By establishing clear program outcomes, aligning curricular components, and ensuring equitable recognition and support for faculty engagement, institutions can cultivate a culture of innovation and collaboration essential for addressing the multifaceted challenges of the future.

4.2.3 The Role of Advisors

In the intricate landscape of university advising, a complex narrative unfolds, marked by challenges faced in the critical role advisors play in shaping students' academic journeys. Amidst the myriad of course selections and program requirements, advisors serve as navigators, guiding students through higher education. However, within this dynamic environment, equity often remains elusive, with students' experiences heavily influenced by the knowledge and resources of their advisors. These heroes of academia traverse a terrain, where institutional hierarchies and undocumented knowledge dictate the path to academic success. As administrators work with the

intricacies of university policies and procedures, advisors are faced with the task of illuminating pathways to success while contending with the constraints of a bureaucratic system. Despite the challenges, advisors persevere, driven by a shared commitment to student success. They serve as the champions of academia, especially when working the cross-college co-taught program. The role of advisors is pivotal, shaping students' trajectories through higher education. Yet, amidst the labyrinth of course selections and program requirements, a fog of uncertainty looms large. As administrators grapple with the tangled web of policies and procedures, equity remains a distant goal, with students' experiences often hinging on the knowledge and resources of their advisors. Their tireless efforts extend beyond mere course registrations, delving into the realms of career exploration and academic innovation. Yet, among the competing interests and logistical challenges, the true value of their contributions can go unrecognized. However, administration recognizes that:

“One of the major components in any student's journey in higher education is their experiences with advisors. Advisors work with students and help them navigate their class selections and opportunities. Advisors play a significant role in the M3 project, as the co-taught classes need students placed in them. Advisors have to have knowledge of the minor, as well as what the classes look like in the registrar system as they have been cross-listed and can look like, as well as understand who may or may not be a good fit for these classes.”

Advisors represent a critical cornerstone in the educational journey of university students, providing essential guidance and support throughout their academic endeavors. Tasked with the responsibility of assisting students in navigating the intricate landscape of course selections and opportunities, advisors play a pivotal role in shaping the trajectory of students' higher education experiences. Their impact extends beyond individual academic pursuits, particularly within initiatives like the M3 project, where co-taught classes necessitate strategic student placement. To effectively fulfill their roles, advisors must possess a comprehensive understanding of various elements, including minor requirements, course structures within the registrar system, and the suitability of classes for individual students. This multifaceted knowledge equips advisors to tailor their guidance to meet the diverse needs of students, ensuring that they are positioned for success in their academic pursuits. Administration mentioned that they are:

“Finding a lot of mythology and war, and just undocumented knowledge around how students navigate all of the majors currently...some advisors know that this department will allow an exception for this course, to be used as a substitute. It isn't in the catalog. These advisors know what these advisors don't. And what we're finding is a problem of equity, that your ability to navigate majors at [the university] depends on who your advisor is and how much they know. And so that's problematic”.

The administration has highlighted a concerning issue surrounding the lack of transparency and consistency in how students navigate through the various majors offered at this university. They describe encountering a landscape rife with "mythology and war" indicating a prevalence of undocumented knowledge and unspoken practices within academic advising. This clandestine information extends to certain advisors possessing insights into exceptions and substitutions for courses that are not officially cataloged. Consequently, disparities arise in students' abilities to effectively navigate their chosen majors, with their success heavily reliant on the knowledge and resources of their respective advisors. This revelation underscores a systemic problem of equity, where students' academic trajectories are influenced by the varying expertise and awareness levels of their advisors, rather than standardized processes and accessible information. Such inequities pose serious challenges to ensuring fair and equitable educational opportunities for all students at the university.

However, this institution is not set up to support more cross-disciplinary types of educational initiatives. Advisors say that when registering students for classes it looks different than traditional non-co-taught classes because:

“It's a “meets with” and sometimes it's a crossed list. Sometimes it's their own number. But you know, faculty drive the curriculum, so sometimes they don't understand why a specific prefix needs to be in there. Or there's an academic hierarchy, I want a management class instead of a tech class.”

The administration has acknowledged the unique challenges faced by advisors when registering students for classes, particularly in the context of co-taught courses. Unlike traditional non-co-taught classes, the registration process for these courses often involves complexities such as "meets with" arrangements and crossed lists, in addition to faculty-driven curriculum decisions. Advisors find themselves navigating a diverse range of scenarios, including cases where classes are listed

under different prefixes or subjected to academic hierarchies. This variability can lead to confusion and frustration among both advisors and students, especially when faculty preferences regarding course selections clash with academic requirements or student preferences. Such complexities highlight the need for streamlined processes and enhanced communication between faculty and advisors to ensure a smoother registration experience for students. While faculty have mentioned their frustrations with the courses in the registrar, the advisors are the ones helping the students navigate the systems and:

“What has been put out on their requirements and use our connections to help them circumvent certain areas where there are errors. We were trying to get students into [Designing Technology for People] as an engineering technology advisor, and realized that there was a cross listing in the lookup classes function in [the university system] and realized that the anthropology section was cross listed with it. And because the engineering/technology seats were full, we got people into the anthropology section, because it was the same exact class just offered by a different department.”

While faculty members express frustrations with certain aspects of course management within the registrar system, advisors play a crucial role in assisting students in navigating these complexities. Advisors not only guide students through the requirements outlined in their academic programs but also leverage their connections and expertise to address potential obstacles. For instance, when faced with challenges like full class capacities or cross-listed courses, advisors utilize their knowledge of the system to find alternative solutions. Despite recognizing the limitations of such approaches, advisors remain committed to facilitating student success and will go to great lengths to help students achieve their academic goals.

“Why do you not have more students and design and innovation? Because that often gets asked of advisors too. Oftentimes we get well, why aren't you doing it that way? Okay, I'm doing my job to the best of my knowledge and my ability, I don't need you questioning it when you don't understand what my job is and that happens quite a bit with the registrar's office.”

This quote highlights the invaluable role of advisors in advocating for students and navigating the complexities of course enrollment. Despite facing challenges and criticisms, advisors are

unwavering in their commitment to supporting student success. The question, "why do you not have more students in design and innovation?" reflects a common inquiry directed at advisors, suggesting that there's an expectation for them to ensure enrollment in certain classes or programs. However, advisors often encounter resistance or questioning from external parties, such as the registrar's office, regarding their methods or decisions when it comes to navigating the structure that is preventing ease of use for the cross-college co-taught class. This dynamic underscores the importance of advisors' efforts to advocate for students and their academic aspirations. Despite potential pushback, advisors persist in their mission to guide students toward their desired courses and programs, demonstrating their dedication to facilitating student success. The pushback can encourage a change of the rigid structures in place in higher education or push back on the programs progress. However, that is up to the stakeholders who are sustaining this program. Due to the lack of recorded knowledge on how to handle this type of course, advisors talk to each other and:

"...then we share it with the other ones because we're all trying to just get our students into what they need and want to for their degree. And so, I had lots of talks with an email conversation with [the program coordinator/faculty member] before ever meeting him in person asking if this class is reasonable? What do you mean by a specialization selective? Could this count? And those kinds of things."

The mention of pushback against rigid institutional norms highlights the potential for resistance to impede program progress or catalyze transformative change. However, the outcome ultimately hinges on the actions of stakeholders invested in sustaining the program.

Amidst this uncertainty, advisors emerge as crucial conduits of knowledge and support for students. Their collaborative approach, characterized by sharing insights and experiences with one another, exemplifies their dedication to ensuring students' academic needs are met in the face of institutional barriers. The reference to seeking clarification and guidance from program coordinators and faculty members shows advisors' proactive engagement in understanding and navigating evolving program requirements. In doing so, advisors not only facilitate students' academic journeys but also contribute to the ongoing development and adaptation of educational programs. Furthermore, advisors try:

“...to let students know about opportunities based off of the conversations they have, if they don't find the minor, sometimes our conversation leads to have you heard of this minor? And they're like, absolutely not. And that's exactly what they wanted to do. And it helps them find the job they wanted at the end. So, we do a lot of career advising, while also getting them through the majors that they've chosen to pursue.”

In doing so, advisors not only facilitate students' academic journeys but also contribute to the ongoing development and adaptation of educational programs. Furthermore, advisors play a crucial role in helping students recognize other opportunities outside of their disciplinary home. Skills that are fostered in the co-taught classes like communication and problem solving, are increasingly in demand across various industries, as they enable individuals to approach complex problems with creativity and adaptability. By introducing students to minors and courses focused on design and innovation, advisors broaden their career horizons and equip them with versatile skill sets that transcend disciplinary boundaries. As a result, students from multiple disciplines who possess these skills are well-positioned to pursue a wide range of career opportunities after college, spanning fields such as technology, business, healthcare, and beyond. Through proactive career advising and exposure to transdisciplinary opportunities, advisors empower students to leverage their unique strengths and interests to navigate the professional landscape successfully, ultimately enhancing their prospects for long-term career success and fulfillment. However, while advisors are there to help students, it can get a little difficult when there is a lot of turnovers and shifting of advisors as stated by this advisor:

“But is if an advisor can speak well to a minor and say like, oh, yeah, like, we're not going to add it right now. Or we can add it now. But we're not going to take that class until your junior year, at least, because that's when you'll have room for it. It keeps that door open. The problem is there is often a lot of turnover and a lot of information pushed at advisors. So, you can talk to every single advisor and next year, you're going to have 50% of those advisors be in a different area or a different major or the major changed. And now they have to refigure out how it fits in their major.”

However, while advisors are dedicated to assisting students, the frequent turnover and shifting of advisors can pose serious challenges. As highlighted by the advisor, the turnover rate within advising departments can lead to a loss of institutional knowledge and continuity in student

advising. When advisors transition out or move to different areas, they take with them valuable insights and familiarity with students' academic paths. This turnover can result in inconsistencies in advising approaches and a lack of continuity in students' academic planning.

Furthermore, new advisors may need time to familiarize themselves with the intricacies of co-taught courses and programs, potentially delaying students' progress or leading to missteps in course selection. Ultimately, the turnover of advisors underscores the importance of implementing strategies to mitigate its impact, such as robust training programs for new advisors and measures to promote continuity in advising practices across transitions. Additionally, the turnover challenges as well as the challenge with the registrar can impact educational initiatives in profound ways, as seen below:

“Advisors express ourselves quite often we have a love hate relationship with the registrar. And it's that same way back. They know we're frustrated with things. But there's certain things that they can't do either, because this system was bought by [the university] and we have to use it, so they know that this is an issue. But it isn't always a priority for them cause they're like, well, minors aren't required”.

The dynamics between advisors and the registrar underscore the complexities inherent in higher education administration. While advisors may encounter frustrations with the registrar's office due to limitations imposed by institutional systems and priorities, it is essential to acknowledge the potential impact of these challenges on educational initiatives. The quote emphasizes the inherent tensions within the advisor-registrar relationship, characterized by a "love-hate" dynamic stemming from divergent perspectives and priorities. However, rather than accepting these challenges as insurmountable obstacles, collaboration and dialogue between advisors and registrar personnel are crucial for effecting change and addressing systemic issues. By advocating for improvements in registrar processes and advocating for the needs of students and academic programs, advisors play a vital role in fostering institutional responsiveness and promoting student success.

Moreover, fostering constructive partnerships with registrar staff can lead to more effective solutions and a greater alignment between administrative processes and the educational mission of

the institution. To help the advisors navigate these institutional barriers, the faculty who is the point of contact for the program has asked advisors:

“What do advisors need to know? What do they need to know to help promote it to help tell students how to fit it in?” And so, I think I’ve tried to be a good liaison for that of, hey, this is how it’ll fit. I’ll put that in quickly, so, then advisors can physically see what that looks like, instead of oh, by the time they graduate, it’ll fit in there. And then they must remember that later. Because we’re very much one person at a time. Trying to help advisors have those conversations in their offices elsewhere on campus as well. But the word of mouth is honestly it’s more of I heard about this thing. And it sounds really cool.”

The active involvement of advisors in promoting and supporting educational programs is pivotal for their sustainability and effectiveness. The quote highlights the crucial role of faculty members as liaisons between advisors and program initiatives, facilitating communication and ensuring that advisors are equipped with the necessary information to effectively guide students. By soliciting input from advisors and providing them with clear guidelines and resources, faculty members contribute to streamlining the process of program promotion and implementation. Moreover, the emphasis on maintaining accurate and accessible record-keeping underscores the importance of institutional support structures in enhancing advisors' ability to assist students in navigating program requirements. Ultimately, fostering collaboration and communication between faculty, advisors, and program stakeholders is essential for ensuring the continued success and longevity of educational initiatives within the university environment. However, the advisors offer insight into what they think about working with students and other stakeholders in a cross-college co-teaching program for transdisciplinary. Overall, an advisor provides valuable insight into the challenges of implementing certain initiatives, highlighting the complexities and logistical hurdles that often lead to their eventual abandonment despite initial support and enthusiasm:

“I think we would look at you and say don’t, because there’s so many logistics of it. And most people aren’t willing to follow through with them, that it ends up on the scrap floor. Like I said, we’ve seen many things come through, and they had all the support behind them, and it was fantastic. And then nobody kept up with it or maintained it and it just kind of like shriveled down and we put all of this work in because it was expected of us to help the students, and nothing came of it and it just kind of went by the wayside...It’s been proven to the university, it doesn’t work. Not that all of them don’t work, but that’s our take on it.”

The sustainability of this program is crucial for ensuring its long-term effectiveness and impact on breaking down silos and teaching and learning in a new way. While the advisor's observation underscores the challenges and pitfalls that can derail initiatives, it also emphasizes the need for sustained effort and commitment to overcome these obstacles. To ensure the sustainability of the program, stakeholders must prioritize ongoing support and resource allocation, establish clear communication channels, and foster a culture of accountability and follow-through. By fostering a collaborative and proactive approach among all involved parties, the program can continue to evolve and adapt to meet the changing needs of students and the broader educational environment.

In the intricate landscape of university advising, a complex story is present, marked by challenges faced in the role advisors play in shaping students' academic journeys. Amongst the extensive course selections and program requirements, advisors serve as navigators, guiding students through higher education. However, within this dynamic environment, equity often remains elusive, with students' experiences heavily influenced by the knowledge and resources of their advisors. These heroes of academia traverse a terrain where institutional hierarchies and undocumented knowledge dictate the path to academic success. As administrators work with the intricacies of university policies and procedures, advisors are faced with the task of illuminating pathways to success while contending with the constraints of a bureaucratic system. While acknowledging the importance of these programs, advisors' express concerns about their sustainability and effectiveness, citing logistical challenges and a lack of follow-through as major obstacles. However, the sustainability of such programs is essential for breaking down silos and advancing teaching and learning and fostering innovation. Therefore, stakeholders must prioritize ongoing support, communication, and collaboration to ensure the continued success of these initiatives. Through collective efforts and a commitment to overcoming challenges, advisors and administrators can work together to foster an educational environment where all students can thrive and succeed.

4.3 The Main Characters

In this section, the focus shifts towards the faculty members who form the co-teaching teams, central figures in the narrative of cross-college co-teaching initiatives. These faculty members assume various roles within the collaborative teaching framework, each bringing their unique

expertise and perspectives to the classroom. The section delves into the intricacies of teacher roles, exploring how faculty navigate their responsibilities, collaborate with their counterparts, and engage with students across disciplinary boundaries. Furthermore, the discussion extends to highlight the institutional barriers that co-teachers encounter in their efforts to implement and sustain co-teaching practices. These barriers encompass a range of challenges, including administrative hurdles, resource constraints, and cultural resistance within academic departments. Additionally, a section addresses the issue of turnover, acknowledging the potential impact of personnel changes on the continuity and effectiveness of co-teaching initiatives. Despite these challenges, the co-teachers emerge as central protagonists in the narrative, driving the success and outcomes of the co-taught classes. Their collaborative efforts, innovative teaching approaches, and commitment to transdisciplinary learning serve as catalysts for transformative educational experiences. Moreover, the section explores the process of identifying suitable co-teachers, emphasizing the importance of selecting individuals who possess the necessary expertise, enthusiasm, and willingness to collaborate across disciplinary boundaries. Finally, the discussion touches upon the dynamics of co-teacher relationships, examining how communication, trust, and shared goals contribute to the success of collaborative teaching endeavors. Overall, the section paints a comprehensive picture of the critical role that co-teachers play in shaping the landscape of cross-college co-teaching, underscoring their importance as the main characters driving the narrative forward in this case study.

4.3.1 Teacher Roles

The dynamics of teacher roles in the classroom may be more straightforward when examining the traditional setup of one teacher leading a group of students. However, in the context of cross-college co-teaching instructor roles become more intricate as educators seamlessly blend their teaching approaches with one another. This collaboration in teaching emerges as a cornerstone for innovation and growth, extending from faculty to students. The notion that collaboration fosters innovation and growth is central to the concept of cross-college co-teaching, where two distinct perspectives converge to transcend disciplinary boundaries. As one faculty member aptly puts it:

“we're attacking the teaching from two different viewpoints...it's not just one person telling you this is the truth; you've got two people”

Cross-college co-teaching brings different viewpoints as two individuals from different disciplinary backgrounds are working together to deliver instruction. This collaborative spirit infuses the classroom with a dynamic energy, where divergent ideas intersect and new pathways to understanding and discovery emerge. Teachers' roles in this program are paving the way for a new pedagogical approach which is pivotal in the success of the delivery of the information. At the core of cross-college co-teaching for transdisciplinary education is the fusion of expertise and perspectives. It's not merely about conveying information but rather about engaging students in a multifaceted exploration of ideas that provide multiple perspectives, therefore the instructors themselves need to be open to multiple and opposing perspectives. As observed within the Prototyping Technology for People: Making Decisions & Thinking Strategically classroom, both instructors will approach an answer differently sometimes, however they ultimately end up at the same conclusion when working with the student(s). They come from two different disciplinary backgrounds and will approach the question differently but help the students arrive at an answer that falls in line with a transdisciplinary perspective. This sentiment is echoed by another faculty member who emphasizes that co-teaching thrives when instructors possess enough common ground to converse effectively yet retain enough differences to offer unique insights:

“there's that kind of stuff I mean I think with co teaching is at its best it's when people have enough in common that they could talk to each other, but different enough that they see, they come at a problem slightly differently”

As this faculty member suggests, the ideal co-teaching dynamic strikes a balance between shared understanding and individual perspective. It's not about always being agreeable or constantly engaging in arguments; rather, it's about cultivating an environment where educators are open to learning, listening, and questioning. Such qualities can prove immensely beneficial to students, the program, and the faculty involved. In collaborative settings like cross-college co-teaching, the ability to share ideas and work through disagreements is essential. It is through this exchange of diverse viewpoints that innovation and growth are fostered, ultimately enriching the educational

experience for all stakeholders. Furthermore, the benefits of that approach as identified by administration are that:

“You get points of view that you would not get exposed to, both from instructors, and from peers, you learn about things in different ways than you would have approached them otherwise, that, that if you're learning about economics from a management person, then you're going to get a different flavor if you're learning about economics from an anthropologist, because they approach the problem from a different point of view, and that different perspective, provides value for the student. It also allows them opportunities to innovate, or to explore new ideas that they wouldn't have had.”

The benefits of such an approach are manifold. Students are afforded a rare opportunity to witness firsthand the synergy of transdisciplinary collaboration and are exposed to perspectives they might not encounter otherwise, enriching their learning experience. Whether learning economics from a business expert or an anthropologist, students gain unique insights that broaden their understanding of the subject matter that meets at an intersection of disciplinary concepts. This exposure not only enhances their academic growth but also cultivates critical thinking and innovation. By embracing diverse perspectives, students are empowered to explore new ideas and approaches, ultimately preparing them for the challenges of the workforce and the world.

Moreover, the collaborative environment fosters creativity and innovation, empowering students to explore new ideas and approaches to problem-solving as another administrator identified:

“I see the benefits of a program like this as offering students a unique look into how to solve problems but not just from one perspective that something is born out of co-working that happens between instructors in a classroom setting”.

The quote shows how the collaborative teaching environment can shape students' problem-solving skills by demonstrating the importance of working in a team with diverse people. It emphasizes the value of exposing learners to diverse approaches, not merely from one instructor's standpoint but through the collective efforts of a team. The collective effort to bring students education that demonstrates the potential of working together is at the forefront of this cross-college co-teaching

initiative. This collaborative spirit extends beyond the classroom, permeating curriculum development and instructional strategies. By immersing students in such an environment, they gain insights into varied problem-solving methodologies. Through cross-college co-teaching, students are not confined to singular viewpoints but are instead equipped with the adaptability and creativity necessary to navigate the complexities of the modern workforce and global challenges. Teaching students through co-teaching across disciplines is the future for education, however not every class will have the need to be co-taught. Disciplinary expertise is important, however connections between disciplines are very necessary. Practically nothing can be solved within one discipline, therefore educational initiatives such as this can pave the way for higher education adapting for the demands of the workforce. Furthermore, here are recognized benefits and challenges when it comes to cross-college co-teaching and one faculty member stated that:

“I think having two teachers creates more like a moral welcoming learning environment. For everyone. Because [the students] may have more of a passion to one or the other. Yet, they're not scared away, right? Just the topics in themselves, I just think that it creates a more welcoming environment where more students can be attracted to what is going on in the classroom.”

The quote emphasizes the inclusive and welcoming atmosphere fostered by co-teaching across disciplines, highlighting its potential to attract a broader range of students to academic transdisciplinary discourse. The collaborative effort of multiple educators creates a nurturing environment where students feel empowered to engage with diverse perspectives without fear or intimidation, however, as seen in the observations there is not always this perfect synergy of disciplines especially when the co-teaching faculty is shifting. This sentiment was echoed in the classroom observations where students were engaging with material that was outside of their disciplinary background. Through initiatives like cross-college co-teaching, educational institutions can proactively adapt to the evolving needs of students and the workforce, ensuring that graduates are equipped with the skills and mindset necessary to thrive in an interconnected world. However, while preparing students and advancing education sounds good, the journey of co-teaching is not without its challenges. Potential conflicts within departments and the need for alignment between co-teachers underscore the importance of effective communication and mutual respect, as depicted from a faculty member who said:

“The downside is potential conflicts within departments. I think another potential issue could be that the co-teachers are not on the same page. Okay. And, you know, it can't even when [co-teacher] and I started working together we were just like, trying to figure out, not even how to dance, but do we really want to dance.”

When cross-college co-teaching is implemented, potential conflicts within departments may arise, emphasizing the necessity for clear communication and alignment between co-teachers and their respective department heads. Departments may find themselves grappling with issues of territoriality or differences in teaching philosophies, which can impede collaboration and cohesion. However, as observed when implementing cross-college co-teaching, when one faculty member is new and does not have experience co-teaching, the faculty members are not “dancing”, they are still practicing, and do not quite have the blending if disciplines aligned where they are co-teaching for transdisciplinarity.

Furthermore, faculty identified the potential for conflicts arising from differing perspectives or objectives between co-teachers, which can be from different understandings of things such as the driving philosophy. In this instance, the notion of teaching and learning in a new way needs to be a concept that has a shared understanding among co-teachers, which as observed is not always the case when it comes to the implementation of the concepts. That highlights the need for professional development opportunities for new and experienced co-teachers. As quoted above, a faculty member reflects on their experience, highlighting the initial uncertainty and negotiation required to establish effective collaboration. The quote highlights the importance of proactive communication and mutual respect in navigating potential conflicts and fostering successful cross-disciplinary partnerships on the department level and co-teacher level. However, as faculty members attest, the rewards far outweigh the obstacles. Co-teaching cultivates a sense of inclusivity and belonging, creating a welcoming environment where students feel empowered to engage with diverse perspectives as seen here:

“We balance each other out. I don't know something I can ask him. And if he doesn't know something, you ask me, and we play to our strengths a little bit. And we work with the students together. And then, you know, there's a lot of things I learned that I had no idea about, and would never learn, probably until we did that.”

The role of collaboration and support in navigating challenges in higher education and maximizing the benefits of cross-college co-teaching is crucial to having transdisciplinary ventures be successful. As faculty members deepen their partnerships, they increasingly appreciate the invaluable support of having another educator to rely on, particularly when co-teaching classes that merge disciplinary perspectives. Both instructors engage with the language and concepts of the respective disciplines, making it beneficial to turn to the expert in each field, especially considering that faculty members are also engaged in a continual learning process. This highlights the necessity for disciplinary expertise, once again emphasizing the idea that disciplinary expertise is important, however there is a need to dismantle disciplinary silos and promote collaboration across academic units. The quote demonstrates how co-teachers complement each other's strengths and knowledge gaps, fostering a symbiotic relationship that enhances both teaching and learning experiences. As observed, the co-teacher in Prototyping Technology for People: Making Decisions & Thinking Strategically, one from business and one from engineering/technology can teach lessons that do not match their respective disciplines. The business teacher has taught students how to 3D model, and the engineering/technology teacher has taught students about market analysis. This dynamic has been fostered through co-teaching across many semesters and working together to learn from each other and understanding what the other discipline can bring to enhance the other, creating a harmony of ideas that merge to create authentic learning experiences for students. By pooling their expertise and working together, educators not only provide students with a more comprehensive understanding of the subject matter but also foster an environment of mutual learning and growth. As one faculty member mentioned:

“I love having somebody else there to work from”

The quote shows the recognition among co-teachers of the importance of collaborating with faculty members from diverse disciplines to facilitate classes aimed at breaking down disciplinary silos. Co-teaching is advancing higher education and can create a network of individuals who want to provide meaningful learning experiences to students. The co-teachers provide each other with the inspiration of having someone else to work from, depicting the benefit of collaboration right in front of the students' eyes. While transdisciplinarity can work with co-teachers who have experience teaching, and experience teaching with each other, there might be instances where

transdisciplinarity is claimed but is not achieved. For example, some classes may claim to transcend disciplines, they may not necessitate collaboration among experts from different fields to offer a comprehensive exploration beyond superficial engagement with multiple disciplines. Another faculty had mentioned:

“You learn each other's parts, like so the collaboration is done now you're approved teachers, you do the whole thing. And I kind of want to say like a little more strongly like, the sum is greater than the parts that can be done logistically, but it will not be the same learning experience. And I don't think the students get the same thing out of it, there is a real difference. When you're there together, having those conversations, doing it, you know, kind of covering the material”

This faculty member explained that the learning experience derived from cross-college collaboration is more beneficial than two individuals teaching similar concepts but only coming from one disciplinary background. This driving force behind co-teaching is bringing the two experts together and teaching at the discipline's convergence point, and the sum that arises from the collaboration is greater than either one of the teachers instructing on their own. Co-teaching embodies collaboration and mutual respect, as educators continue to explore innovative pedagogical approaches, co-teaching stands as a shining example of the transformative power of collaboration in higher education. Even advisors recognize the work it takes from faculty to keep cross-college co-teaching going as the advisors are in communication with the faculty to better understand the rules and exceptions around students getting into classes run by the M3 program. An advisor had mentioned:

“I had lots of talks with an email conversation with [a faculty member] before ever meeting him in person around “Is this class reasonable? What do you mean by a specialization selective? Could this count? He's really good about staying on top of emails and emailing back immediately. And I will say that's probably the best part about the minor is that he's very active with it. Which will give some accountability to the minor because if we can't get an answer, then students kind of give up on it because it's not a requirement.”

The dialogue displays the integral role of a faculty member in facilitating communication and maintaining the vitality of the minor program. Beyond co-teaching duties, this faculty member

serves as a crucial liaison, engaging in ongoing communication to address various inquiries regarding course content, eligibility criteria, and the importance of specialization electives. Their proactive approach to promptly responding to emails demonstrates a commendable dedication to ensuring the accessibility and clarity of the minor program. In essence, the instructor's responsiveness not only fosters accountability within the minor but also mitigates the risk of student disengagement due to unresolved queries, thereby upholding the program's relevance and importance. Given the institutional complexities that complicate cross-college collaboration, this faculty member's commitment to open communication becomes even more vital, serving as a linchpin in navigating administrative hurdles and fostering a conducive learning environment across academic domains.

Furthermore, the general responsibility of the minor falls on this faculty member because the minor is technically housed within that respective college. Once again, the institution's structure is not set up to create a minor shared between three different academic units. This limitation has had faculty that will take a step back in the sense that they said:

“I’ve always taken the copilot seat and said, you this is your course you drive it. I will participate however you need me”

The statement emphasizes a collaborative approach to co-teaching, wherein one participant assumes a supportive role, offering guidance and assistance while allowing the primary instructor to maintain control over the course's direction. This dynamic underscores the importance of finding individuals who are willing to collaborate and blend their respective expertise to cultivate a genuinely transdisciplinary learning environment. Indeed, co-teaching partnerships thrive when there is a mutual understanding of shared responsibility and a commitment to leveraging diverse perspectives for the benefit of student learning. In a transdisciplinary setting, such collaboration becomes even more essential, as it allows for the seamless integration of multiple disciplines, enriching the educational experience and fostering holistic understanding. Thus, fostering a culture of collaboration and shared ownership among co-teaching teams is essential for creating dynamic and impactful learning environments that transcend disciplinary boundaries. However, this relates to the driving philosophy, a deep understanding of the transformation that the M3 program is working to foster needs to be realized for true participation in these initiatives. However, after

some time co-teaching, there is a sense of mutual respect that is achieved and a real collaborative relationship that forms from teachers working together for a shared goal:

“We reached sort of a different place; I think there was respect there. And there was a lot of talk even from the beginning do tech education and ethnography go together well? I feel like now we really enact that in the classroom. Sometimes we taught each other's parts and I feel comfortable about like, what we would each say, and that it would be imbued with the values that that came from this long-standing collaboration. So, I think students see and feel that, and are interested in that.”

Over time, as co-teachers collaborate, a sense of mutual respect develops, fostering a genuine partnership driven by a shared commitment to a common goal. As reflected in the evolving dynamics of the co-teaching relationship, initial questions regarding the compatibility of engineering/technology education and anthropology give way to a nuanced understanding and effective implementation within the classroom. Through ongoing dialogue and collaboration, co-teachers not only learn from one another but also gain confidence in each other's expertise. This mutual trust enables them to seamlessly integrate their perspectives, ensuring that each aspect of the curriculum reflects the values and principles derived from their collaborative efforts. Students, in turn, witness and experience the depth of this collaboration, discerning the authenticity and sincerity imbued within the classroom environment. They are drawn to the palpable synergy between co-teachers, recognizing the richness that emerges from their long-standing partnership. Consequently, students are more inclined to engage actively in the learning process, inspired by the genuine exchange of ideas and the embodiment of shared values within the educational context.

In higher education, collaboration between faculty members and across disciplines is essential for innovation and academic growth. Cross-college co-teaching exemplifies this principle, where educators merge diverse perspectives to transcend disciplinary boundaries. This collaborative spirit injects classrooms with dynamic energy, fostering the emergence of new pathways to understanding and discovery. The success of such initiatives hinges on a shared commitment to the program's transformative goals, leading to a genuine partnership between co-teachers. Over time, mutual respect is cultivated, allowing for seamless integration of perspectives and values. Students benefit from this collaboration, experiencing a rich learning environment where diverse viewpoints are embraced, and authenticity is palpable. Despite challenges such as

departmental conflicts or differing teaching philosophies, effective communication and mutual respect are vital for navigating these obstacles. These passages exemplify the need for co-teachers to understand each other, and their shared goals for class echoing the need for professional development. Furthermore, the idea arises of a program coordinator who can stay in communication with administration such as department heads, and advisors rather than adding that to a faculty members pre-existing responsibilities. Through cross-college co-teaching, students gain insights into varied problem-solving methodologies, fostering adaptability and innovation. However, achieving transdisciplinary goals requires a deep understanding of the program's philosophy and ongoing collaboration. The responsibility often falls on faculty members to maintain program vitality and facilitate communication, showcasing the importance of their commitment. Ultimately, co-teaching embodies collaboration and mutual respect, offering students authentic learning experiences that prepare them for the complexities of the modern world, therefore the instructors understanding the role they play is vital for the program's success..

4.3.2 Institutional Barriers for Co-teaching

Navigating the intricacies of higher education involves confronting barriers, and one such hurdle lies in the intricate relationship between faculty members and institutional structures. The example of a semester abruptly halted due to advisor misguidance underscores the critical importance of effective communication between faculty and advisors. This disconnect not only disrupts course enrollments but also highlights the necessity for advisors to be well-informed about course offerings and their alignment with student interests. As faculty members strive to deliver quality education and support students' academic journeys, addressing these communication gaps becomes important for the delivery of educational initiatives that meet both institutional goals and student needs. Furthermore, the challenge of promoting the Scholarship of Teaching and Learning (SoTL) within the realm of tenure and promotion reflects a broader institutional imbalance in prioritizing research over innovative pedagogy. Despite the recognized value of teaching and learning, the emphasis on research-focused initiatives often sidelines efforts to enhance teaching practices. This discrepancy prompts a reevaluation of the purpose of higher education and calls for a more balanced approach that values both research and innovative pedagogy. Embracing co-teaching and co-learning experiences not only revitalizes the educational experience but also equips students with the skills needed to thrive in a rapidly changing world. However, logistical

complexities in scheduling and coordinating courses across departments pose additional challenges, requiring strategic planning and collaboration to ensure program integrity while accommodating diverse student needs and preferences. By addressing these barriers and fostering a culture of collaboration and innovation, faculty members can navigate the complexities of higher education more effectively, ultimately enhancing student engagement, learning outcomes, and institutional success. This following excerpt highlights a barrier encountered by faculty member:

“The biggest most glaring example was how advisors fit into all of this, where this is my second semester teaching with [the co-teacher]. But it should have been my third because I'm missing one in there because...there was a semester that got shut down because I had zero students from my side. And I didn't know why I had no students because I had students in the first round, and then all of a sudden, they were all gone. It took some investigative work to realize nope the advisors just didn't know what to do with us so they told people do not take it because this will ruin your plan of study. But they made that decision on their own because they were operating without enough information or connection to us. But that was a barrier that we ran into face first.”

Navigating these barriers is crucial for the teachers involved in the program as it directly impacts their ability to deliver quality education and support students' academic journeys effectively. The example highlighted shows the implications of inadequate communication between faculty and advisors on course enrollment and program success. When advisors lack comprehensive information about course offerings and their relevance to student interests, they inadvertently hinder students' access to valuable learning opportunities. This not only compromises the integrity of the academic experience but also reflects a systemic disconnect that can impede students' academic progress and engagement. Therefore, by addressing these communication gaps and fostering a collaborative relationship between faculty and advisors, teachers can better serve their students and ensure the seamless delivery of educational initiatives that align with institutional goals and student needs.

However, the faculty involved within the M3 program will be responsible for keeping up the relationships and their existing responsibilities. Furthermore, a faculty member delves into the challenge of promoting the Scholarship of Teaching and Learning within the context of tenure and promotion. Despite the recognized value of teaching and learning, it often takes a backseat to

research-focused initiatives in the academic hierarchy. This discrepancy raises questions about the institutional priorities and the broader purpose of higher education, emphasizing the need for a more balanced approach that values both research and innovative pedagogy.

“Understanding better the Scholarship of Teaching and Learning, when it goes to promotion, tenure and merit ...I'm not saying don't take the focus away from research that's why we have all the buildings and things on campus that we can use, just using it better...thinking back to the barriers is always going back to what's the purpose of higher education today? That's still a barrier. Because less people will see the purpose of higher education. Just to go in and learn about entrepreneurship in a class I could pull up a video and watch that I really wanted to, but having these different opportunities for innovation is something they won't get other places or being in a room with co teaching and co-learning happening.”

Bringing value back into the classroom through co-teaching is essential for revitalizing the educational experience and addressing the evolving needs of students in higher education. As the quote highlights, there is a growing recognition of the importance of innovative pedagogy, such as the Scholarship of Teaching and Learning (SoTL), alongside traditional research-focused initiatives. While research undoubtedly holds importance in academia, the emphasis on innovative teaching practices is equally critical in preparing students for the complexities of the modern world. By integrating co-teaching and co-learning experiences into the curriculum, educators can create dynamic learning environments that foster critical thinking, problem-solving, and transdisciplinary collaboration. These experiences offer students unique opportunities for hands-on learning, real-world application of concepts, and exposure to diverse perspectives, which are essential for cultivating well-rounded, adaptable graduates.

Thus, embracing co-teaching as a means to enhance the value proposition of higher education not only enriches the academic experience but also equips students with the skills and knowledge needed to thrive in an ever-changing global landscape. Another crucial barrier lies in the logistical complexities of scheduling and coordinating courses across departments. Conflicting priorities and rigid scheduling constraints hinder the seamless delivery of interdisciplinary programs, exacerbating the challenge of meeting student needs and preferences. In the face of these administrative hurdles, faculty members grapple with the delicate balance of accommodating diverse schedules while maintaining academic standards and program integrity:

“The biggest barrier is trying to figure out the classroom size, and the availability and how they all coincide to then even provide it to a student. And then we find out on the back in that we only have three people enrolled because it conflicts with a major course...now we have to move it well then, it's not great time for another course or not great time for a faculty member or something like that. So, there's a lot of competing priorities and it just kind of depends on where it falls on everyone's priority list...And then are there multiple people that can teach those? Or is it just that person, so I think those competing pieces. It's really hard to have the flexibility needed for students' schedules...It just gets more complicated the bigger group gets, the harder it is to collaborate with things a lot of times and so I think that's I think that would be my biggest barrier.”

The complexities of scheduling and classroom logistics emerge as a barrier for faculty members seeking to deliver transdisciplinary programs effectively. As stated in the quote, the dance of aligning classroom size, availability, and course offerings poses a challenge in accommodating student needs and preferences. The conflicting priorities among faculty members further complicates the situation, with different instructors balancing varied commitments and schedules. Moreover, the inflexibility inherent in the scheduling process exacerbates the problem, making it difficult to find optimal timeslots that cater to diverse student schedules and academic requirements. This administrative conundrum is compounded by the sheer volume of stakeholders involved, making collaboration and coordination increasingly cumbersome. Consequently, the quest for a harmonious scheduling solution becomes a delicate balancing act, requiring meticulous planning and negotiation to ensure that all parties' needs are met while upholding program integrity and academic standards. In essence, addressing these administrative hurdles is paramount to fostering a conducive learning environment that prioritizes student accessibility, engagement, and success.

Overall, in the complicated landscape of higher education, faculty members encounter multifaceted barriers that pose serious challenges to the delivery of quality education and the fulfillment of students' academic needs. From miscommunications between faculty and advisors leading to enrollment disruptions to the struggle of promoting innovative pedagogy within tenure and promotion, these barriers highlight the need of fostering effective collaboration, communication, and adaptability within academic institutions. Moreover, logistical complexities in scheduling and coordinating cross-college co-teaching programs further complicate the landscape, highlighting the need for strategic planning and coordination to ensure seamless

program delivery. Despite these challenges, embracing innovative teaching practices, such as co-teaching, and advocating for a balanced approach to academic priorities can revitalize the educational experience and better prepare students for success. By addressing these barriers head-on and fostering a culture of collaboration and innovation, faculty members can navigate the complexities of higher education more effectively, ultimately enhancing student engagement, learning outcomes, and institutional success.

4.3.3 Turnover

In higher education, faculty members often find themselves navigating shifts in roles and responsibilities, particularly amidst changes in institutional leadership. The recent influx of new administrative personnel, including a new president, provosts, and deans, has underscored the pressing need for ongoing alignment with institutional values and priorities. As highlighted by a faculty member's observation below, these transitions can introduce challenges in maintaining continuity and advocating for the importance of programs like M3, especially when confronted with evolving value structures within the institution. In response to the recurrent cycles of turnover, there emerges a criticality to continually update stakeholders on the importance and objectives of cross-college co-teaching initiatives. Additionally, as evidenced by recent faculty shifts, sudden changes in instructional roles can present serious challenges to program continuity and effectiveness. The unforeseen promotion of an engineering/technology instructor to department head, for instance, necessitated swift adaptations within the co-teaching framework. Such scenarios show the importance of planning and faculty development initiatives to navigate transitions effectively and preserve the authenticity of transdisciplinary learning experiences. In essence, the landscape of higher education demands a proactive stance towards program advocacy and strategic planning to navigate turnover and leadership transitions. By fostering a culture of advocacy and ensuring ongoing communication with incoming leadership, institutions can safeguard the integrity and effectiveness of cross-college co-teaching initiatives, ultimately contributing to the enduring success of transdisciplinary learning experiences. Therefore, the arrival of new administrative personnel may introduce further changes to institutional dynamics as the faculty member pointed out in the following quote:

“We have a brand-new president; we have a brand-new provost. We have multiple, my college has a brand-new dean. There's such a turnover right now. And there are seasons of turnover. But now you have to update everyone on what this thing is that we're doing? And there may not be the same value structure as there was before.”

Amidst the backdrop of extensive turnover, as articulated by the recent influx of new leadership personnel, including a fresh president, new provosts, and deans across the colleges, there emerges a pressing need to ensure ongoing alignment with institutional values and priorities. The nature of turnover cycles necessitates continual updates to stakeholders regarding the importance and objectives of programs like M3.

Moreover, the shifting value structures within the institution underscore the importance of preserving the integrity and relevance of co-teaching initiatives. Establishing a dedicated liaison for the program, distinct from the co-teaching instructors, could serve as a vital conduit for maintaining relationships and advocating for the sustained importance of collaborative pedagogy in the evolving academic landscape. That idea can help as a faculty member had suggested that to continually show the importance of the cross-college co-teaching:

“If you made your agreement with the previous Dean and a new dean comes in, at least they have a paper trail to say, this is a great program. It's working. The students love it. We get good job placement for graduates. I think that it's important to avoid that turnover problem not just with your dean's and you know, leaders but like you said administrative staff to know what the past dean did when they tried to work out their finances and where they put their money”.

The establishment of a dedicated liaison for cross-college co-teaching programs, separate from the teaching faculty, emerges as a strategic solution to navigate the challenges posed by turnover and administrative transitions. This liaison would play a pivotal role in preserving institutional memory and advocating for the sustained relevance of collaborative pedagogy amidst evolving academic landscapes. By maintaining a comprehensive paper trail documenting program success, such as student satisfaction and job placement rates, the liaison ensures continuity and facilitates communication with incoming leadership. This proactive approach not only mitigates the turnover problem but also fosters a culture of transparency and accountability, enabling cross-college co-teaching initiatives to thrive and flourish in the face of organizational change.

“I must continuously and continually advocate for this thing that we're doing. And if there's changes of leadership that I must advocate, again, for new people who weren't there at the beginning of the conversation to say, no, this is a thing that we're doing. This is the thing that matters. It's important. It's part of a grant. It has benefits and institutional knowledge is lost as people move on”.

In essence, sustaining cross-college co-teaching initiatives requires ongoing advocacy and dedication from all stakeholders, especially amidst changes in leadership. As emphasized by the need to continuously advocate for the program's importance and benefits, it becomes increasingly crucial to preserve institutional knowledge and maintain momentum, even as individuals transition within the organization. By fostering a culture of advocacy and ensuring that the value of these initiatives is communicated effectively to new leadership, we not only safeguard against the turnover problem but also affirm the importance of collaborative pedagogy in driving positive educational outcomes. This proactive stance ensures that cross-college co-teaching initiatives not only endure but thrive, contributing to the dynamic evolution of higher education in an ever-changing landscape.

Furthermore, as this program has seen, one of the engineering/technology instructors who was co-teaching with an anthropologist, was promoted to department head during the summertime, shifting the dynamic of the co-taught class for the fall semester. The promotion occurred late in the summer, not leaving much opportunity to train a new faculty member with an engineering/technology background. Therefore, in place of finding an engineering/technology faculty member with disciplinary expertise, the program hired a graduate student with a background in design. While the graduate student brought valuable expertise in design, they lacked experience in teaching and had not undergone professional development to clarify their role and expectations within the co-teaching framework. As administrators pondered the logistics of faculty changes, the question arose:

“Okay, what do you do with the class? Do you cancel it? Do you throw someone else in there? And you can't really throw someone else in there without some understanding of where everybody lies in the thing.”

Cancelling the class or hastily substituting instructors without a comprehensive understanding of the program's objectives and dynamics could undermine the integrity of the transdisciplinary

learning experience. Furthermore, the sudden need for last-minute replacements due to faculty role shifts could result in instructors lacking the established relationships necessary to foster genuine collaboration in a transdisciplinary setting. In such scenarios, maintaining the authenticity and effectiveness of co-teaching becomes increasingly challenging, highlighting the importance of strategic planning and faculty development initiatives to mitigate the impact of turnover on program continuity and quality. Amidst the backdrop of extensive turnover and the recent influx of new leadership personnel, including a fresh president, new provosts, and deans across the colleges, there emerges a pressing need to ensure ongoing alignment with institutional values and priorities. The nature of turnover cycles necessitates continual updates to stakeholders regarding the importance and objectives of programs like M3. Moreover, the shifting value structures within the institution underscore the importance of preserving the integrity and relevance of co-teaching initiatives. To fortify this endeavor, establishing a dedicated liaison for the program, distinct from the co-teaching instructors, could serve as a vital conduit for maintaining relationships and advocating for the sustained importance of collaborative pedagogy in the evolving academic landscape. As one faculty member aptly stated, this advocacy is essential to continually emphasize the importance of cross-college co-teaching initiatives, especially in the face of leadership changes and shifting priorities within the institution. This proactive approach not only mitigates the turnover problem but also fosters a culture of transparency and accountability, enabling cross-college co-teaching initiatives to thrive and flourish in the face of organizational change. However, as evidenced by recent faculty shifts, sudden changes in instructional roles can pose serious challenges to program continuity and effectiveness. Strategic planning and faculty development initiatives are essential to navigate such transitions effectively, ensuring that the authenticity and effectiveness of co-teaching are preserved, ultimately contributing to the ongoing success of transdisciplinary learning experiences.

4.3.4 Finding the Teachers

The essence of successful cross-college co-teaching lies in the ability to identify dedicated faculty members who are not only willing to collaborate but also committed to investing extra time in crafting meaningful learning experiences that transcend disciplinary boundaries. This pursuit presents both challenges and opportunities, as faculty must be willing to step outside their comfort zones and embrace innovative teaching methods to achieve true transdisciplinarity. However,

complacency with existing teaching loads and styles often serves as a barrier to finding such educators who are eager to explore intersections and blend disciplinary knowledge effectively. The faculty engaged in the M3 program exemplify this dedication, investing considerable time and effort into collaborative planning to ensure a seamless integration of diverse expertise. This collaborative spirit extends to the development of course materials, where meticulous consideration is given to the progression of content, aiming to seamlessly blend disciplinary knowledge in a logical and cohesive manner. Therefore, the success of cross-college co-teaching hinges on the recruitment and cultivation of educators who are not only passionate about their subject matter but also enthusiastic about the transformative potential of transdisciplinary collaboration. Administration recognized that:

“You've got to find the faculty that works with a course that's willing to somehow, expand it and be open to the opportunity to give a little bit, to take on a little bit more. You got to find somebody that is willing to do that and not afraid to take that chance, or risk themselves, because to co-teach undergraduate courses, you got to find somebody that has control over a course that makes sense for integration and motivated to take the extra time because it's, they're going to be taking their time out of their day to sit down and work with somebody and then be willing to go stand up in front of students together every you know, every time the class meets and work on that.”

Identifying educators who are willing to go above and beyond their regular teaching duties is essential for the success of cross-college co-teaching initiatives. As emphasized by the administration, finding faculty members who are not only open to expanding their courses but also eager to embrace the challenges and opportunities of transdisciplinary collaboration is crucial. Such educators must be willing to invest additional time and effort into collaborative planning and instruction, showing a commitment to the shared goal of enhancing the students' learning experience. As seen in the co-teaching material that was analyzed, the co-teachers have integrated their ideas to combine both of their disciplines as seen below for the Prototyping Technology for People: Making Decisions & Thinking Strategically learning objectives:

1. *Recognize biases in how people process information, conducting user tests and interviews to gain insights from prototypes to make business development decisions*

2. *Engage in decision-making strategies to develop prototypes in a variety of media (digital and/or physical) for the appropriate level of fidelity necessary to communicate, understand, and test innovative ideas*
3. *Select and use appropriate methods/tools/equipment/software to make decisions and prototype innovative ideas*
4. *Pitch a viable solution for a validated problem to a variety of potential investors and/or stakeholders.*

The learning objectives outlined for the Prototyping Technology for People: Making Decisions & Thinking Strategically course exemplify the integration of engineering/technology and business concepts, showcasing a fusion of both disciplines. Firstly, the objective to recognize biases in information processing and conduct user tests and interviews demonstrates an understanding of human-centered design principles, a core aspect of engineering, while also emphasizing the importance of market research and user feedback in making informed business decisions. Additionally, engaging in decision-making strategies to develop prototypes in various media reflects the intersection of engineering design principles with business development strategies, highlighting the need for transdisciplinary collaboration to create innovative solutions. Moreover, the selection and utilization of appropriate methods, tools, and software underscores the integration of technical skills with business acumen, demonstrating the practical application of both disciplines in problem-solving and innovation. Lastly, pitching a viable solution to potential investors and stakeholders showcases the culmination of engineering/technology and business ideas, emphasizing the importance of effectively communicating the value proposition of a product or service in the marketplace. Overall, these learning objectives exemplify how the Prototyping Technology for People: Making Decisions & Thinking Strategically course integrates engineering/technology and business concepts to prepare students for real-world challenges and opportunities in the innovation landscape. Furthermore, for Designing Technology for People: Anthropological Approaches, their learning objectives are as follows:

1. *Identify opportunities for innovation that emerge from ethnographic studies and divergent thinking approaches to design.*

2. *Cooperatively (diverse design team) engage in the engineering design process to solve open-ended, ill-defined problems with people whose views may differ from their own.*
3. *Demonstrate teamwork skills, use ethical decision-making, apply critical thinking skills, and demonstrate the ability to apply knowledge in real-world settings.*
4. *Communicate clearly (orally, in writing, and via other forms of documentation) the design process using an electronic engineer's notebook and presenting final design solutions using drawings and digital presentation techniques.*

The learning objectives outlined for the Designing Technology for People: Anthropological Approaches course show the combination of engineering/technology and anthropology, depicting the transdisciplinary nature of the curriculum. Firstly, the objective to identify opportunities for innovation through ethnographic studies underscores the integration of anthropological research methods with engineering design principles, emphasizing the importance of understanding human behavior and culture in developing technological solutions. This reflects a collaborative approach that draws upon anthropological insights to inform the design process, resulting in solutions that are culturally sensitive and responsive to diverse user needs. Additionally, the emphasis on cooperative engagement in the engineering design process with diverse teams reflects the integration of anthropological perspectives on inclusivity and diversity, fostering collaboration among individuals with varying viewpoints and backgrounds. Furthermore, the demonstration of teamwork skills, ethical decision-making, and critical thinking underscores the application of anthropological principles in real-world settings, where social and cultural considerations are integral to the design process. Finally, clear communication of the design process and solutions using various documentation methods highlights the importance of effectively conveying technical information to diverse audiences, showcasing the intersection of engineering/technology with anthropological principles of communication and interpretation. Overall, these learning objectives demonstrate how the Designing Technology for People: Anthropological Approaches integrates engineering/technology and anthropology to prepare students for holistic problem-solving and innovation in diverse cultural contexts.

The successful implementation of cross-college co-teaching initiatives relies heavily on the dedication and collaboration of educators who are willing to go beyond their typical teaching roles.

Administrators emphasize the importance of finding faculty members who are not only open to expanding their courses but also enthusiastic about embracing the challenges and opportunities of transdisciplinary collaboration. Such educators must invest additional time and effort into collaborative planning and instruction, demonstrating a commitment to enhancing students' learning experiences. The analyzed co-teaching material for Prototyping Technology for People: Making Decisions & Thinking Strategically, reveals how educators integrate engineering/technology and business concepts, exemplified by learning objectives focused on recognizing biases in information processing, developing prototypes, selecting appropriate methods, and pitching viable solutions. These objectives showcase a fusion of both disciplines, highlighting the necessity of transdisciplinary collaboration to create innovative solutions that address real-world challenges. Similarly, for Designing Technology for People: Anthropological Approaches, learning objectives emphasize the integration of engineering/technology and anthropology, demonstrating the importance of understanding human behavior and culture in technological design. These objectives underscore the need for collaboration among diverse teams to solve complex problems, integrating anthropological perspectives on inclusivity and diversity into the engineering design process. Overall, the integration of diverse disciplines in co-teaching initiatives prepares students for holistic problem-solving and innovation in real-world contexts, emphasizing the importance of finding educators willing to collaborate and make transdisciplinary classes a reality. As articulated in the quote to follow, the process of co-teaching requires all parties involved to make decisions and compromises, which can entail additional labor. However, despite the potential challenges, the speaker emphasizes that the experience of co-teaching has been remarkably enriching.

“We need to all make decisions and compromises. And that could be something that creates extra labor that people might not want to engage in. But from my own perspective, I have found it to be far more enriching than anything else.... We think differently, we might talk about things differently, but I haven't found that to be a problem in the classroom. Rather, I think, like we both been able to talk about things from our perspective and like we're respectful of one another. And I think for students, they get to hear more diverse perspectives even though, it's only two but still, it's two different perspectives coming from, you know, in many ways.”

The faculty highlights how differences in thinking and communication styles between co-teachers have not been detrimental in the classroom; rather, they have contributed to a more diverse and engaging learning environment. This sentiment shows the importance of selecting educators who not only bring different perspectives to the table but also exhibit mutual respect and a willingness to collaborate. The quote illuminates the profound impact that well-matched co-teachers can have on students, exposing them to a broader range of viewpoints and fostering a dynamic learning atmosphere.

Additionally, the instructors who co-teach and co-plan together have come to enjoy the collaborative environment in which they work to write the syllabus and the structure for the class. This quote below highlights the type of instructor that would do well in a collaborative, however this type of work is not for everyone:

“I get to sit down with somebody else and do that, rather than just kind of do it on my own, where a lot of times I might just say, oh remember and I’ll change that when I go, but when you’re working with somebody else, you’re kind of held, hold your feet to the fire to say well let’s actually fix this now, and not forget about it.”

The quote exemplifies the collaborative nature of the M3 program and highlights the importance of educators who are committed to working together to enhance the learning experience for students. Teachers who actively seek collaboration, like the one described, are well-suited for the M3 program as they thrive in environments where they can engage in co-planning and co-teaching with their peers. This collaborative approach not only fosters accountability but also encourages continuous improvement and innovation in curriculum development. By partnering with another instructor, educators are motivated to address issues and make necessary adjustments in real-time, resulting in a more cohesive and effective learning environment. Furthermore, the shared responsibility of developing syllabi and structuring classes allows for a diverse range of perspectives to be incorporated, enriching the educational experience for students. Overall, educators who embrace collaboration bring valuable skills and insights to the M3 program, contributing to its success and promoting interdisciplinary learning. The co-teachers must be prepared to navigate the complexities of co-teaching, including coordinating schedules, aligning course content, and effectively working together in front of students and on their own terms. Therefore, the selection of educators who are both adaptable and motivated to engage in cross-

college co-teaching is paramount, as their enthusiasm and dedication are integral to the success and sustainability of these innovative pedagogical endeavors.

Furthermore, the necessity of establishing a shared understanding and language among instructors when striving for transdisciplinary collaboration is critical due to the fact that the instructors are hailing from different disciplinary backgrounds and use different terminology. Therefore, without a common understanding of the objectives and principles of transdisciplinarity, there is a risk of producing superficial or fragmented transdisciplinary efforts. The faculty member below highlights the importance of clarity and alignment in defining transdisciplinary goals to ensure that educators do not revert to their familiar disciplinary boundaries when faced with challenges:

“So, we all have the same common way an understanding of what we mean by that because otherwise you're going to get very weak examples, and probably not truly transdisciplinary. Okay, they're still going to try and go back to their comfort zone. Which is going back to their own colleges.”

The importance of co-teachers establishing a shared understanding and language within their transdisciplinary collaboration cannot be overstated. Clarity of language ensures that educators do not retreat to their familiar disciplinary boundaries when confronted with challenges, thereby fostering genuine and effective collaboration across disciplines. By embracing a unified approach to transdisciplinary goals, educators can cultivate richer and more impactful learning experiences that transcend disciplinary silos, ultimately benefiting both faculty and students alike. In *Designing Technology for People: Anthropological Approaches*, it was evident from the observations that the anthropology instructor took on much of the transdisciplinary curriculum independently yet made an effort to incorporate language from both disciplines. For instance, the anthropologist gave anecdotes about Thomas Edison's design journal shared alongside safety training necessary for utilizing lab equipment for prototype construction, integrating that with the anthropological side of the class. Similarly, in a *Prototyping Technology for People: Making Decisions & Thinking Strategically* lesson, the engineering/technology instructor discussed competitor analysis, a topic typically associated with business instruction, while both instructors were present. Furthermore, the business instructor provided guidance to students on navigating a 3-D drawing program and using calipers, showcasing the seamless integration of disciplinary

knowledge. These instances highlight the importance of transdisciplinary collaboration in transformative educational initiatives, where educators draw from diverse fields to offer comprehensive insights and experiences to students. The success of cross-college co-teaching programs hinges on the dedication and collaboration of educators who are willing to transcend disciplinary boundaries and embrace innovative teaching methods. It is very important to find faculty members who not only possess expertise in their respective fields but also demonstrate a genuine enthusiasm for collaboration. The commitment to invest additional time and effort into collaborative planning and instruction is essential for creating meaningful learning experiences that prepare students. As exemplified by the faculty engaged in the M3 program, educators must be willing to blend disciplinary knowledge seamlessly and work collaboratively to develop comprehensive course materials. The integration of diverse perspectives enriches the educational experience for students, exposing them to a broader range of viewpoints and fostering a dynamic learning environment.

However, finding educators who possess these qualities can be challenging, as complacency with existing teaching loads and styles often serves as a barrier to collaboration. Nonetheless, educators who actively seek collaboration and demonstrate a willingness to engage in co-teaching and co-planning are well-suited for programs like M3, where collaboration is necessary. By embracing collaboration and cultivating a shared understanding among instructors, cross-college co-teaching programs can effectively prepare students for problem-solving and innovation, equipping them with the skills needed to thrive our world.

4.3.5 Co-teacher Relationships

Cross-college co-teaching relationships can change based on the co-teachers involved in the teaching dynamics at the time. The previous section gave insight into some of the qualities that the co-teachers should have to be successful, but there have been successes and challenges among the co-teacher teams. Through collaborative efforts, educators share responsibility for course delivery, fostering interactions and diverse perspectives within the classroom. However, as articulated by faculty members engaged in such endeavors, navigating co-teaching dynamics can sometimes prove to be difficult to achieve. The experiences shared by faculty members highlight the importance of establishing mutual respect and a shared sense of purpose, essential for navigating the complexities inherent in cross-disciplinary collaborations. The co-teachers' words

exemplify the necessary tension inherent in collaborative endeavors, recognizing its pivotal role in transforming education. While challenges persist, the rewards of genuine collaboration are profound, offering opportunities for personal and professional growth and ultimately enriching the educational journey for all involved. As a faculty member had mentioned:

“I don't see any big drawbacks necessarily in terms of learning or anything I think there's some challenges around, you know, you've got to have the right people, you got to have motivated people that are willing to not be the experts in the room at all time, and willing to negotiate and compromise...and it can be time consuming to do that the other one would be, you know, some people may struggle at first or push back some students in that type of environment right, maybe somebody is very comfortable with skimming the book, give me the quiz one, and that's not what this is about. I'm not saying those people wouldn't do well there. You've got to break through with them too. And that could add an additional challenge to it.”

The quote demonstrates the importance of fostering respectful co-teaching relationships founded on a shared commitment to innovative pedagogy. It highlights the necessity of embracing a philosophy of teaching and learning that transcends traditional boundaries, requiring educators to relinquish the role of sole expert and engage in collaborative negotiation and compromise. This approach, while challenging, offers immense potential for transformative educational experiences. As educators navigate the complexities of cross-disciplinary collaboration, they must be willing to confront resistance and overcome barriers to ensure the success of collaborative initiatives. By embracing diversity of thought and pedagogical approaches, educators can create inclusive learning environments that cater to a variety of student needs and preferences, ultimately fostering meaningful learning experiences for all involved. As observed, one of the Designing Technology for People: Anthropological Approaches courses was taught by a younger faculty member, who started teaching with an engineering/technology professor that had a long-standing teaching collaboration with another anthropologist. As both the instructor in the long-time teaching relationship are open to collaboration, they:

“It's been nice, [faculty member] and [faculty member] are amazing to work with because like I've made suggestions and they've been extremely like open to those. And so, we've incorporated a few different things this semester, I've made some PowerPoint changes. And stuff, I've really appreciated that like being the new

professor coming in, but, you know, I've really been treated as a colleague, and I have so much respect for both of them."

The positive feedback from the younger faculty member highlights the collaborative and supportive environment fostered by the long-standing teaching relationship between the engineering/technology professor and the anthropologist. This testimony underscores the importance of cultivating inclusive and respectful co-teaching partnerships, where all participants are valued as equal contributors to the educational process. The willingness of both instructors to embrace new ideas and incorporate suggestions from their colleagues reflects a commitment to continuous improvement and innovation in pedagogy. Furthermore, the experience of being treated as a respected colleague despite being new to teaching demonstrates the inclusive nature of the collaboration, where expertise is recognized and valued regardless of seniority. Overall, this example illustrates how effective co-teaching relationships can enhance the professional development and sense of belonging for all faculty members involved, ultimately benefiting the students and enriching the learning experience.

However, while those instructors have had success another faculty member had pointed at that:

"Not everybody can do this. And I don't think it's for everybody. None of us are suggesting that this is something that should be forced upon like every subject matter. Every area it would take special partnership, you know, to be able to make it happen. But the benefits are so great that it's worth investing in."

While the benefits of effective co-teaching relationships are evident, it's important to acknowledge that not all instructors may be suited for this collaborative approach. As emphasized by the faculty member, successful co-teaching requires a special partnership and a willingness to engage in shared decision-making, compromise, and mutual respect. It's essential to recognize that co-teaching is not a one-size-fits-all solution and may not be suitable for every subject matter or teaching style. However, despite the challenges and complexities involved, the potential benefits of co-teaching are important and worthy of investment. By carefully selecting partners and providing adequate support and resources, institutions can create environments conducive to successful co-teaching initiatives, ultimately enhancing student learning outcomes and enriching

the educational experience. However, some of those sentiments are echoed by another faculty member:

“Yeah, I think co teaching is difficult but, in some ways, it's helpful because you're sharing responsibility for the course.”

While the notion of sharing responsibility for a course in co-teaching arrangements may initially seem beneficial, it can also introduce complexities and challenges, as noted by a faculty member. Co-teaching requires both instructors to actively participate in course planning, delivery, and assessment, often necessitating a high level of coordination and communication. While this collaborative approach can distribute the workload and draw upon the expertise of multiple educators, it also means that each co-teacher must be willing to take on their fair share of responsibilities and contribute to the overall success of the course. Therefore, while sharing the course may alleviate some individual burdens, it also places additional accountability on each co-teacher to fulfill their obligations and effectively collaborate with their counterpart. There are instances where may be there was not an even distribution of work and there have been some arguments as seen below:

“This is hard work to do. Sometimes we were fighting. That's a drawback. That's a strength, because we've had to work through some things which is an ongoing process. So, it is more challenging, but important to have to do that, and to not just expect or retreat and stay with people who think, like you do. It's more important to get out of that box and work with others. And it's, I think it's way more important to show students and to demonstrate that you do value that, I think that's a very powerful thing for them to see and participate in as well.”

Navigating through challenges and disagreements as a co-teaching team not only strengthens the collaborative bond between educators but also sets a powerful example for students. Despite the inherent difficulties and tensions that may arise in collaborative endeavors, overcoming these obstacles fosters a deeper understanding and appreciation of each other's perspectives and working styles. By demonstrating a willingness to engage in constructive dialogue, negotiate differences, and find common ground, co-teachers model effective communication and problem-solving skills for their students. This not only enhances the learning experience but also prepares students for

the realities of working in diverse teams beyond the classroom. Therefore, while the process of co-teaching may be demanding, the opportunity to navigate through challenges together serves as a valuable learning experience for both educators and students alike, reinforcing the importance of collaboration and mutual respect in academic and professional settings. This is further echoed in the following quote:

“We all felt an experience that is not to say, we all got along...we did once receive a comment in our evaluation, “the parents are fighting”, but the truth of the matter was, I think there's so much active engagement and conversation back and forth between us”

The quote highlights the active dialogue that often accompanies collaborative teaching efforts, even if they may be misinterpreted by external observers. By working through disagreements and navigating challenges as a team, co-teachers demonstrate resilience, adaptability, and a commitment to shared goals. The co-teachers are passionate about what they are bringing to the table for students. Students witness firsthand the benefits of working collaboratively and engaging in respectful discourse, preparing them for future endeavors where teamwork and interpersonal skills are essential. Therefore, the experience of co-teaching serves as a valuable learning opportunity that extends beyond the classroom, shaping both educators and students into more effective collaborators and professionals. The following reflects a faculty member emphasizing the importance of working with differing perspectives, noting that this tension is not only inherent in academia but also mirrors real-world scenarios where collaboration is essential for innovation and success.

“It is so much easier for me to teach by myself. They teach with a colleague and give up some of the stage or to have to wrestle with like how much ethnographic techniques are enough, so there's tension there...There's necessary tension across science and math across, engineering, and technology you're pushing and pulling. And that's life. That's all of life, you know, anywhere these students go, and I think that's what we hear from them is when they go in for a job interview and people want to know how do you work with people different than yourselves. They've got to, and they have to for innovation. They have to learn how to, to share knowledge across these disciplines. And same is true for faculty.”

The faculty member's insight serves as a powerful reminder of the real-world applicability of cross-college co-teaching efforts. By acknowledging the inherent tension in collaborating with diverse perspectives, educators can embrace this challenge as an opportunity for growth and innovation. Just as students will encounter diverse viewpoints in their future careers, learning to work effectively with colleagues from different disciplines prepares them for the collaborative demands of the professional world. The faculty member's analogy underscores the importance of sharing knowledge across disciplines, emphasizing that successful collaboration is not only beneficial within academia but also crucial for fostering innovation and success in various industries. This perspective can serve as fuel for cross-college co-teaching efforts, inspiring educators to overcome challenges and embrace the transformative potential of cross-college collaboration.

However, even with arguments and tension, the co-teacher's relationship:

“...has to be a heartfelt collaboration where people get along, or at least have the same motivation to help the students even if their point of reference is very different. Or that their point of tackling a problem is different. I think it's an organic exercise from faculty.”

The importance of faculty members actively wanting to participate in cross-college co-teaching initiatives cannot be overstated. Unlike scenarios where faculty might feel compelled or obligated to engage in such endeavors, genuine enthusiasm and commitment are essential for fostering meaningful collaboration and achieving impactful outcomes. As emphasized by the quote provided, heartfelt collaboration arises when educators share a common motivation to prioritize student success, even amidst differing perspectives or approaches to problem-solving. This organic alignment of goals and values among faculty members creates a fertile ground for innovative teaching practices and transformative learning experiences. When educators are genuinely invested in the collaborative process, they are more likely to overcome challenges, navigate tensions, and work synergistically to create enriching educational opportunities for their students. Therefore, fostering a culture where faculty members are inspired to participate in cross-college co-teaching initiatives not only enhances the quality of education but also cultivates a sense of ownership and fulfillment among educators, ultimately benefiting the entire academic community. Therefore, as one faculty member put it:

“It's the being willing and able to respect the other fields and see them as complimentary not opposing.”

When faculty members demonstrate a willingness to engage with and learn from colleagues in other disciplines, they set a powerful example for students, highlighting the importance of collaboration.

Moreover, by encouraging a culture of respect and collaboration across departments, institutions can create an environment where faculty members feel empowered to explore new pedagogical approaches and contribute to the collective advancement of knowledge and understanding. Therefore, fostering mutual respect and collaboration among faculty members is essential for promoting meaningful cross-college co-teaching experiences that benefit both educators and students alike. A faculty member compared their co-teaching to::

“...almost like creating a contract kind of thing. saying these are our core values about this thing we're trying to make. And that there's times where we're going to ask you to step up and you will be in charge of some of these lessons or lectures or units. Or activities or whatever. And you'll be the driver of those. And then there's other times we're going to ask you to take the back seat and what does that look like? What does the supportive role of that look like? Because I think for many faculty, they never experienced this, and it they get antsy. I think this is why I'm having some tension with this one colleague, because it's not easy to play the supportive role.”

The analogy provided by the faculty member vividly illustrates the dynamic nature of co-teaching relationships and the challenges associated with playing the supportive role. Just as in any partnership, there are times when one must take the lead and others when they must step back and provide support. However, for many faculty members, especially those accustomed to sole teaching responsibilities, navigating this shift in roles can be daunting. It requires a willingness to relinquish control, adapt to different teaching styles, and effectively collaborate with colleagues, all of which can evoke feelings of discomfort or uncertainty. Yet, embracing this supportive role is integral to the success of cross-college co-teaching initiatives, as it fosters an environment of mutual respect, cooperation, and shared responsibility. Therefore, institutions must recognize the inherent challenges of playing the supportive role and provide educators with the necessary support, training, and resources to navigate these complexities effectively. Only then can faculty members

fully embrace the collaborative nature of co-teaching and harness its transformative potential for the benefit of both educators and students. However, there will be semesters to that do go as smoothly as one would like, as this faculty member stated:

“In the very first semester, we thought it was clunky. It was clunky, just because we sort of knew what the endpoint was. And we sort of knew how to get there. But if you make the analogy of dancing together ballroom dancing, you know where you want to be, you know what you're supposed to do. But there's this synchrony that has to come together to make it work. And so, over the over the time that we've worked together, we've developed that synchrony where we can almost finish each other's sentences kind of thing.”

The journey of co-teaching is often marked by its ebbs and flows, with some semesters presenting unforeseen challenges. As one faculty member candidly reflects on their initial experience, likening it to a clunky dance, it becomes evident that achieving synchrony in collaboration requires time and persistence. Despite the initial hurdles, the relationship between co-teachers deepens as they spend more time working together. Just like partners learning to dance in perfect harmony, educators can gradually develop a shared understanding, anticipating each other's moves and thoughts, emphasizing the importance of what professional development opportunities can work to fast track. This process of synchronization not only enhances the effectiveness of teaching but also strengthens the bond between co-teachers, fostering a sense of trust. Over time, this synchronized partnership allows educators to navigate challenges in the classroom and beyond more seamlessly, ensuring a smoother and more enriching co-teaching experience for both them and their students. Additionally, a faculty member reflected on their past collaborative experiences and appreciate the basis of the cross-college co-teaching initiative:

“I've had a couple of experiences in my career where I had had many, many collaborators. I'm a collaboration oriented, applied anthropology standard, like, my life is like, nothing but collaborative. There's a lot of that, but I think some of the ones that stick out or are more memorable over time, was where there was more personal and professional growth, when you're collaborating with someone who's really more different as a thinker, and in background and in skill set than you are.”

The reflection of the faculty members on their past collaborative experiences offers valuable insight into the broader importance of cross-college co-teaching initiatives. By emphasizing the importance of collaborating with individuals who possess diverse perspectives, backgrounds, and skill sets, the faculty member highlights the transformative potential of cross-college co-teaching. Thus, the faculty member's reflection highlights the profound impact of cross-college co-teaching on fostering collaboration and promoting learning outcomes geared toward transdisciplinary ventures.

Cross-college co-teaching relationships are dynamic and multifaceted, influenced by the unique dynamics and interactions between co-teachers. While the previous sections have shed light on the qualities necessary for successful collaboration, it's important to acknowledge that co-teaching experiences can vary, with both successes and challenges. Despite this variability, the overarching theme remains clear: through collaborative efforts, educators can share responsibility for course delivery, fostering interactions and diverse perspectives within the classroom. The experiences shared by faculty members underscore the importance of establishing mutual respect and a shared sense of purpose, essential for navigating the complexities inherent in cross-disciplinary collaborations. As articulated by faculty members engaged in such endeavors, the journey of co-teaching involves necessary tension and occasional disagreements, reflecting the transformative potential of collaboration in transforming education. However, these challenges are outweighed by the rewards of genuine collaboration, offering opportunities for personal and professional growth while enriching the educational journey for all involved. Through reflective practice and a commitment to continuous improvement, educators can harness the power of cross-college co-teaching to create inclusive and innovative learning environments, preparing students for success in an interconnected world.

4.4 The Performance

This section is labeled The Performance because it depicts what happens when cross-college co-teaching is enacted. The first section explores how cross-college co-teaching affects students' engagement through a means of transdisciplinary education. The following section explores how disciplinary boundaries are transcending within the co-taught courses. And the last section details the innovation that has risen from the program in regard to teaching, learning and preparing

innovators. Overall, this section looks to describe the challenges and opportunities that have come from the implementation of cross-college co-teaching.

4.4.1 Student Engagement and Transdisciplinary Learning

In the realm of education, transformative shifts are occurring as institutions strive to prepare students for the dynamic challenges of the modern world. These shifts entail embracing transdisciplinary collaboration, fostering innovation and creativity, and instilling resilience in the face of failure. Through the integration of diverse perspectives and experiences, educators are pioneering new approaches to teaching and learning, breaking down traditional silos and creating inclusive environments where students from various backgrounds can be innovators. At the heart of this program lies the recognition that meaningful learning experiences extend beyond disciplinary boundaries, encompassing real-world problem-solving, teamwork, and adaptability. As faculty members and administrators navigate these changes, they are confronted with the need to balance disciplinary expertise with transdisciplinary collaboration, providing students with both foundational knowledge and the skills necessary for success in a connected, rapidly evolving global landscape. The following exploration delves into the insights and reflections of stakeholders engaged in cross-college co-teaching initiatives, shedding light on the complexities, opportunities, and transformative potential inherent in this collaborative approach to education. Through their experiences, we uncover the underlying themes of innovation, diversity, experiential learning, and the cultivation of a mindset that embraces failure as a steppingstone to growth and innovation. To begin, administration viewed this program to have students talking and working with other students:

“And so now we have students from three different colleges actually working together and learning from each other with very different backgrounds. a liberal arts major has a very different undergraduate experience than a Polytechnic and vice versa. So, you have those kinds of collisions going on a regular basis and it's got some real strength.”

The administration champions the program's ethos of students engaging in dialogue and collaborative work across disciplinary boundaries, recognizing the enriching value of diverse perspectives. They highlight the notable benefits derived from students of various backgrounds

coming together to learn from one another, fostering a dynamic environment where innovative ideas can flourish. Those ideas were echoed by an instructor who witnesses the students working, and they mention that:

“And you all are working together to solve a problem. That is a much richer kind of team than simply having a bunch of engineers in a room all trying to solve the problem.”

The importance of students from diverse backgrounds collaborating to solve problems lies in the richness and depth of perspectives they bring to the table. Unlike possibly more homogeneous teams composed solely of individuals from a single discipline, transdisciplinary teams benefit from a wide range of viewpoints, experiences, and approaches. This diversity fosters a more holistic understanding of the problem at hand and encourages innovative solutions that draw from multiple fields of expertise.

Furthermore, the enrichment of educational experiences through diversity of thought and background necessitates the dismantling of disciplinary silos, a process that can often begin with faculty and permeates through students, subjects, and topics alike as recognized by a faculty member:

“it's diversity of thought, it's the diversity of backgrounds that really enriches it. And you have to break down the silos in order for that to happen. And that starts at the faculty, and it goes down to the students and even goes down to the subjects that are being taught and the topics that are being addressed.”

As faculty members facilitate collaboration, students are encouraged to draw from diverse backgrounds and areas of expertise, often resulting in innovative solutions that transcend traditional disciplinary boundaries. This dynamic exchange of ideas not only enriches the learning experience but also equips students with the adaptability and creativity necessary to tackle real-world challenges effectively. The faculty are actively working together each semester to facilitate teaching and learning in a new way that goes beyond disciplinary silos. Through the M3 program driving philosophy the faculty is hoping to:

“...really transform the learning experience around innovation and creativity and bringing together different colleges and having students of different backgrounds and different majors get together. And see if we can create a learning environment that truly does enhance a student's ability to innovate and be creative and work in teams and work in diverse teams, and better understand some other disciplines”.

This faculty members' mindset is grounded in the belief that there is little risk in attempting to initiate institutional change. Their goal is to create an educational experience that not only enhances students' ability to innovate and collaborate but also promotes a deeper understanding of diverse perspectives and disciplines. This proactive approach reflects a recognition of the importance of transdisciplinary learning and the value of diverse teams in solving complex problems. The faculty's willingness to experiment with new teaching methodologies highlights their dedication to institutional change and their belief in the transformative power of education. While their numbers may be small in a large institution, the impact of their efforts could serve as a catalyst for broader change, especially when coupled with the enthusiasm and appreciation demonstrated by students for such courses. However, while the faculty stresses the importance of opportunities to work across disciplinary lines, the faculty also stresses the value of having disciplinary expertise as well:

“I don't think we should ever get rid of disciplinary expertise yet; I don't think it's just like, black or white thing where, or about binary decision where you have to have one and not the other. I think we want to have that experience where they can come back and learn how to work with people in different disciplines work across teams.”

Amidst the emphasis on fostering transdisciplinary collaboration, the faculty underscores the enduring importance of disciplinary expertise. The faculty member above asserts the rejection of a binary approach to education, advocating instead for a nuanced perspective that incorporates both disciplinary depth and transdisciplinary experiences. This approach aims to cultivate students' abilities to navigate diverse fields and collaborate effectively across teams, thereby preparing them for real-world challenges.

Therefore, while transdisciplinary experiences can cultivate useful skills in students, the students still need a disciplinary home to return to. Faculty members recognize the importance of

transdisciplinary experiences in shaping students' skills and perspectives. While providing students with opportunities to engage across disciplines, they also acknowledge the importance of maintaining a disciplinary foundation. This balance ensures that students not only benefit from diverse learning experiences but also have a disciplinary "home" to anchor their knowledge and expertise. Moreover, faculty members themselves find value in facilitating transdisciplinary education. They see it as an opportunity to innovate in their teaching methods, breaking away from traditional approaches to create more engaging and authentic learning experiences:

“So, ways that we can do things differently than we thought of before and it's kind of the whole idea with the design innovation program...Engaging students and really bringing authentic experience to them in ways that people haven't done it before...with kind of the whole teaching across colleges and across disciplines, ways that we can do that well, and break systems...I've tried to be innovative and support students to be innovators as well so I've kind of have that unique experience coming up with new ways of doing teaching us new ways of doing assessment involving students in the assessment process so that's what I like to innovate”.

Incorporating students into the assessment process for a new transdisciplinary class is essential for several reasons. Firstly, it promotes student engagement and ownership of their learning experiences. By actively involving students in the assessment process, educators empower them to take charge of their education and become co-creators of knowledge. This approach fosters a sense of responsibility and accountability among students, as they play a role in evaluating their own progress and that of their peers. Additionally, student involvement in assessment enhances the authenticity of the learning experience. As educators strive to innovate in their teaching methods, incorporating students' perspectives and feedback ensures that assessments are relevant, meaningful, and reflective of real-world challenges. By soliciting input from students, instructors can tailor assessments to align with the goals and objectives of the transdisciplinary program, thereby maximizing its effectiveness in preparing students for the complexities of the modern workforce. Furthermore, there is a hope among faculty that the students will be able to:

“...learn how to work with people in different disciplines, work across teams. I always hear stories of them learning different skills, different ideas from people outside of their majors, they would have never thought about. Same thing with teaching it myself like I learned from my students from outside my discipline. I learned things from the instructors outside of it. I think that shifts the mindset of

like this is the professor being the expertise and all, be all knowledge. We don't know everything...let's learn together through this and do something meaningful.”

Additionally, through collaboration with students and colleagues from different disciplines, faculty members expand their own knowledge base and gain fresh insights, fostering a culture of continuous learning and collaboration within the academic community. The quote highlights the importance of students learning to collaborate across disciplines and work in diverse teams, ultimately enriching their educational experience. Faculty members express hope that through such collaboration, students will not only acquire new skills and ideas but also challenge traditional notions of expertise. By sharing experiences of learning from students outside their disciplines, faculty members emphasize the value of openness to learning from others. This collaborative approach benefits students and extends to faculty members, who gain new perspectives and insights from working with colleagues and students from different backgrounds. This process promotes a culture of continuous learning and collaboration within the academic community, contributing to the advancement of knowledge and the pursuit of meaningful educational experiences.

Therefore, the administration emphasizes the importance of making transdisciplinary programs accessible and relevant to students from diverse academic backgrounds, advocating for a contextualized approach that goes beyond traditional disciplinary boundaries:

“We just need to make it make sense for everyone. Instead of just the Polytechnic students in design and innovation. I think we need to make it make sense for everyone else and kind of contextualize it of why would an ag student be in this minor? Why would a selling and sales student take this or something like that?”

The quote from the administration depicts their commitment to fostering inclusivity and relevance in transdisciplinary programs. By advocating for an approach that extends beyond the confines of traditional disciplinary boundaries, administrators aim to ensure that all students, regardless of their academic backgrounds, can see the value and applicability of such programs. They recognize the importance of contextualizing these initiatives to resonate with students from diverse fields of study, such as agriculture or sales, thereby demonstrating how participation in transdisciplinary programs can benefit them in their respective career paths. This mindset reflects a broader

institutional strategy to promote transdisciplinary collaboration and prepare students for the complex challenges of a rapidly evolving professional landscape. Furthermore, the following quote underscores the notion that true expertise cannot be attained simply by taking a single class with instructors from different disciplines. It highlights the necessity of more comprehensive educational experiences, such as project-based courses, which integrate various skills from different fields. It emphasizes the valuable collaborative opportunities presented by co-teaching environments, where educators from diverse backgrounds converge to provide students with enriched learning experiences:

“...both of those classes present an opportunity for us to send into the world, both highly motivated, innovators, business thinking people and great solutions to problems. So, I see the university as a great catalyst to bring those two pieces together and kind of explode out”

The quote further reinforces the idea that transdisciplinary collaboration is essential in fostering well-rounded, innovative students who are prepared for the work force. By combining the expertise from various disciplines in project-based courses and co-teaching environments, universities can nurture students who possess not only specialized knowledge but also the ability to think critically and creatively across different domains. The emphasis on sending forth motivated individuals with problem-solving skills reflects the university's role as a catalyst for societal progress, where diverse perspectives converge to generate impactful solutions. This approach not only benefits students by preparing them for dynamic professional environments but also contributes to broader societal advancement through the cultivation of adaptable and forward-thinking leaders.

Additionally, administration thinks there's value as the following quote demonstrates the importance of learning from failure and receiving constructive feedback in the process of effecting change and innovation:

“It's a nice way to say that if you're going to change the world, you have to learn how to fail and how to fail fast without putting all your eggs in one basket. And it can be scary to do that without some kind of safety net, some kind of scaffolding that you get from your instructors to say, okay, well, that was a nice try but next time I would do it this way...and so you get immediate feedback, too. So, it's not just failing, it's failing paired with learning that you learn what you did wrong. You learn what you can do better next time. And it's done in a way that that you feel like

you're capable of failing and you're not just out on your own and stuck with the consequences."

The crucial role of failure and feedback in driving meaningful change and innovation is important as highlighted above. Administration recognizes the value in this perspective, as it aligns with fostering resilience and adaptability among students. By encouraging a culture where failure is seen as a steppingstone to growth rather than a setback, educators provide students with the necessary support and scaffolding to navigate challenges with confidence. This approach not only empowers students to take risks but also instills in them a mindset that embraces continuous learning and improvement. Moreover, the emphasis on immediate feedback ensures that students can iterate on their ideas, refining their approaches and strategies for future endeavors. Ultimately, by integrating failure as an integral part of the learning process, institutions can better prepare students to tackle complex problems and make meaningful contributions to their communities and the world at large. As observed, the co-teachers have students working in groups based on the students interested in a project, bringing students from various disciplines to a team. As a faculty member mentioned:

"I can think of the times when you know, a management student who instead of just learning about business, or how businesses work in their class, or how products are made, could actually work with another student to make a product, make a thing and go through the process of like if I was crafting a business, and was making something of my own, what would it look like and then working with other students who help them do that"

The collaborative approach to learning, as highlighted by the faculty member, exemplifies the transformative potential of transdisciplinary teamwork in education. By bringing together students from diverse backgrounds and skill sets, educators provide them with opportunities to apply theoretical knowledge in practical, real-world contexts. In this scenario, a management student is not limited to passive learning about business concepts but actively engages in the process of creating a product alongside peers from complementary disciplines. This hands-on experience fosters a deeper understanding of the subject matter while also honing critical thinking, problem-solving, and collaboration skills. Moreover, by working collaboratively to navigate the complexities of project development, students gain insights into different perspectives and

approaches, enriching their learning experiences and preparing them for the challenges of the professional world. Such initiatives not only promote academic excellence but also nurture the innovative spirit necessary for driving positive change and addressing contemporary societal issues. Furthermore, another faculty member said:

“I think it provides students with a richer experience than just the same voice going on and I probably would advocate that co-teaching is probably more valuable than just coming in for 15 or 8 weeks and talking about my thing and then eight weeks of someone else talking about that thing. I think that integration of or alignment of topics where two people have different perspectives is valuable”.

By bringing together instructors from diverse backgrounds and perspectives, co-teaching creates a dynamic learning environment where students are exposed to a variety of viewpoints and approaches. As one faculty member articulates, this approach enriches the educational experience by offering students a broader range of perspectives and insights than traditional single-voice instruction. Furthermore, the integration of different viewpoints encourages critical thinking and deepens students' engagement with the subject matter. By challenging students to consider multiple perspectives, co-teaching disrupts conventional modes of learning and encourages a more holistic approach to education. A faculty member further shown the importance of experiential learning in problem-solving by emphasizing the need for students to identify and frame problems themselves rather than being provided with predefined solutions as done elsewhere:

“You might go over to engineering, and you might take like a freshman level engineering course, and they might give you a design brief with here's a problem...don't give them a problem. Make them identify it...we knew at the end of the day, one of the things I really wanted was people that could frame a problem for themselves so that they identify it, frame it, and then work to solve it and to do it in teams of people...we can do it in a way that motivates students and keeps them engaged and you know, puts them in a space where they they're challenged to work in a team to do things. I always tell the students you're going to struggle to not talk about this class when you go to an interview. Because when you interview, they always ask you things like when did you experience a problem that you had to work through? When did you work with a team of people different than yourself? How did you overcome those challenges working with people that are different than you know?”

This experiential learning approach, as advocated by the faculty member, offers students invaluable skills that are highly sought after in the job market. By requiring students to identify and frame problems independently, rather than spoon-feeding predefined solutions, this method fosters critical thinking, creativity, and adaptability. Working collaboratively in teams further enhances their ability to communicate effectively, navigate diverse perspectives, and solve complex problems collectively. These experiences not only equip students with practical skills but also provide compelling anecdotes for job interviews. Employers often value candidates who can demonstrate their ability to tackle challenges, work effectively in teams, and adapt to diverse environments—all of which are cultivated through the hands-on problem-solving approach advocated by the faculty member. Thus, this educational experience not only prepares students for the workforce but also positions them as competitive candidates in the job market. As well as interview benefits, students can enhance their resumes/CVs as well as mentioned by a faculty member:

“I think number one is to get as many hands-on experiences as possible. And that has two goals. One is that it literally gives you that experience like you know, these students can say that I have been through this process right, no matter what the form whether we're talking about film production of ethnographic data, whether we're talking about you know, learning how to create a prototype like those processes, students can literally say I can do them. And that stuff is hugely important for ultimately their CVs as well because when students leave college, a lot of times their CVs are very bare...it becomes, you know, having these different projects, those become CV builders, too. So, I think the like, that combination is really critical. I don't also think, though, that it is important to also, you know, have more theoretical training to be able to step back and understand like how the world operates and why it does, right, because ultimately, the goal of innovation, like we don't push this in the class in any intense way right but the goal of innovation should be to create a more socially just world ideally, right...But in general we want students to be trained to think about how their schools can be used to do good”

The quote emphasizes the dual benefits of hands-on experiences in transdisciplinary learning environments for students. Firstly, such experiences provide practical skills and firsthand knowledge, enabling students to confidently assert their abilities in various processes, enhancing their employability. These experiences serve as tangible evidence on their CVs, bolstering their credentials and distinguishing them from other candidates in the competitive job market. Secondly, the quote highlights the importance of theoretical training alongside practical experiences. It shows

the importance of understanding the underlying complexities of the world to drive meaningful innovation towards creating a more socially just society. By combining practical skills with theoretical understanding, students are equipped not only to navigate the workforce effectively but also to critically analyze and contribute to societal progress.

With this in mind, it becomes evident that transdisciplinary learning and hands-on experiences are essential components in equipping students with the skills and mindset needed to tackle real-world challenges and enact meaningful change. The following quote encapsulates the essence of the design innovation program, highlighting the faculty member's commitment to exploring novel teaching methods and fostering innovation among students by engaging them in authentic learning experiences and involving them in the assessment process:

“I think for the most part is around teaching...ways that we can do things differently than we thought of before...how can we try out different ways of engaging students and really bringing authentic experience to them in ways that people haven't done it before”.

This quote reflects the core philosophy of the design innovation program, emphasizing the faculty member's dedication to redefining traditional teaching paradigms. By prioritizing innovation in teaching methods, the program aims to provide students with unique and immersive learning experiences. The faculty member details the importance of exploring diverse approaches to engage students authentically, thus fostering a dynamic and enriching educational environment. Through this commitment to experimentation and creativity, the program seeks to empower students to think critically, problem-solve effectively, and adapt to the demands of an ever-changing world. While this program offers students a taste of transcending disciplinary boundaries, foundational training for faculty and students is equally, if not more important. Understanding the foundational principles within one's field is essential for grasping the intricacies of structural thinking and comprehending the underlying reasons for the world's complexities. As expressed by an anthropologist, this foundational training equips individuals to recognize the importance of their research as an intervention in societal processes, whether on a small or large scale. Thus, while versatility is valuable, it is equally crucial to appreciate the importance of fundamental knowledge and its role in achieving broader objectives:

“I do think that it's also important to get that more foundational training, you know, in in whatever your field and I can speak to anthropology, because I'm an anthropologist right, but to really like learn how to do kind of structural thinking to really understand why the world is the way it is, right? And then how our research can be an intervention in that process, rather, on a small or big scale. And so, I think getting that background is also really critical. So, it's not just about like, I can do lots of things, right? But it's also like I understand the importance of why we want to do what we want to do right and how we can use that towards bigger goals”

The quote underscores the importance of acquiring foundational training within one's field, emphasizing its role in fostering structural thinking and enabling individuals to comprehend the underlying mechanisms shaping the world. The anthropologist highlights the importance of understanding why phenomena occur and how research can serve as an intervention within societal processes, irrespective of scale. This foundational knowledge not only provides individuals with a deeper understanding of their discipline but also equips them with the tools to contribute meaningfully to broader goals and initiatives. To seek more foundational training, individuals can engage in formal education programs, attend workshops or seminars, participate in research projects, or seek mentorship from experienced professionals in their field. By prioritizing foundational training, individuals can enhance their critical thinking skills, expand their knowledge base, and better navigate the complexities of their chosen discipline, ultimately contributing to meaningful advancements in their field and beyond. Beyond including cross-disciplinary interactions within higher education and then the work force.

Adding to that, for a program like this to sustain and grow, there must be bridge made to fill the gap between research and teaching. As a faculty member pointed out:

“We've got some amazing faculty members that are doing research in innovation, and continuing to find funding for that kind of research, yes, we can design the next, you know, Mars, Land Rover. But at the same time, we can do research to create the next hotspot of innovators. In addition, creating minors and majors and colleges built around education of innovation education of startup companies, and education have, it's okay to fail. I think one of the scariest things that I've seen with the undergraduates and all the students that I've worked with is fear of failure, and making sure we're educating our students, all the r1 universities on students. It's okay to fail.”

Bridging the gap between education and research is imperative for the sustainable growth of innovative programs within higher education. As highlighted by a faculty member, while universities boast remarkable faculty engaged in cutting-edge research, it is equally crucial to channel these efforts towards nurturing the next generation of innovators. Beyond merely designing groundbreaking technologies, there is a pressing need to cultivate a culture of innovation and entrepreneurship among students. These ideas entail integrating research findings into educational curricula to equip students with the skills and mindset necessary for success in their future. By establishing minors, majors, and colleges dedicated to fostering innovation and entrepreneurial endeavors, higher education institutions can instill a culture where failure is embraced as a vital component of the learning process. This holistic approach not only encourages creativity and risk-taking but also addresses the pervasive fear of failure prevalent among undergraduate students. Thus, by bridging the gap between education and research, universities can effectively prepare students to become the driving force behind future innovations and societal advancements. However, overall, the value, once again in a cross-college co-teaching program for transdisciplinarity is upheld:

“I think that on a on a broader level, having teachers, faculty members from different colleges or departments teaching together that brings in a whole different opportunity for different experiences different focus, because for you, your life experiences have taken you down a different path than mine.”

The importance of cross-college co-teaching programs for transdisciplinarity is underscored by the diverse perspectives and experiences that faculty members from various departments bring to the table. This approach offers a unique opportunity for students to benefit from a rich tapestry of knowledge and expertise, each shaped by the distinct life experiences and career trajectories of the instructors and students involved. By collaborating across disciplinary boundaries, faculty members can offer students a more comprehensive understanding of complex topics, drawing from a diverse range of perspectives and focusing areas of expertise. This not only enriches the learning experience but also cultivates a culture of innovation and collaboration that prepares students for success in an increasingly interconnected world.

Overall, in the evolving landscape of higher education, transformative shifts are occurring to prepare students for the dynamic challenges of the modern world. Embracing transdisciplinary

collaboration, fostering innovation, and instilling resilience in the face of failure are at the forefront of these changes. Through integrating diverse perspectives and experiences, educators are pioneering new approaches to teaching and learning, creating inclusive environments where students from various backgrounds can become innovators. At the heart of these initiatives lies the recognition that meaningful learning experiences extend beyond disciplinary boundaries, encompassing real-world problem-solving, teamwork, and adaptability. Stakeholders, including faculty members and administrators, are committed to breaking down traditional silos, promoting collaboration, and fostering a culture of innovation within academia. Through cross-college co-teaching initiatives and hands-on experiences, students are engaged in collaborative problem-solving, enhancing their critical thinking skills and preparing them for the complexities of the modern workforce. Faculty members emphasize the importance of experiential learning in problem-solving, encouraging students to identify and frame problems themselves. These experiences not only prepare students for the workforce but also position them as competitive candidates in the job market by enhancing their CVs and providing them with valuable interview skills. Furthermore, faculty members recognize the importance of maintaining disciplinary expertise while embracing transdisciplinary collaboration, highlighting the need for a balanced approach in higher education. Bridging the gap between education and research is essential for sustainable growth, as universities strive to cultivate a culture of innovation and entrepreneurship among students. Cross-college co-teaching programs for transdisciplinarity offer unique opportunities for students to benefit from diverse perspectives and experiences, enriching their learning experiences and preparing them for success in an interconnected world. In conclusion, these initiatives underscore the importance of transdisciplinary learning and engagement in equipping students with the skills and mindset needed to tackle real-world challenges and enact meaningful change.

4.4.2 Beyond Disciplinary Boundaries

In the landscape of higher education, traditional disciplinary boundaries often serve as barriers, separating distinct fields of study into silos. At this university a plethora of academic disciplines flourish across ten distinct colleges. However, breaking down these silos between the colleges and fostering collaboration across disciplines has proven to be a challenge. Yet, amidst this landscape of academic tradition, a shift is underway—a shift propelled by a collective vision

of leadership, innovation, and collaboration. Spearheaded by faculty members who recognize the importance and value of transcending disciplinary confines, this university is on a journey of cross-college co-teaching, an approach that extends beyond the traditional structure of the institution. This section explores the power of cross-college co-teaching, where faculty members from diverse backgrounds converge to impart knowledge, inspire creativity, and cultivate a new generation of innovators. Through candid insights from faculty and administrators alike, we delve into the successes and challenges in this transdisciplinary endeavor. Faculty members reflect on the challenges posed by disciplinary silos, acknowledging the need to transcend these boundaries in order to nurture holistic understanding and foster innovation. The issue of disciplinary silos is one that has been recognized for a while now as a faculty member had pointed out:

“It's known [the university] has had a... tradition of siloing it's really...but I think that's something we're all interested in in moving away from and talking about what that can look like in training innovators going forward”

Breaking away from the tradition of disciplinary silos is imperative for several reasons. Firstly, disciplinary silos inhibit understanding complex issues by confining knowledge within narrow boundaries. By breaking down these silos, faculty members can facilitate dialogue and collaboration, enabling students to explore many perspectives. Secondly, transcending disciplinary boundaries is essential for fostering innovation and creativity. By bringing together individuals from diverse fields, cross-disciplinary collaboration encourages the exchange of ideas, methodologies, and approaches, fueling the discovery of novel solutions to real-world problems both for students and faculty alike. Moreover, dismantling disciplinary silos cultivates a culture of inclusivity and openness, where diverse voices and perspectives are valued and celebrated. In doing so, universities can better prepare students to navigate the complexities of a connected world, where collaboration is beneficial and essential for driving meaningful change.

However, even knowing this information, faculty find it hard to overcome other barriers such as incentives:

“I already mentioned there's definite siloing here people know it. And not always enough action or incentive to break it down.”

The lack of incentives for breaking down disciplinary silos presents a noteworthy challenge for faculty members striving to promote transdisciplinary collaboration. In a traditional academic environment where success is often measured by disciplinary achievements and individual accomplishments, there is little motivation for faculty to invest time and effort into collaborative ventures that transcend disciplinary boundaries. As mentioned in previous sections, it takes more work from the faculty members to engage in this type of work. Moreover, institutional structures and reward systems may prioritize disciplinary excellence over collaboration, further perpetuating the silo mentality. Without tangible incentives or recognition for transdisciplinary work, faculty members may hesitate to invest in cross-college co-teaching initiatives, opting instead to focus on activities that align more closely with traditional academic norms and expectations. As a result, the potential benefits of transdisciplinary collaboration, such as holistic problem-solving and innovation, may remain underutilized, hindering the advancement of knowledge and the preparation of students for an increasingly transdisciplinary world. Addressing this challenge requires not only the creation of incentives and rewards for collaboration but also a cultural shift within academia that values collaboration across disciplinary boundaries as integral to scholarly excellence and societal impact. As faculty have attempted to work to change the structure of the institution faculty recognize that:

“...what they do well is I believe that because of the upper administration, embracing leadership and innovation, it makes it much easier to get some of these things done. But higher ed is actually pretty difficult to change. And the disciplines we have, based in colleges, and [the university] as 10 different disciplines or colleges, it's very difficult to break down those barriers, between those colleges, sometimes called silos. So, we basically have 10 silos, kind of doing their own thing. And trying to work across that is difficult, because higher education is not meant to work across disciplines, they are set up specifically, so that those disciplines can pretty much stand alone. And so historically, you know, we're working within a higher education system that is not necessarily set up to innovate.”

The recognition of the challenges inherent in breaking down disciplinary silos underscores the complexity of effecting institutional change within higher education. Despite efforts to promote collaboration and innovation, the entrenched nature of disciplinary structures presents obstacles. As faculty members navigate the intricate dynamics of academic departments and colleges, they encounter institutional barriers that hinder cross-disciplinary initiatives. The very architecture of

higher education institutions, with distinct colleges and departments organized around disciplinary boundaries, reinforces siloed thinking and practices. Efforts to foster cross-college collaboration require not only top-down support from university leadership but also a fundamental reimagining of academic structures and norms to prioritize collaboration and innovation across disciplinary boundaries. Only through sustained advocacy, cultural transformation, and systemic reform can academia embrace collaboration as essential to meeting the demands for transformation. To work to break down barriers this project has been taking strides:

“We have three different colleges involved liberal arts, business management, and the Polytechnic all working on creating this innovation curriculum. And that is pretty unique. We're talking about a traditional business school, talking about a liberal arts program. And now you're talking about this Polytechnic, which is not a college that you find everywhere...And so that's an example of how [the university] is really, I think, leading the way”.

The collaborative initiative involving three colleges—liberal arts, business management, and the Polytechnic—represents a notable departure from the traditional siloed approach to higher education. By bringing together faculty and expertise from diverse disciplines, this project embodies a shift toward collaboration and innovation. This cross-college collaboration not only facilitates the development of an innovative curriculum but also fosters a culture of collaboration and knowledge exchange that transcends disciplinary boundaries. As faculty members from different colleges come together to design and implement the innovation curriculum, they demonstrate a commitment to breaking down silos and embracing a more integrated approach to education and scholarship. Through initiatives like this, the university is at the forefront of promoting collaboration and paving the way for change in academia. Even the administration recognizes its importance, especially now when the value of higher education is coming into question. Administration recognizes this:

“...there's cross teaching in there...there's a different exposure and thought process. Because when you get in the Polytechnic, you hear a lot of people that talk and think the same way that you do, and somebody coming from anthropology or somebody coming from engineering or even a management area, think very differently. And it doesn't mean that it's wrong, it's just different. And that's the whole point of the design and innovation, because we don't work in silos. So, trying to get students out of, you're not just going to work with other people that like

computers...it's a really good exposure for students outside of just their like general education classes, to be applying something they actually want to do. But with people that don't think the same way as them but have the same goal of innovating and working on a project, it fits into a lot of people's majors and interests because of that, when they want to just be able to take ideas and collaborate with people but have a structure to it."

At a time in higher education where the relevance and efficacy of traditional academic structures are being scrutinized, initiatives that promote diversity of thought and cross-disciplinary exchange are becoming increasingly vital to keep higher education up to date. By facilitating interactions between students and faculty from disparate disciplines, co-teaching initiatives enrich the educational experience, providing students with exposure to diverse perspectives and ways of solving problems. By emphasizing collaboration over siloed thinking, these initiatives foster a culture of innovation and creativity, equipping students with the tools and mindset necessary to address real-world problems collaboratively. As such, initiatives like co-teaching not only add value to higher education but also ensure its continued relevance and impact. In fact, a faculty member identified the purpose of co-teaching for the sake of innovation, it was said that:

"Innovation is made up of many, many different components. And so, in order to teach innovation, we've got to bring experts in on those different components and put it together, no one professor can teach a minor or major or certificate in innovation. It's, I can teach you finance. I can teach you marketing, but to teach you entrepreneurship, I have to teach you finance and marketing and operations, and legal. And so, you know, innovation as well as entrepreneurship. It's not just a single thing. It's made up of so many other moving parts, that it forces us, in essence, to do co-teaching and collaborative teaching...because of the nature of the beast, we're forced to do collaborative teaching".

The essence of co-teaching is illuminated by innovation. As one faculty member aptly articulated, innovation comprises a plethora of interconnected components, each requiring specialized expertise. Attempting to convey the intricacies of innovation through a singular lens would be akin to fitting a square peg into a round hole; it simply cannot capture the entirety of the concept. Instead, co-teaching emerges as a necessity, as it enables the synthesis of diverse perspectives and skill sets essential for a comprehensive understanding of innovation. By bringing together experts from various disciplines, co-teaching not only enriches the learning experience but also mirrors the

collaborative nature of innovation itself. In this way, co-teaching becomes not just a pedagogical strategy but a reflection of the inherent complexity and interdependence of the innovation process. Furthermore, the faculty thought that the convergence of disciplines allows for deeper learning and value of other disciplines, as stated below:

“I think programs that allow or that require disciplines to converge need to exist, because that's how we can show that other disciplines and skills can be valued in other places...I think that's how we can create together, learn things that they probably were cut off to them because a liberal arts students may not have the same access to the skills and things as like an engineering student. But now we can bring it together. They can value their what they bring to the table they value what they bring to the table, and hopefully democratize some of those practices across the disciplines. And I think that's the biggest benefit is that people from different areas can see where their strengths and backgrounds and interests are valued. And then they can still have a home because if they don't have someplace to go back to, that's the problem because they won't know where they belong...with having us co-teaching, we are valuing others.”

This perspective highlights the potential of transdisciplinary education, where students from diverse backgrounds can recognize and appreciate the unique contributions each discipline brings to the table. By breaking down traditional silos through cross-college co-teaching and promoting collaboration, academic programs that converge disciplines not only facilitate deeper learning but also promote a sense of belonging and inclusivity among students, creating a community. As observed, the co-taught classes open the lab spaces to all students involved in the Design and Innovation minor. The open lab spaces create areas for further cross-disciplinary interactions and innovations. Students learn lab safety from other students and are free to create. By allowing all students to enter this space, it fostered an environment where varied skills and perspectives are valued. The continuation of this type of cross-college collaborative work can lead to the democratization of knowledge and practices, ultimately enriching the educational experience for all involved. This notion is echoed in the following where cross-college co-teaching is seen as working to break down silos, and through that providing students an example of collaboration with people who come from different places and think differently. The value of this initiative is known, and with that there is hope to break down disciplinary silos.

“So, not only do students benefit from seeing how different people approach a problem but also in working together with students from other places. I know the phrase breaking down silos is used, and I don't want to use that in a cliché sense but there is some silo breakage that's happening and it kind of mirrors what they'll end up doing in the quote unquote real world.”

Future directions could involve further expanding and institutionalizing cross-college co-teaching programs, integrating them more deeply into the fabric of higher education institutions at natural convergence points of disciplines. Furthermore, the firsthand experience of working across disciplinary borders equips students with the adaptability needed to navigate collaboration. By mirroring real-world dynamics within their educational experience, students are better prepared to thrive in professional environments that require them to work across disciplinary boundaries effectively. The success of this program is evident as faculty have seen students explore outside of their disciplinary backgrounds and learn from each other. Students are using labs and machinery, learning ethnographic approaches, and utilizing business development plans and strategies. Since students' academic backgrounds vary, most are exploring new ideas and concepts in some capacity due to the cross-college co-teaching initiative. The M3 program is opening doors and extending design spaces to all students on campus. A faculty member recalls the success in the following quote:

“I think we've known all along that there's really great benefits to bringing diverse populations of students together, you know...they've got these unique backgrounds, that they're coming from diverse majors, that they may never have sat in a classroom together in a collaborative way like this, and then asked to do something like this. So, I think we're finally feeling the effects of that to a much greater scope than we ever have...when you look at our current enrollment, diverse all across campus, we've also seen that in their ability to design, you know, they've come up with some really creative designs. We've been very happy with how they've started to use the lab. They've leaned on people that are technically you know, proficient, but then others have come in there that have never touched any of this stuff and never would touch any of this, you know, prototyping type of equipment are in there doing it you know, and which is cool. I mean, to see an anthropology major, like holding up a laser cut product, it's cool”

The M3 program's commitment to inclusivity and diversity in education represents a notable step forward in higher education. By bringing together students from diverse backgrounds and majors,

the program fosters a collaborative learning environment that mirrors the complexities of the real world. This inclusive approach enriches the traditional siloed educational experience for students and creates a culture of innovation. As faculty members witness the innovative outcomes of cross-college co-teaching, from the creation of unique design solutions to the utilization of prototyping technologies by students with varied skill sets, they recognize the transformative potential of breaking down traditional academic silos. All students deserve a chance to design and innovate. Furthermore, the success of the M3 program highlights the importance of democratizing design spaces within higher education. By opening doors to students from all corners of campus, regardless of their academic backgrounds, the program challenges conventional notions of who can participate in design education and be present in those spaces. This shift towards inclusivity not only democratizes access to design disciplines but also empowers students to explore their creative potential without the constraints of disciplinary boundaries and in a space where the students are supported. As the faculty member above recalled observing an anthropology student engaging with laser cutting technology and contributing to innovative design projects, they celebrate the program's role in dismantling barriers and creating opportunities for all students to design and innovate. Lastly, this program can serve to empower all stakeholders to learn:

“So, I think there's lots of ways to co-teach and co -learn...co learning flows in all kinds of directions, which I think is very empowering, useful and important and lifelong education and also in the something that produces is very important, which is diversifying higher education and opening the academy”.

The comprehensive approach of the M3 program fosters collaboration among students and empowers all stakeholders involved in the educational process. Through co-teaching and co-learning, faculty members and students can exchange ideas, perspectives, and expertise across disciplinary boundaries. This collaborative spirit not only enhances the quality of education but also promotes lifelong learning and professional development. Moreover, by diversifying higher education and embracing inclusivity, the program contributes to opening new avenues for innovation within the academy. As stakeholders engage in this transformative educational model, they become active participants in shaping a more dynamic, inclusive, and impactful learning environment for all.

In the landscape of higher education, traditional disciplinary boundaries often serve as barriers, separating distinct fields of study into silos. At this university, a plethora of academic disciplines flourish across ten distinct colleges. However, breaking down these silos between the colleges and fostering collaboration across disciplines has proven to be a challenge. Yet, amidst this landscape of academic tradition, a shift is underway—a shift propelled by a collective vision of leadership, innovation, and collaboration. Spearheaded by faculty members who recognize the importance and value of transcending disciplinary confines, this university is on a journey of cross-college co-teaching, an approach that extends beyond the traditional structure of the institution. This section explored the power of cross-college co-teaching, where faculty members from diverse backgrounds converge to impart knowledge, inspire creativity, and cultivate a new generation of innovators.

Breaking away from the tradition of disciplinary silos is imperative for several reasons. Firstly, disciplinary silos inhibit understanding complex issues by confining knowledge within narrow boundaries. By breaking down these silos, faculty members can facilitate dialogue and collaboration, enabling students to explore many perspectives. Secondly, transcending disciplinary boundaries is essential for fostering innovation and creativity. By bringing together individuals from diverse fields, cross-disciplinary collaboration encourages the exchange of ideas, methodologies, and approaches, fueling the discovery of novel solutions to real-world problems both for students and faculty alike. Moreover, dismantling disciplinary silos cultivates a culture of inclusivity and openness, where diverse voices and perspectives are valued and celebrated. In doing so, universities can better prepare students to navigate the complexities of a connected world, where collaboration is beneficial and essential for driving meaningful change. Looking ahead, future directions could involve further expanding and institutionalizing cross-college co-teaching programs, integrating them more deeply into the fabric of higher education institutions at natural convergence points of disciplines. Furthermore, the firsthand experience of working across disciplinary borders equips students with the adaptability needed to navigate collaboration. By mirroring real-world dynamics within their educational experience, students are better prepared to thrive in professional environments that require them to work across disciplinary boundaries effectively. The success of this program is evident as faculty have seen students explore outside of their disciplinary backgrounds and learn from each other. Students are using labs and machinery

that have never seen a lab in the Polytechnic before, all due to the cross-college co-teaching initiative. The M3 program is opening doors and extending design spaces to all students on campus.

Furthermore, the M3 program's commitment to inclusivity and diversity in education represents a notable step forward in higher education. By bringing together students from diverse backgrounds and majors, the program fosters a collaborative learning environment that mirrors the complexities of the real world. This inclusive approach can enrich the traditional siloed educational experience for students and can create a culture of innovation. As faculty members witness the innovative outcomes of cross-college co-teaching, from the creation of unique design solutions to the utilization of prototyping technologies by students with varied skill sets, they recognize the transformative potential of breaking down traditional academic silos. All students deserve a chance to design and innovate. Also, the program highlights the importance of opening design spaces within higher education. By opening doors to students from all corners of campus, regardless of their academic backgrounds, the program challenges conventional notions of who can participate in design education and be present in those spaces. This shift towards inclusivity not only democratizes access to design disciplines but also empowers students to explore their creative potential without the constraints of disciplinary boundaries and in a space where the students are supported. The comprehensive approach of the M3 program fosters collaboration among students and empowers all stakeholders involved in the educational process. By diversifying higher education and embracing inclusivity, the program contributes to opening new avenues for innovation within the academy.

4.4.3 Innovation

The M3 program embodies innovation across various domains, including educational approaches, teaching methodologies, and the cultivation of innovative mindsets. This section aims to delve into the multifaceted nature of innovation within the program, particularly focusing on how cross-college co-teaching facilitates transdisciplinary education to foster innovation. By embracing collaborative teaching practices that transcend disciplinary boundaries, the M3 program has effectively fostered innovation in diverse aspects of education and learning. From reimagining traditional teaching methods to promoting collaboration, the program exemplifies a well-rounded approach to innovation that extends beyond the confines of individual disciplines. Through the integration of diverse perspectives and expertise, cross-college co-teaching serves as a catalyst for

creativity, problem-solving, and the development of innovative solutions to real-world challenges. Thus, this section seeks to explore the transformative impact of cross-college co-teaching on fostering innovation across various facets of the M3 program. As a faculty member perceived innovation at this university as:

"I think my sense is that innovation, again, innovation is sort of just defined as sort of doing something better than it's been done before. You know, I think there's innovation that's happening all over [this university], and it's a sort of a highly decentralized kind of effort...we've had some, examples where you can sort of see more purposeful directed innovation... things are, you know, sort of slow moving...my hunch is, you know, most higher education institutions are siloed... I think that there is that those compartments of the university resistant to change, [the university] tends to be a little bit more inward, focused, and different parts of the university tend to focus on competing against themselves, as opposed to being a little bit more outward focused."

The faculty member offers a perspective on innovation within the university context, defining it as the endeavor to improve upon existing practices. They acknowledge that innovation is not centralized but rather occurs organically across various departments and initiatives within the university, however as in the previous sections the structure of the institution along with faculty responsibilities make these types of initiatives easy on paper, difficult in action. However, the faculty member highlights the challenges posed by the decentralized nature of innovation, particularly within a higher education institution characterized by disciplinary silos and internal competition. This decentralized structure, they argue, inhibits cooperation and collaboration, making it difficult to work effectively in transdisciplinary spaces. The faculty member raises concerns about the replication of innovation across different colleges within the university, questioning the efficiency and feasibility of such endeavors. Overall, their insights shed light on the complexities of fostering innovation within the higher education landscape and underscore the importance of addressing structural barriers to collaboration and cooperation.

Additionally, other faculty members view their roles as innovators in the sense of educational innovation:

"So, for me, most of the innovating that I do comes with how I teach my classes, and set up new curricula, and design lessons and that sort of stuff. So, I've been teaching for a couple of decades... but constantly trying to find new ways to do

things that work better, experimenting with activities and assignments for students, and see what works and doesn't work, and then kind of modify and update things as I go along. So that's, that's where most of the innovation and being an innovator, would fall for me”.

This perspective sheds light on the dynamic nature of innovation within academia, particularly concerning pedagogy and curriculum development. Rather than solely focusing on groundbreaking research or technological advancements, some faculty members emphasize innovation in their teaching methodologies and course designs. This approach underscores a commitment to continuous improvement and adaptation, where educators actively seek out novel strategies to enhance student learning experiences. The value of teaching and learning at a research-intensive university can be put on the back burner, therefore, finding faculty members with a passion for educational initiatives makes programs such as the M3, successful in its pursuit of cross-college co-teaching for transdisciplinarity. By engaging in ongoing experimentation and reflection, these faculty members contribute to the evolution of educational practices, ensuring relevance and effectiveness in an ever-changing landscape of teaching and learning. The umbrella of innovation has an immense reach from students and faculty and beyond, when disciplinary boundaries are transcended. At the heart of the M3 program's guiding principles lies the belief that anyone can be an innovator, a philosophy that remains steadfast among the faculty:

“...the mindset at the core, is that we want to democratize the approach to education about innovation, which offers students from all over, opportunities to think about and do innovation, and then give them opportunities to explore innovation through a transdisciplinary approach.”

Central to the foundational principles of the M3 program is the commitment to democratizing innovation education, a philosophy upheld by the faculty. By embracing this mindset, the program aims to make the pursuit of innovation accessible to all students, regardless of background or discipline. This inclusive approach not only fosters diversity but also cultivates a culture where individuals from various backgrounds can engage with and contribute to the innovation process. Through a transdisciplinary approach, students are encouraged to explore innovation from multiple perspectives, enabling them to develop critical thinking skills and creative problem-solving abilities. Thus, the M3 program not only empowers students to become innovators but also instills

in them a broader understanding of the role innovation plays in driving societal progress. This can also be seen in the co-teaching materials learning objectives, where students work to; “*Test innovative ideas*” and “*prototype innovative ideas*” in Prototyping Technology for People: Making Decisions & Thinking Strategically, and in Designing Technology for People: Anthropological Approaches, students work to “*Identify opportunities for innovation*”. Both classes are driven by the notion that anyone can be an innovator as students from diverse disciplines are actively engaging with these learning objectives. Aligning learning objectives with the driving philosophy that anyone can be an innovator is important as it promotes inclusivity and encourages students from diverse backgrounds to participate in the innovation process, regardless of their prior experience or expertise. By emphasizing that innovation is not limited to specific disciplines or individuals, it creates a level playing field where all students feel empowered to contribute their unique perspectives and ideas. Moreover, incorporating objectives such as “*testing innovative ideas*” and “*prototyping innovative ideas*” foster a hands-on, experiential learning approach that allows students to apply theoretical concepts in real scenarios. Additionally, by encouraging students to “*identify opportunities for innovation*” the learning objectives instill a proactive mindset that encourages students to seek out and capitalize on areas where innovation can drive positive change. Overall, by aligning learning objectives with the philosophy that anyone can be an innovator, educators not only empower students to embrace their creative potential but also equip them with the skills and mindset needed to thrive in an increasingly complex and dynamic world. These ideas are emphasized in the experience detailed by a faculty below:

“...we're working on the following hypothesis in a lot of our programming, which is, for most students, they are going to learn best, and especially in these kinds of different ways of thinking. So, when you give someone a problem where there's a correct solution...you have eliminated pathways of learning, and, and opportunities to engage in kind of desirable difficulties that moves students away from innovative thought and toward algorithmic thought...and so the more we set up learning opportunities that give students opportunities to practice completing algorithms. The worst we're doing and preparing for the workforce, they're going to go into...to inculcate that among students you put them in circumstances, over and over and over again, where they've got to try and solve a problem, where there's no clear answer...that can look like case discussions that can look like innovation labs where you're trying to solve a larger societal problem, etc., but, but none of those have answers to them”.

The quote highlights the importance of open-ended problems in fostering deeper student learning and innovation. By presenting students with problems that lack a single correct solution, educators create opportunities for diverse thinking and innovation to flourish. Open-ended problems challenge students to explore ambiguity, encouraging them to use various approaches, experiment with different strategies, and embrace uncertainty. Moreover, by immersing students in environments where they must navigate uncertainty, such as case discussions or innovation labs, educators cultivate resilience and adaptability, qualities crucial for thriving in a rapidly evolving workforce, which in turn brings back value to higher education for some. Thus, the emphasis on open-ended problems not only enriches student learning experiences but also equips them with the mindset and skills necessary for tackling the workforce with confidence.

Another faculty member proposed that there should be a common core for innovation, and that's how students should be taught such skills:

“I think there should be a common core for everybody to be thinking about innovation. It because who, what area doesn't want to innovate in some way?”

While the notion of implementing a common core for innovation in higher education may appear appealing on the surface, it overlooks the nature of innovation across different disciplines. The landscape of higher education is incredibly diverse, with each field possessing its own unique challenges, methodologies, and approaches to innovation. A one-size-fits-all approach fails to acknowledge these differences and risks diluting the depth and specificity of innovation education. Furthermore, imposing a standardized curriculum for innovation neglects the importance of transdisciplinary collaboration and the integration of discipline specific knowledge into innovative practices. Innovation is inherently context-dependent, and what constitutes innovation in one discipline may not necessarily translate to another. Therefore, instead of a rigid common core, a more effective approach would involve providing students with opportunities for transdisciplinary exploration and guidance that aligns with the specific objectives in their respective fields. Furthermore, as innovation can look different a faculty member wondered:

“...what does it mean to teach innovation? I think, is sort of probably the most underdeveloped sort of component is my sense, I think just more broadly speaking, if you were to sort of say, you know, who are the community of scholars, and focus

on it, it's not in trying to pull them together, I think we have we have real strength in these areas. And I think we can, we can, we can continue to sort of evolve them by trying to join them up”.

The quote reflects a faculty member's contemplation on the complexity of teaching innovation and the need for further development in this area. By questioning what it truly means to teach innovation, the faculty member highlights a common challenge faced in academia: the lack of a cohesive understanding or framework for innovation education. Despite strong expertise in various disciplines related to innovation, there seems to be a fragmentation that inhibits the effective teaching and integration of innovative practices. The faculty member suggests there is untapped potential in bringing together scholars from diverse backgrounds to advance innovative education. By fostering collaboration and synergy among these scholars, there is an opportunity to enhance the teaching of innovation and develop a more comprehensive and cohesive approach that benefits students and contributes to societal progress. Thus, the quote underscores the importance of collaboration and transdisciplinary dialogue in shaping the future of innovation education.

It can additionally be challenging when some colleges are perceived as maybe not thinking about innovation as recognized by a faculty member:

“The bad side is that they tend to be limited to certain groups, or there are certain elements or not elements there are certain major majors or departments that they're not going to do a lot of thinking about innovation, even though they could, that the philosophy, you know, the philosophy department within liberal arts might not be thinking about innovation”.

Cross-college initiatives are crucial for teaching innovation because they foster collaboration and inclusivity across diverse academic disciplines. As highlighted by the faculty member, the challenge of creating a common core class for innovation arises from the perception that certain colleges or departments may not prioritize or engage with innovation as extensively as others. This disparity can result in missed opportunities for transdisciplinary exchange and hinder the development of innovative thinking skills among students. By implementing cross-college initiatives, universities can bridge these gaps and promote a culture of innovation that transcends traditional disciplinary boundaries. Such initiatives facilitate knowledge sharing, collaboration, and the exchange of diverse perspectives, enriching the learning experience for students and enabling them to tackle complex real-world problems from a multidimensional standpoint.

Additionally, cross-college initiatives encourage faculty members from different disciplines to collaborate on curriculum development and pedagogical approaches, ensuring that innovation education remains relevant, inclusive, and accessible to all students, regardless of their academic background. Overall, cross-college initiatives play a vital role in cultivating a dynamic and forward-thinking academic environment where innovation thrives and flourishes across all disciplines. The value as perceived by a faculty member is as follows:

“I also think there's an opportunity to have depth. I don't think you can take one class with an anthropologist and an environmental scientist and say, I'm an expert in both right like, it does take more than that, which is why we have minors and why we have a major...I think a fun benefit of this class is that it brings students together who would otherwise never take classes together. And I think in co-teaching environments...we're having educators from both courses in the classroom, and I think having these students collaborate, right like the debilitating menstrual pain who won last semester they had an environmentalist on their team. They also had an industrial engineer, right? Like they have these people who otherwise never would have crossed paths, working together, coming up with a great innovation.”

Having diverse thinkers around is invaluable for innovation as it fosters depth of understanding and collaboration across disciplines. As expressed by the faculty member, the richness of innovation education lies in the interaction between individuals with varied expertise and perspectives. While it may not be feasible to achieve expertise in multiple fields through a single class, the opportunity for collaboration enhances the learning experience. Through collaboration, students gain insights from different fields, sparking creativity and generating novel solutions to complex challenges. Ultimately, the collaboration between students and educators from various disciplines not only enhances the quality of innovation but also cultivates a culture of inclusivity, creativity, and mutual respect. This is echoed in another faculty's testament below:

“The benefits are that, you get points of view that you would not get exposed to otherwise, both from instructors, and from peers, you learn about things in different ways than you would have approached them otherwise...It also allows them opportunities to innovate, or to explore new ideas that they wouldn't have had.”

The sentiment expressed by another faculty member reinforces the importance of collaboration and diverse perspectives in fostering innovation within educational settings. By bringing together instructors and peers from various backgrounds, students are exposed to many viewpoints that challenge their conventional ways of thinking and encourage them to approach problems from fresh angles. This exposure not only broadens their understanding but also ignites their creativity, enabling them to explore unconventional ideas and solutions that they may not have considered otherwise. Furthermore, the collaborative environment provides students with the freedom and encouragement to innovate, fostering a sense of ownership and empowerment in their learning journey. Ultimately, the synergy between diverse perspectives and the freedom to innovate cultivates an inclusive community where students are inspired to push the boundaries of knowledge and make meaningful contributions to their fields and society. As a faculty member pointed out, teaching innovation goes beyond what is typically done in a classroom:

“Specifically with regard to innovation and exposing students to a new way of thinking about life so it's not just rote memorization or facts and figures, but it's more about changing a mindset about how to approach the world and how to think about problems and how to address them and propose solutions, and innovation, or innovation learning would be at the heart of that...those are ways that we could transform not just education but the people involved in education to approach life in a different way, specifically with innovation at the heart of it.”

The faculty member's insight stresses the transformative potential of innovation education beyond the confines of traditional classroom instruction. By emphasizing the importance of fostering a new mindset and approach to life, the faculty member highlights that innovation education extends far beyond rote memorization or the acquisition of factual knowledge. Instead, it seeks to instill in students a broader understanding of how to navigate the complexities of the world, tackle challenges, and propose creative solutions. Innovation learning becomes not just a subject but a guiding principle that shapes individuals' perspectives and attitudes towards problem-solving and critical thinking. This approach to education has the power to not only revolutionize teaching methods but also empower individuals to embrace innovation as a fundamental aspect of their personal and professional lives. Thus, innovation education becomes a catalyst for broader societal change, fostering a culture where creativity, adaptability, and forward-thinking are celebrated and encouraged at every level of education and beyond.

However, for innovation prospects to be helpful faculty mentions different skills that could benefit future innovators:

“...if someone's going to be an innovator, to learn about these things that are less familiar to them and how people have different ways of doing and thinking about things and I guess being both attuned to these differences and caring about them...people are paying attention to a bigger range of possibilities, and I think for the most part, they feel empowered by that. I think it's important for students who are going to be innovative, to be curious and to be encouraged to be curious about all the different ways of being and doing things in the world. And since we're talking about true innovation let's say and beyond. I think we need to cultivate independent thinking and tenacity ...that's often times where true innovation is... and I guess the last thing is helping people learn how to communicate about what's innovative and how to actually make it happen. So, these are related and different skills to have that could be valuable to being an innovator... helping people to come together who recognize and appreciate these forms of innovation and be innovative and powerful combinations, and how you can have a good learning environment and community that supports all of that and sets up a foundation for lifetime learning.”

The quote emphasizes the importance of creating an environment that fosters curiosity, celebrates diversity, and promotes independent thinking—essential qualities for nurturing innovation among students and faculty. By acknowledging and embracing the inherent differences in how people approach problems and think about the world, individuals are encouraged to explore a broader range of possibilities, expanding their creative horizons and empowering them to innovate. This openness and inclusivity enrich the learning experience and cultivate a sense of empowerment and agency. Moreover, the quote underscores the importance of independent thinking, recognizing that true innovation often emerges from the ability to challenge the status quo and persist in the face of adversity. By instilling these values and skills, educators within the M3 program lay the groundwork for a community of lifelong learners who are equipped to navigate the complexities of the modern world and drive meaningful change through innovation. In addition to fostering individual growth, the quote emphasizes the importance of building a supportive learning environment and community that nurtures innovation collaboratively. By bringing together individuals who appreciate and value diverse forms of innovation, such as independent thinking, curiosity, and effective communication, a synergistic environment is created where ideas can flourish and evolve. This collaborative spirit not only enhances the quality of innovation but also fosters a sense of belonging and collective purpose within the community. Furthermore, by

promoting open dialogue and exchange of ideas, students and faculty can learn from each other's experiences and perspectives, enriching their understanding and catalyzing new insights and discoveries. Ultimately, by establishing a learning environment and community that champions innovation and fosters collaboration, educators set the stage for continued growth and success, empowering individuals to make a lasting impact on the world through their innovative endeavors. However, in order to achieve instilling the mindset of independence, communication, and life-long learning, students need scaffolding because they are coming from the traditional education setting:

“I think, innovative education needs to probably have a competency in that to show how things scaffold on...I think that design innovation minor probably does it better than anyone else at the moment...you can take your ideas across classes, you'll know that innovation is not going to occur in a 16-week class, in terms of birth of the idea to the product on the table. It's going to take time and I think that's where undergraduate education, will, will work is somewhere along the lines of deciding where that time starts, how that fits into a sequence of classes. And I think that will mature out of the time. That's how I think it will change an undergrad education a little bit more programmatically, integrated, as opposed to how you can take a design innovation minor, and you slot it in when you feel I think there should be a little bit more”.

Scaffolding innovation is essential for students transitioning from traditional education settings to embrace the mindset of independence, communication, and lifelong learning necessary for innovative thinking. As highlighted by the faculty member, innovative education requires a structured approach to building competencies and skills that scaffold upon one another. Programs like the design innovation minor exemplify effective scaffolding by providing students with opportunities to develop and refine their innovative ideas across multiple courses. This iterative process allows students to understand that innovation is not confined to a single semester but requires time and ongoing effort to evolve from conception to realization. However, students have taken the classes out of order, or will take on class but not the other due to meeting graduation requirements. Nonetheless, by integrating innovation education into undergraduate curricula in a more cohesive and programmatic manner, educators can better prepare students for the complexities of the innovation process and equip them with the skills to work in dynamic environments. Furthermore, scaffolding innovation within undergraduate education entails reimagining the sequencing of classes to facilitate a more integrated and holistic learning

experience. Rather than treating innovation as an isolated discipline or minor, there is a need to embed innovation principles and practices across various courses and disciplines. This integrated approach ensures that students receive consistent exposure to innovative thinking and problem-solving methodologies throughout their academic journey. By strategically designing curricula that emphasize cross-disciplinary collaboration and project-based learning, educators can create immersive learning environments where students learn to apply innovative concepts in real-world contexts. Ultimately, scaffolding innovation in undergraduate education equips students with the necessary skills and competencies and also creates a culture of innovation. A faculty member attributes this to:

“I think that it's not only the people that create the innovation. It's the organizational culture that enables that innovation to occur. ...it's enabling people to think outside the box...and be free thinkers in terms of coming up with solutions.”

Creating a community of innovators hinges not only on the individuals within the organization but also on the organizational culture that fosters and sustains innovation. As highlighted by the faculty member, it is the synergy between people and the enabling environment that catalyzes innovation. By nurturing a culture that values creativity, encourages risk-taking, and embraces diverse perspectives, organizations empower individuals to think outside the box and generate groundbreaking solutions to complex problems. This shows the extent to which the M3 program has reached, it goes beyond the student level, and faculty members are now being innovative within their own departments, fostering a sense of freedom and autonomy in decision-making. This empowers faculty and potentially other stakeholders to explore unconventional ideas and approaches without fear of repercussion, fostering a spirit of innovation and experimentation. Ultimately, it is the combination of visionary individuals and an organizational culture that prioritizes innovation that paves the way for transformative breakthroughs and drives sustained success in higher education. In their pursuit of innovation, the faculty member emphasizes the importance of striking a balance between two contrasting perspectives, as articulated in the following quote:

“we're hoping to find a place in the middle, where it can appreciate and value both sides because the most innovative and most disruptive technology comes from understanding and valuing both sides of the house.”

The faculty member's sentiment shows the approach required for fostering innovation within any field. By acknowledging and valuing the diverse perspectives represented by different "sides of the house," whether they be traditional methods or cutting-edge technologies, individuals can tap into a rich source of creativity and insight. Rather than viewing these perspectives as diametrically opposed, the faculty member advocates for finding a middle ground where the strengths of each approach can be leveraged to drive innovation forward. Indeed, it is often at the intersection of tradition and innovation that groundbreaking advancements occur, as the synthesis of old and new ideas sparks novel solutions to complex problems. In embracing this balanced approach, individuals can unlock the full potential of their creativity and contribute to the development of truly transformative technologies and ideas. This is echoed in the following faculty quote:

“I think it's good to have diversity of thoughts in the classroom, if you're going to understand different people's perceptions, right. And those perceptions are going to come from having people that think differently...if you got a whole bunch of people in the room that think the same way, then your product or your innovation is going to look the same way...if you have someone say, like from anthropology, or from liberal arts, or from UX, or from someone that isn't looking like you, then you might come up with a better product. And that comes by having different people in the classroom with differing opinions, regardless of what you may think of their opinion. Because when you fast forward that into the real world, to get the best product, you need to have diversity of thought, and background.”

The faculty member's perspective demonstrates the role of diversity in fostering innovation within higher education. As the faculty member suggests, diversity of thought is essential for understanding different perceptions and generating innovative solutions to complex problems. When students are exposed to a range of viewpoints, whether from anthropology, liberal arts, UX design, or other fields, they are challenged to consider alternative perspectives and approaches. In today's society, where innovation often arises from the convergence of multiple disciplines, fostering diversity in higher education is not just desirable but imperative for driving meaningful progress and addressing the multifaceted challenges of the future. Thus, by embracing diversity of

thought and background in the classroom, educators lay the foundation for a culture of innovation that empowers students to make a positive impact in their fields and beyond. However, it is still of the utmost important to have a disciplinary understanding and a disciplinary home. Understanding the fundamentals of a discipline lays the groundwork for innovation; as one faculty member suggests, it is only by mastering the rules that individuals can break free and unleash their creative potential.

“...you break the students down; you teach them the rules. And then you say, now disregard everything I said, and come up with your own way of working. And it's the last part that leads towards innovation. How can an architect be innovative if they don't know how concrete and steel and glass work? How can a designer be innovative if they don't know the rules of how the elements and principles of design work, design history, design theory? You have to learn all those things so that then you can break free. And that is where innovation comes in. Innovation doesn't happen until that part; all the parts before are preparing you to be innovative. But if you're not careful, and if you don't do the last part, you will just be a sort of a boring robot. You won't ever do anything innovative; you'll just be regurgitating old, tried and true ideas...but innovation comes by rediscovering what you started the training process with but reinforced by a clear and solid understanding of the basic principles of your discipline”.

Foundational training serves as the cornerstone for fostering innovation within any discipline. As articulated by the faculty member, mastering the fundamental rules and principles of a field is essential for individuals to develop a deep understanding of their craft. While championing transdisciplinary opportunities the value of disciplinary expertise is still present. For students and faculty members in various fields, foundational knowledge provides the necessary framework upon which innovative ideas can be built. Understanding the intricacies of one's specific field equips individuals with the tools to push boundaries and explore new possibilities. A deep understanding can lead to sharing in collaborative settings, sparking innovation. This comprehensive understanding instills confidence and competence, empowering individuals to break free from traditional norms and conventions. However, innovation does not occur solely through adherence to established rules; rather, it flourishes when individuals possess the expertise to challenge and transcend these boundaries. By encouraging students to question, experiment, and reimagine existing paradigms, educators pave the way for true innovation to emerge.

Thus, while foundational training provides the scaffolding for innovation, it is the willingness to push beyond these limitations that ultimately leads to groundbreaking advancements and transformative change within a discipline. The imperative for innovation can be seen as important throughout academia, as highlighted by the insights of a faculty member:

“what I can see is that gets more embedded into more times of study and degrees, as each respective area feels that they need to be innovative, or to deal with new things that are coming in at such a pace now that we equip students to be able to be innovative in an environment where they can thrive when they get out...we have a long history of this and we're not in any way a follower. I think we're a leader in this area...But as I said before, I think innovation is much broader than that. And so I think it's ready every student should be aware of how to be innovative, whether that's organizational change, or whether that's implementing new software or developing new software or apps or whatever the next greatest thing is, and to kind of tie all of that in so I think that's kind of where I believe that education will move”.

As education continues to evolve in response to the rapid pace of change in today's world, innovation has become a cornerstone of academic pursuits across all disciplines. The insights shared by the faculty member underscore the growing recognition that fostering innovation is essential not only for individual success but also for the competitiveness of academic institutions as a whole. Indeed, as new technologies and methodologies emerge, there is a heightened expectation for graduates to possess the skills and mindset necessary to navigate and contribute to the workforce. Furthermore, the faculty member's emphasis on the broad scope of innovation highlights the need for education to encompass not only technical skills but also the ability to drive organizational change and adapt to emerging trends. In this way, education is not simply about imparting knowledge but rather about equipping students with the capacity to think critically, solve problems creatively, and lead innovation in their respective fields. As such, the future of education lies in empowering every student to embrace innovation as a fundamental aspect of their learning journey.

Overall, the insights shared by stakeholders show the growing recognition that fostering innovation is essential for student success and the competitiveness of academic institutions. Indeed, as new technologies and methodologies emerge, there is a heightened expectation for graduates to possess the skills and mindset necessary to navigate and contribute to the workforce. Furthermore, the faculty member's emphasis on the broad scope of innovation highlights the need for education

to encompass not only technical skills but also the ability to drive organizational change and adapt to emerging trends. In this way, education is not simply about imparting knowledge but rather about equipping students with the capacity to think critically, solve problems creatively, and lead innovation in their respective fields. As such, the future of education lies in empowering every student to embrace innovation as a fundamental aspect of their learning journey. This perspective is echoed in the faculty member's observation that innovation is becoming increasingly embedded across different areas of study and degrees, reflecting a broader shift towards cultivating innovative mindsets in higher education. As institutions strive to equip students with the skills, the need for innovation becomes more important in academia. The stakeholder's recognition of innovation's multifaceted nature, encompassing everything from organizational change to software development, underscores the need for education to evolve along with the demands of the world. By fostering a culture of innovation and providing students with the tools and opportunities to explore new ideas and technologies, universities can prepare graduates to excel in the global economy. Thus, as education continues to adapt to meet the challenges and opportunities, innovation will remain at the forefront, shaping the future of learning and driving meaningful progress in society..

4.5 The Encore

This section labeled The Encore represents where the M3 program and its stakeholders can go next in terms of continuing with cross-college co-teaching for transdisciplinarity in the pursuit of innovation. The sections consist of Professional Development Opportunities, Shared Language, Teacher Transformations, Sustainability, and Creating a Community of Transformation.

4.5.1 Professional Development Opportunities

At the heart of the M3 programs' success lies a commitment to fostering a dynamic learning environment. The M3 program dedicates a week during the summertime to facilitate discussions and progressions within the program. This time serves as a platform for co-teachers to address challenges, celebrate successes, and strategize for the upcoming school year. While these summertime meetings are valuable, they are not the sole professional development opportunity that the co-teachers think are necessary. Continuous meetings are crucial to delve into co-teaching

dynamics concerning enrollment, funding, and establishing a collective understanding among stakeholders. Administrators and educators alike recognize the necessity of robust faculty development programs to ensure a shared understanding of key concepts like team teaching and transdisciplinarity, particularly for new faculty members. As such, the importance of nurturing a culture of mutual respect, open communication, and inclusive collaboration cannot be overstated. Moreover, interviews underscored the necessity of clarifying expectations regarding co-teaching within the M3 program. Administrators stress the importance of having robust and required faculty development programs to ensure a common understanding of terms like team teaching and transdisciplinarity. These programs are essential for creating a level playing field and fostering effective collaboration among faculty members. This is particularly vital for new faculty members who may lack prior familiarity with the courses. Defining what team teaching and transdisciplinary approaches entail is essential. Providing dedicated time for faculty development allows educators to collaboratively design courses, ensuring a truly distinctive and enriching experience for both faculty and students.

"it's extremely important that we provide professional development opportunities for faculty..."

and

"...give them some time to go through this faculty development..."

These quotes show the need to provide faculty with robust professional development opportunities, enabling them to grasp the intricacies of team teaching and transdisciplinarity. This involves engaging in meaningful discussions to gain a comprehensive understanding of these concepts and how they can be effectively put into practice. It's evident that when there's a turnover in faculty or when a faculty member transitions into a new role without clear expectations, gaps in understanding can arise. For instance, the new faculty member who co-taught one of the observed classes, missed the summer retreat and lacked official professional development on the M3 program's goals and initiatives, which resulted in struggle to fully integrate into the program. This highlights the importance of ongoing professional development for instructors, benefiting both faculty members and students alike. Failure to comprehend the driving philosophy behind the M3

program can lead to a lack of alignment in its implementation, as observed in instances involving co-teaching between both experienced and new faculty members. Therefore, prioritizing professional development opportunities is essential for enhancing faculty efficacy and ensuring the students receive and the co-teachers provide true transdisciplinary experiences. Moreover, fostering an environment where faculty members can set aside personal barriers, particularly ego, is paramount for successful collaboration. It necessitates creating mutual respect for each other's expertise and a readiness to compromise in pursuit of the common goal of enhancing the course and benefiting the students. Creating a space where both new and experienced faculty members feel empowered to share their thoughts is crucial. This inclusivity ensures that diverse perspectives are considered, enriching the collaborative process. It also encourages open communication and the exchange of ideas, ultimately leading to more innovative and effective teaching strategies.

The following quote not only shows the importance of humility and cooperation but also emphasizes the strategy that co-teachers employ to foster a collaborative and supportive environment where every voice is valued and heard. Such an approach not only strengthens the bonds between faculty members but also enhances the overall learning experience for students. This quote highlights a strategy co-teachers embody to work together and allow for other disciplinary perspectives to be implemented into courses:

"...deal with the cliché that many people say you know, check your ego at the door... I have to respect, anthropology, enough to say, I'm going to give you talk time, and it's going to it's going to carve into my design time..."

Prioritizing professional development opportunities is imperative for enhancing faculty efficacy and ensuring students receive authentic transdisciplinary experiences. This necessitates fostering an environment where personal barriers, particularly ego, are set aside in favor of collaborative cooperation. By cultivating mutual respect for each other's expertise and creating a space where both new and experienced faculty members feel empowered to contribute, the collaborative process becomes enriched with diverse perspectives. The quote provided underscores the importance of humility and cooperation, highlighting a strategic approach employed by co-teachers to promote inclusivity and innovation in teaching strategies. Embracing this ethos not only strengthens faculty bonds but also enhances the overall learning journey for students, ensuring a truly enriching educational experience.

Furthermore, the necessity of foundational training in respective fields, such as anthropology, is important. Training will prepare faculty with essential knowledge but also teaches them structural thinking to understand the driving philosophy of the program. Additionally, providing full credit for the course and establishing clear expectations are vital to ensuring faculty commitment. Offering incentives and framing collaboration as a professional development opportunity can encourage active participation and engagement.

“That's why they need to get full credit for the three credit hours of the course. Because you want them in that course at all times. And so, you need to create what the base expectations are, common framing of how we go about doing this as a professional development piece becomes very, very important.”

In summary, comprehensive training not only equips faculty with necessary knowledge but also fosters a deeper understanding of the program's guiding philosophy. Additionally, providing full credit for the course and establishing clear expectations are crucial for securing faculty commitment. Recognizing the importance of incentivizing participation, offering full credit for course hours ensures faculty's continuous engagement and investment in the program. By framing collaboration as a professional development opportunity, educators are encouraged to actively participate, ultimately enhancing the effectiveness and success of the program. As highlighted in the quote, establishing common expectations and a shared framework for collaboration is essential for maximizing the impact of professional development initiatives and fostering a culture of continuous improvement within the faculty community. In conclusion, the journey towards achieving true transdisciplinary education within the M3 program is a collaborative endeavor that demands continuous investment in professional development and a commitment to shared goals. As highlighted by the data provided, full credit for course participation and establishing clear expectations are vital steps towards securing faculty commitment and engagement. By framing collaboration as a professional development opportunity and fostering an environment where diverse perspectives are valued and encouraged, the program ensures not only the enhancement of faculty efficacy but also the delivery of authentic and enriching learning experiences for students. This ethos of collaboration and continuous improvement serves as the cornerstone of the M3 program's success, paving the way for innovation and excellence in higher education.

4.5.2 Shared Language

In relevance to transdisciplinarity and the M3 program, the concept of shared language extends beyond linguistic proficiency to encompass a sharing of disciplinary languages, facilitating communication across cultural and disciplinary boundaries. This shift reflects the evolving demands of the contemporary workforce, where the ability to innovate and navigate diverse career paths is paramount. Faculty members, therefore, recognize the importance of adopting common languages and lenses, such as design innovation and entrepreneurship, to facilitate transdisciplinary collaboration and undergraduate learning transformation. Faculty members articulate the necessity of embracing new cognitive capacities to adapt to the evolving landscape of education and work. They emphasize the importance of equipping students with the skills required for innovation and self-driven career development. By offering a shared framework for problem-solving and creativity, faculty have thought that students can be better prepared to navigate diverse career opportunities and contribute meaningfully to their respective fields.

“This is how the world of work is going to be and they're going to need to innovate themselves and their career fields as they go. And that's going to require some common language, I think the design innovation, entrepreneurship, like that offers a common”

In embracing the notion that students must innovate themselves and their career fields as they navigate an evolving professional landscape, faculty emphasize the importance of cultivating a common language, preparing students for opportunities and meaningful contributions to their respective fields.

Moreover, faculty members themselves grapple with the challenges of transdisciplinary collaboration, likening it to learning a new language. Collaborative endeavors, particularly in securing grants for transdisciplinary projects, require faculty to transcend traditional disciplinary boundaries and adopt a well-rounded approach to research and innovation. This shift in mindset represents a crucial departure from conventional academic practices, highlighting the need for ongoing professional development and support mechanisms to facilitate successful collaboration across disciplines.

“We are seeking faculty to get together and do transdisciplinary kinds of things. It's almost like speaking another language”

As faculty articulate the necessity of collaborative transdisciplinary endeavors, likening them to learning a new language, they emphasize the imperative for professional development and support mechanisms to facilitate successful collaboration across disciplines. Establishing a shared language in academia underscores the complexity of communication and collaboration across disciplinary boundaries. While the concept is widely embraced, mastery of multiple disciplinary languages remains an ongoing challenge for faculty and students alike. As the demands of the workforce continue to evolve, there is a growing recognition of the need to cultivate new cognitive capacities and adopt common languages, such as design and innovation and entrepreneurship, to foster transdisciplinary collaboration and undergraduate learning transformation. In the collaborative efforts observed there is a dynamic exchange where faculty members bring forth their perspective, enriching discussions with diverse insights and expertise. As a faculty member recalls:

“I noticed in our collaboration is we always had that back-and-forth chime in, you know, offer the perspective of your field, but I think we do more filling in the blanks...we might be talking in the afternoons like, oh, this would be a good thing to add. But more interestingly, I might say something about design or [the co-teacher] might say something about anthropology where you really see that the other person has spent more time with of other areas as well is more seasoned in that in thinking that way”.

The insights shared by the faculty member are important for transdisciplinary collaboration in educational settings, particularly when teachers converge from different disciplines. By incorporating multiple fields, instructors can address complex topics from various angles, providing students with a more comprehensive understanding of the subject matter. This collaborative approach enhances the depth and breadth of learning and fosters critical thinking and problem-solving skills as students engage with diverse perspectives. Furthermore, the faculty member's observation highlights the value of mutual learning and knowledge exchange in collaboration. This mutual exchange not only benefits teachers personally but translates into more engaging instruction for students, as they are exposed to a broader range of ideas and viewpoints.

Thus, embracing collaboration allows teachers to capitalize on the strengths of each discipline while promoting a culture of continuous learning and innovation in education.

In conclusion, the sharing of vocabulary emerges as a critical element in fostering transdisciplinary collaboration within the M3 program and beyond. Shared language extends beyond linguistic proficiency to encompass fluency in disciplinary languages, facilitating communication across disciplinary boundaries. While mastery of multiple disciplinary languages remains a challenge, faculty members recognize its importance in preparing students for the demands of the workforce. As faculty and students navigate collaborative endeavors, likened to learning a new language, they emphasize the imperative for ongoing professional development and support mechanisms to facilitate successful collaboration across disciplines. The insights shared by faculty members underscore the importance of embracing diverse perspectives and expertise in educational settings, enriching discussions and enhancing the depth and breadth of learning for all involved. Thus, the sharing of vocabulary serves not only as a means of communication but also as a catalyst for transformative change and innovation in academia and beyond.

4.5.3 Teacher Transformations

The discussions among faculty members highlight the transformative nature of collaborative teaching experiences, where individuals from diverse backgrounds and disciplines converge to create a unique educational community. Faculty members express appreciation for the openness to suggestions and the integration of diverse perspectives, fostering a sense of collegiality and mutual respect. As the faculty members navigate the intricacies of co-teaching, they acknowledge both the challenges and rewards of balancing responsibilities and integrating their expertise into existing frameworks. Through this process, the instructors undergo personal and professional growth, expanding their teaching methods and gaining insights into disciplines beyond their own. These collaborations improve the standard of teaching as educators learn from one another and refine their instructional methods over time. Ultimately, collaborative teaching experience serves as a catalyst for innovation, pushing educators to explore new methodologies, engage in transdisciplinary dialogue, and nurture a community of lifelong learning within academic communities. Transitioning from the broader implications of collaborative teaching, one faculty member reflects on pivotal moments that reshaped their approach to education,

emphasizing the importance of intentional pedagogy and preparing students for real-world applications:

“I had a couple of really important moments in my understanding of what I was doing. And it really came from when I stopped just following a syllabus that somebody had handed to me and started thinking to myself about this a little bit...Why don't I choose to teach the things in a way that enables me to force students into using certain tools that will be useful to them when they finish, right...you're going to be developing a set of ancillary skills in the process that are more transferable to the workforce...for me as a faculty member recognizing that we can make choices that are all equally valid in terms of how we teach a subject, but some of which are better than others in terms of the kinds of, you know what enables students to do on the on the on the back end...I actually want to know what's going to be valuable on the back end...I've been in the academy for 30 years, so like what the hell do I know about what companies need. So, that's when you start sort of at sort of going to companies and asking the question like, What is a set of skill sets or ways of thinking or what have you, that would actually better prepare students to be not just to get the first job, and succeed at it but kind of put them on the right career path way.”

The insights shared by the faculty member demonstrate the fundamental shift in the teaching approach within academia, emphasizing the need to move beyond traditional syllabi and embrace a more intentional teaching methodology. By questioning the status quo and reevaluating the curriculum's effectiveness in preparing students for the workforce, the faculty member shows the importance of aligning educational goals with real-world applications, transforming from traditional teaching practices to one that will build students skills. This shift towards practical, applied learning can equip students with the tools for success in their careers. As well as fostering the development of transferable skills that are beneficial in the job market. It represents a transformative moment wherein educators recognize their role in shaping students' trajectories beyond the classroom, emphasizing the value of experiential learning and industry-relevant skills. Furthermore, the faculty member's journey reflects a broader transformation in the perception of education's purpose, from solely disseminating knowledge to actively preparing students for their professional lives. By engaging with industry partners and seeking input from companies, educators are the ones who bridge the gap between academia and the workforce, ensuring that students graduate with the skills and competencies needed to thrive in their chosen fields. The faculty member's realization serves as a catalyst for reimagining pedagogical practices,

emphasizing the value of practical, applied learning in preparing students for successful careers and fulfilling lives beyond graduation. Involving educators with this mindset into co-teaching classes, the students will be at the center of their learning. Co-teaching creates a dynamic environment where teachers and students are learning from each other. A faculty member fondly discussed what the evolution of co-teaching was like:

“So, I think it's only improved my teaching, I can learn better ways of doing things. New ideas I never would have thought about before. And it actually makes the course continuously evolve rather than stay stagnant to, because you're pushing each other.”

Participating in collaborative teaching experiences enhances individual teaching practices and fosters continuous development among educators. As expressed by a faculty member reflecting on their co-teaching journey, the process has enriched their teaching approach. By engaging in dialogue and sharing ideas with co-teachers from different disciplines, educators are exposed to novel perspectives that inspire new approaches to instruction. This collaborative dynamic encourages experimentation and pushes educators to constantly evolve their teaching, ensuring that courses remain responsive to changing needs. Moreover, the mutual exchange of insights and feedback between co-teachers stimulates professional growth, allowing educators to refine their pedagogical techniques and embrace new practices that enhance student learning outcomes. Thus, co-teaching becomes a transformative experience where educators not only enjoy the process of co-teaching but also embrace innovation as a fundamental aspect of their professional development.

Furthermore, a faculty member describes their time co-teaching as an on-going learning experience:

“And I also think as an educator like it's really enriching, because there's many things that like I've learned from [the co-teacher] you know, as I watch him teach about design that I have wasn't exposed to in anthropology so for me, it's an ongoing learning experience.”

Engaging in co-teaching partnerships not only benefits students but also fosters lifelong learning among educators. As articulated by a faculty member, their co-teaching experience was

collaborative, providing continuous opportunities for growth. This ongoing exchange of knowledge and insights stimulates curiosity and encourages educators to remain open to learning throughout their careers. By embracing co-teaching as an ongoing learning experience, educators cultivate a mindset of curiosity and adaptability, constantly seeking out opportunities to expand their knowledge and refine their practices. Thus, co-teaching becomes a vehicle for lifelong learning. The co-teaching also becomes the way faculty thinks innovation education should be taught, for example, a faculty member had said:

"...it's just like innovation that's broad ...I couldn't do it alone too you know I don't think it's as strong".

Co-teaching emerges as a pivotal strategy for fostering innovation in education, enabling faculty to merge their individual expertise into a cohesive, impactful learning experience. The sentiment expressed by a faculty member eloquently underscores the collaborative essence of innovation education, highlighting the expansive nature of innovation that necessitates a collective effort. As faculty members recognize the limitations of teaching alone, they increasingly value the collaborative potential of co-teaching to enhance the strength and depth of their instructional endeavors. Through this collaborative approach, faculty members not only enrich the educational environment with diverse perspectives and ideas but also demonstrate a shift in mindset towards embracing teamwork and collaboration. This transformation demonstrates a profound evolution in the way faculty perceives teaching innovation, emphasizing the transformative power of cross-college co-teaching to elevate the quality and effectiveness of education delivery. In the realm of academia, faculty members often find themselves entrenched in their own perspectives and methodologies, yet as one faculty member observes, the benefit of collaboration lies in the opportunity to break free from this fossilization and explore alternative approaches:

"We can all get a little let's call it like fossilize in our own perspective like this is how I would do this, write about this, and get it out you know. It's the benefit of being with other people, thinkers, doers, is that they go other ways...I'm always interested in people's ways of doing things...I think it's just being open to certain settings. I think earlier on I wouldn't have imagined myself in or having any kind of comfort level in or holding my own ground."

In the realm of academia, faculty members often find themselves entrenched in their own perspectives, guided by habitual ways of thinking and working. However, as one faculty member observed, the opportunity to collaborate with diverse thinkers and doers offers a refreshing departure from this intellectual stagnation. By engaging with individuals who approach problems from alternative angles, faculty members are encouraged to step outside their comfort zones and explore new avenues of thought and action. This exposure to different ways of doing things not only broadens their horizons but also fosters a spirit of openness and adaptability. Consequently, the co-teachers have become more adept at navigating unfamiliar settings and holding their own ground, confident in their ability to contribute meaningfully to discussions and initiatives beyond their traditional scope of expertise. Through this ongoing process of exploration and collaboration, faculty members continue to evolve, embracing change and innovation as essential components of their professional growth and development in academia. Reflecting on the evolving dynamics of their collaboration, a faculty member shares insights into the mutual influence and growth experienced with their co-teacher, highlighting the unexpected but enriching transformation that has occurred:

“So sometimes [co-teacher] and I joke about how I'm becoming a little bit more like her with people centered stuff, and sometimes she'll pull back and she's more technical in or design focused in nature, which I think that's kind of cool. You know, you'd never, you never would have thought that was going to happen. And so, I think those kinds of things are, are good.”

The faculty member's reflection shows the value of transformation within collaborative endeavors. As they navigate their evolving roles and dynamics with their co-teacher, they recognize the richness that comes from embracing new disciplinary backgrounds. The exchange of ideas and the blending of different disciplines creates a deeper understanding of the subject matter. This adaptive mindset promotes growth and development among co-teachers and within the broader community. By embracing transformation as an integral part of collaboration, faculty members expand their own capabilities and contribute to a dynamic and inclusive learning environment where everyone can thrive and contribute. The collaboration between co-teachers, blending their respective expertise, was evident in both co-taught classes. In *Designing Technology for People: Anthropological Approaches* the co-teacher with a background in anthropology incorporated

design terminology into their instruction. Similarly, in Prototyping Technology for People: Making Decisions & Thinking Strategically, both co-teachers demonstrated a fusion of their vocabularies and delivered lessons that transcended the boundaries of their disciplines. The collaborative partnership between co-teachers has not only enriched the classroom experience but has also had a positive impact on individual teaching practices, as exemplified by the faculty member's reflections:

“So for me, just personally, it's impacted me in a positive way, because now I have someone else in the classroom, another professor if you will, and afterwards we can sit down and go, well that didn't go very well, or maybe if we did this it would go better... that's really helped me and influenced my teaching in my other classes...I think that partnership. It has helped me be better in my other classes, and hopefully better in 340.”

The faculty member's testimony shows the transformation that can come from collaborative teaching partnerships on individual teaching approaches. By engaging in post-lesson reflections and discussions with their co-teacher, they have gained valuable insights into their own teaching methods and identified areas for improvement. However, the unique partnership that comes from co-teaching allows for new teaching strategies to be realized and creating innovative methods to convey information that transcends the typical boundaries of disciplines. This reflective practice not only enhances their effectiveness within the co-taught class but also translates into tangible benefits for their other courses. As a result, the partnership's impact extends beyond the co-taught class, positively influencing teaching practices across various academic contexts, as the faculty members all belong to different disciplinary homes. Through this collaborative process of mutual support and feedback there are benefits for both the co-teachers and their students.

In addition, beyond collaborating post-class for reflective discussions on teaching, the co-teachers have experienced transformation as they can now rely on each other for assistance if one misses or forgets certain information:

“I think we do more filling in the blanks of if something happens in the morning. We might be talking about in the afternoons like, oh, this would be a good thing to add. But more interestingly, I might say something about design or [faculty member] might say something about anthropology where you really see that the other person has spent more time with of other areas as well is more seasoned in that in thinking

that way or what they might propose or add I think those are some of the differences. So that's why I say it's like more of a going further down that that path”

This is particularly crucial in the context of co-teaching, especially when crossing disciplinary boundaries to foster a genuine transdisciplinary learning experience. Moreover, this underscores the importance of ongoing professional development and the qualities of educators essential for ensuring the success of such collaborations. In addition to the logistical aspects of co-teaching, such as filling in informational gaps that arise throughout the day, there is a deeper layer of collaboration that emerges. The faculty member highlights how their interactions extend beyond supplementation of content. It is emphasized how, during discussions, they organically integrate insights from their respective disciplines, showcasing a genuine transdisciplinary exchange. This engagement reflects a willingness to bridge disciplinary boundaries and foster mutual respect for each other's expertise and perspectives. The dynamic nature of their collaboration, where they not only complement each other's knowledge but also push each other to explore new concepts and ways of thinking is evident. While professional development is essential for equipping educators with the skills necessary for successful collaboration, it is this genuine exchange of ideas and mutual growth that truly defines the transformative potential of co-teaching in fostering a transdisciplinary learning experience. Transitioning from the emphasis on the transformative potential of co-teaching, it's evident that the collaborative spirit extends beyond the exchange of knowledge and into the very fabric of classroom dynamics, as highlighted by one faculty member's reflections:

“I don't want to not have another person in the room with me. It's kind of like always somebody to lean on. So, if I forget something [my co-teacher] will say it or if [my co-teacher] forgets something I'll say it and we'll just go back and forth on some things. Obviously, I've picked up new ways to do things, him and the others”.

The sentiment expressed by the faculty member is important as it shows a shift in the preferences of the educator towards co-teaching dynamics. This instructor mentions that regardless of teaching a transdisciplinary class, the instructor values having another teacher to work and learn from. Having another individual in the room creates a relationship where each co-teacher complements the other's strengths and fills in any gaps, ensuring a comprehensive learning experience for

students. There is value for both the educators and the students. This dynamic also provides an opportunity for constant dialogue and exchange of ideas between co-teachers enriching their teaching methodologies and creating camaraderie and support within the teaching team. This shift towards embracing co-teaching reflects educators' recognition of the benefits of collaboration in enhancing the teaching process and student outcomes. Faculty has felt like they have changed as a result of these collaborations as noted in the following:

“I know, I changed a lot as a result of this. And I feel like that I bet influence the kind of mentorship I might be involved in now, which is super important”.

The transformative impact of co-teaching extends beyond the classroom and into the realm of mentorship, as faculty members recognize the profound changes, they undergo through collaborative teaching experiences. By actively engaging in co-teaching dynamics, educators expand their teaching methods and their learning flows into their mentorship principles. The collaborative nature of co-teaching advances continuous learning, which translates into mentorship practices. Faculty members who have experienced the benefits of co-teaching can draw from their collaboration to guide and support their mentees. This integration of co-teaching insights into mentorship underscores the interconnectedness of pedagogy and mentorship, highlighting the importance of collaborative approaches in both realms of academic engagement. Although not all faculty are formally engaged in mentorship, the student-centered nature of classroom dynamics in co-taught classes often sees faculty adopting mentorship roles. This is evident in the support provided to student groups working on design projects, which can continue beyond the class and receive funding. In such cases, co-teachers willingly assist students, offering guidance on navigating next steps to ensure the success of their innovations.

Additionally, the following insight sheds light on the transformative impact of collaborative teaching experiences, emphasizing how they not only enhance individual teaching practices but also contribute to the dynamic evolution of course curricula and instructional methods:

“...I think it's only improved my teaching; I can learn better ways of doing things. New ideas I never would have thought about before. And it makes the course continuously evolve rather than stay stagnant, because you're pushing each other”.

The importance of collaborative teaching experiences in fostering teacher transformations cannot be overstated. The quoted insight underscores how such collaborative endeavors serve as catalysts for growth by exposing educators to perspectives, innovative approaches, and ideas. Through collaboration, teachers can engage in reflective practices, exchange pedagogical strategies, and challenge each other's assumptions, ultimately leading to the refinement and enhancement of their teaching methodologies. Furthermore, collaborative teaching encourages a community of continuous learning and adaptation, where educators are motivated to stay abreast of best practices in education. By pushing each other to explore new avenues and experiment with different instructional techniques, collaborative teaching experiences enable teachers to break away from stagnation and embrace change. The following reflection provides insights into a transformative intellectual journey experienced by an individual, highlighting the evolution of their perspectives regarding the materiality and social dynamics of the world in relevance to their co-teaching relationships:

“...if I was being totally honest, I didn't pay very much attention early on to like, how things stayed together or came apart like that just was not a priority to me, maybe, maybe social things groups or people, or, you know, how they came together and came apart but just the materiality of that in the world of like, how things actually get made... and so for me, that's been a big intellectual journey, there are things I would read today and be interested in and consider in ways that I wouldn't have before so that's a benefit coming from this at the same time...it's interesting because you're the most different thinker than someone but sometimes it's interesting because you're not as much”.

This introspective journey underscores the impact of collaborative teaching relationships on personal growth and intellectual development. Through the exchange of ideas and perspectives within co-teaching dynamics, individuals can broaden their horizons, reconsider their priorities, and expand their understanding of materiality and social dynamics in the world. By engaging with colleagues who possess diverse backgrounds, expertise, and ways of thinking, educators are challenged to reevaluate their own assumptions and approaches, leading to a deeper appreciation for the complexities of teaching and learning. Moreover, this process of mutual learning and exploration fosters a sense of intellectual curiosity and openness to new experiences, enabling educators to continuously evolve and adapt in their professional practice. Thus, collaborative teaching relationships serve as catalysts for personal and intellectual transformation, enriching not

only the educational experience but also the broader understanding of the world around us. While faculty can value co-teaching and the transformations that have occurred from them, others identify places of struggle such as:

“I'm naturally extroverted. So, I like being with people. And I'm usually pretty compliant, especially when I'm working with people that I see as very capable...It's been nice. The couple places where I've struggled. I'll use that loosely. Is that it isn't a balance of responsibility, that it's definitely more his class than my class. That the flavor of it is more what he was doing. Like we didn't create something brand new, that we used his class as the template and then kind of plugged my stuff into it. And because of that, that, that I don't want to use a phrase, unequally yoked, but that concept is there where it's definitely more his than mine, because it was his baby to start with rather than a class that we had crafted from scratch. And so, at times, there's things that I just have to take a backseat to, but because it's more his than mine...And that's I'm not that's not a pot shot against him at all. But I like teaching a lot, and I'm good at it. And prior to this the class that I married with his was a class that I loved, and I crafted, and I created from scratch. And I taught the whole thing, right? And I got to really be involved in the students and I was heavily involved in directing it because I was the only one there right. And now that we combined ours, I have to take a step back from it. And yeah, sometimes I'd like to do more in this. But it that would require us to kind of reconfigure the class and kind of deconstruct the whole thing and start over again...”

The quote reveals a complex interplay of personal and professional dynamics within the realm of co-teaching. The faculty member's extroverted nature can predispose them to collaboration and interaction, fostering a positive attitude towards working with capable peers. However, underlying this enthusiasm is a struggle with the unequal distribution of responsibility and ownership within the co-taught class. The faculty member articulates a sense of imbalance, noting that the class structure predominantly reflects the vision and framework of their co-teacher, rather than a collaborative creation from scratch. This feeling of being "unequally yoked" highlights a tension between personal investment and shared ownership, as the faculty member navigates the transition from teaching a class they crafted to co-teaching within an established curriculum. Despite acknowledging the competency and expertise of their co-teacher, there's a palpable desire to maintain a more active role in shaping the course content and direction, showing the challenges of merging individual teaching styles and preferences within a collaborative teaching environment. Moreover, the faculty member's struggle sheds light on the implications of co-teaching dynamics on professional autonomy and fulfillment. Having previously enjoyed the autonomy of crafting

and directing their own class, the transition to co-teaching necessitates relinquishing some degree of control and authority. This shift in responsibility gives rise to a longing for greater involvement in shaping the course's trajectory. The faculty member's desire to contribute more prominently to the class reflects a deep-seated passion for teaching and a commitment to providing students with a meaningful learning experience. However, reconciling personal aspirations with the collaborative nature of co-teaching presents a formidable challenge, requiring careful negotiation and mutual respect for each other's expertise and contributions. This struggle shows the importance of fostering open communication, shared decision-making, and a spirit of collaboration to ensure equitable participation and satisfaction among co-teachers. In the co-taught courses, it's noticeable that one professor typically initiates the class every day, with rare instances of the other co-teacher taking the lead. Furthermore, in another class, it's apparent that when students have questions, they consistently seek assistance from the co-teacher who primarily oversees the course, particularly in the class where the co-teacher is a graduate student. While achieving a perfect balance in teacher roles and speaking time may be challenging, there's an opportunity to explore adjustments in the structure of co-taught classes to foster a more equitable involvement among all co-teachers involved, however it does remain key that the co-teachers involved want to be present and teach in this type of class. While striving for a balanced participation among co-teachers it's essential to recognize that the willingness and engagement of all co-teachers play a pivotal role in the success of such collaborative classes. Reflecting on their journey, one faculty member shares insights into their initial apprehensions and eventual integration into the team dynamic, underscoring the value of collaboration and the ongoing process of self-discovery within the program:

"I came into this kind of feeling like an outsider because I was kind of thrown into this and over time, I've felt like I've become more part of the team, but I had no idea what I was going to offer when I started. And I still don't know whether they're not the all the things that I offer are always valuable and sometimes I'm just there as an agent of chaos. But I've enjoyed working with the team and enjoyed getting to know them."

Highlighting the journey of a faculty member's integration into the team dynamic serves as proof to the collaborative spirit within the program. By sharing insights into their initial feelings of being an outsider and their subsequent evolution into an integral part of the team, this underscores the program's commitment to inclusivity and support for new members. The willingness of the existing faculty to embrace and accept new teachers demonstrates a culture of collaboration and mutual

respect. It showcases how the program fosters an environment where individuals are encouraged to explore their potential, contribute their unique perspectives, and grow professionally. This anecdote not only emphasizes the importance of welcoming new members into the program but also highlights the program's dedication to nurturing a collaborative community where all members can thrive and contribute to shared goals. Yet, if a faculty member allows apprehension to hinder their integration into the co-teaching community, it can pose challenges in the classroom. Thus, identifying faculty members willing to participate in co-teaching initiatives and collaborate across disciplinary boundaries becomes increasingly essential. In the pursuit of fostering innovation in education, the willingness of faculty members to engage in co-teaching endeavors and collaborate across disciplinary boundaries emerges as a crucial factor, facilitating the exploration of diverse perspectives and approaches to teaching and learning. In education, innovation often takes on various forms, extending far beyond traditional definitions. One educator reflects on their role around innovation in the following:

“I don't think I ever thought of myself as an innovator. I don't think that that is a word that ever came into my mind. But I would say now, I think the biggest role I have to play in the innovation processes as an educator.”

How educators view themselves within innovation holds importance in shaping education's trajectory. When educators perceive themselves as innovators, it sparks a mindset shift that transcends conventional teaching methodologies. By recognizing their potential to drive change and make meaningful contributions to the field of education, educators are more inclined to embrace experimentation, creativity, and continuous improvement in their teaching practices. This self-perception empowers educators to challenge the status quo, explore new ideas, and adapt to the evolving needs of students and society. Moreover, viewing themselves as innovators fosters a sense of ownership and accountability for the quality of education they deliver, motivating them to seek out opportunities for professional growth, collaboration, and transdisciplinary engagement. Ultimately, how educators perceive themselves not only influences their approach to teaching but also cultivates a culture of innovation within educational institutions, ultimately benefiting students and shaping learning. This highlights the interconnectedness between educators' self-perception and collaborative teaching experiences, underscoring how both factors contribute to the enrichment of the learning environment and the holistic development of students. The following

quote encapsulates the diverse range of insights gained through collaborative teaching experiences, highlighting the reciprocal learning process between co-teachers and the valuable contributions each brings to the classroom dynamic.

“I learned a lot about specific inventions, which I did not know...I learned all about the history of the engineer's notebook... he looked closely at how things are made, put together, the value of sketching the value of creative brainstorming, about teaching and teaching technology, authentic learning, I learned a lot about communities of practice, and really about the love of making. I learned a lot about all those things from [my co-teacher] and from teaching together over the years. We are very different people in almost every respect possible...from me, I think he learned more about ethnography designing for people with different worldviews, how to observe and interview people, how to make sure their story is told and represented. I think I added a lot of thoughts about aging transitions over the life course disability, and some out of the box thinking, I'm not the most conventional person or teacher...t was more of a power combination for us to work together...I think there's so much active engagement and conversation back and forth between us and the students...”

The quote illustrates the depth of knowledge and expertise exchanged between co-teachers in a collaborative teaching environment. Through their partnership, both educators have expanded their understanding across diverse domains, from specific inventions to teaching practices and the importance of authentic learning experiences. Each brings unique perspectives to the table, with one talking about the intricacies of engineering and design, while the other offers insights into ethnography and inclusive teaching methods. This dynamic exchange fosters a synergistic relationship, allowing for a comprehensive exploration of topics ranging from the history of engineer's notebooks to the nuances of representing diverse stories. Moreover, the partnership extends beyond the classroom, shaping a collective learning journey that enriches the educators' teaching approaches equipping the students with a diverse skill set.

Furthermore, being part of an environment where learning is a reciprocal process, allows for opportunity to continuously expand knowledge as a faculty member pointed out:

“And so I'm just like happy to be in a setting in which I feel that my own learning continues to grow both from working with [my co-teacher] but also students because I don't know anything about a lot of this stuff, right, like one of our students last semester runs that lab and he walks me through everything because I know nothing. And it's super cool to also be in a classroom space where it is flipped in a

lot of ways and students have a lot more expertise than me in other areas. And so, it's cool to have those interactions and learn.”

Being part of an environment where learning is a reciprocal process allows faculty members to continually broaden their knowledge and expertise. As one faculty member pointed out, the opportunity to learn from both colleagues and students is invaluable. Embracing a mindset of openness to new insights, faculty members have transformed their mindset. Instead of relying solely on their own expertise, they recognize the value of engaging with individuals who possess different areas of knowledge and expertise. This collaborative exchange promotes a culture of mutual respect and learning within the academic community. By embracing the idea that everyone has something to teach and something to learn, faculty members have transformed their role from mere instructors to lifelong learners, enriching their own educational experiences while empowering their students to become active participants in the learning process. Through this shift in perspective, faculty members have not only redefined their own roles within the academic community but have also cultivated an environment where curiosity and collaboration thrive. As faculty began their unexpected journey at the university, their professional path unfolded serendipitously, leading to a rich learning and teaching experiences that continue to evolve:

“I didn't actually come to [the university] thinking this was what I was going to do and sort of happened serendipitously, but the more we got talking about it, and working well together like the more interesting it got. So, it's been a great learning as well as teaching experience. I think a lot of things you teach well it comes from, like, some of the learning you do yourself...on the subject of lifelong learning, you never stop learning from working on these things, or from working with different people”.

Initially unsure of their trajectory, the faculty member found themselves increasingly engaged and intrigued as they became immersed in the M3 project and collaborated effectively with the other faculty members. This newfound enthusiasm for teaching and learning enriched their understanding and transformed their mindset towards education. Embracing the idea of lifelong learning, they recognized the inherent value in continuously challenging oneself and engaging with diverse perspectives. Through their experiences, they came to understand that effective teaching often stems from personal growth and self-discovery, fostering a mindset of curiosity and openness

to new ideas and experiences. This transformation underscores the profound impact of their journey at the university, shaping not only their professional endeavors but also their approach to lifelong learning and personal development. In a journey of professional evolution, a faculty member's career has seamlessly come full circle as described in the following, demonstrating the enduring influence of their experiences at the university on both their professional trajectory and personal growth:

“My career has come full circle. When I started out, I was working with older adults, frail older adults living in the community trying to live in the community trying to stay living in the community. And I really saw firsthand how they lived in a world that was not designed for them. I was not interested or trained in design at the time, but a lot of things have happened since then and in some ways, my career has come full circle because now I work with students who are designing for that world, And I try to help them think about those things and consider and how you can understand different people's experiences and ways of being in the world, and different kinds of life experiences that you may not have had yourself and how that goes together with designing in general for people or specific technologies for people. So I think I'm an innovator in trying to put all that together and trying to especially where it meets up with design and innovation education trying to help people, maybe especially people at an earlier moment in their career in life course think about those things and how they can travel forward with that, as they make a career and think about how they'll use those ideas and ways of thinking in their lifetime.”

In a journey of professional evolution, a faculty member's career has come full circle, showcasing the power of design in addressing societal needs. Initially working with frail older adults struggling to navigate an environment ill-suited to their needs, the faculty member witnessed firsthand the disparities caused by a lack of thoughtful design. Now, they work alongside students who are dedicated to crafting solutions for the very world they once observed with empathy. By imparting their insights and experiences, the faculty member empowers aspiring designers to consider diverse perspectives and life experiences in their design process, fostering innovation and inclusivity. This full circle journey epitomizes the transformative potential of design in addressing real-world challenges and underscores the importance of integrating empathy and understanding into the fabric of design education.

As faculty members witness the transformative impact of design on addressing real-world challenges and fostering empathy, they are increasingly motivated to expand their initiatives and promote further innovation. As a faculty member stated in the following:

“I mean, I would love to do it in other classes, you know, I may not want to do it in every class. Because I think the planning process for teaching the class takes longer, but once you're in it, it's nice, you're not lecturing every day. And in general, this isn't a class that's built around lectures, like we have lectures at the beginning and then it moves into teamwork, right? I think more than anything, I'm someone who really embraces the possibilities of interdisciplinary work. I do think it's the future in most fields. And so, for me to be able to do this in the classroom, I think is awesome... I think it's great for students. I think it's great for us, as educators, to grow and I think just in general is reflective of for the world. Its hand is going”

Cross-college co-teaching represents the future of education, as it embodies collaboration and innovation. Faculty members express enthusiasm for expanding such initiatives, citing the benefits of collaborative teaching experiences. While acknowledging the additional time investment required for planning, they highlight the rewarding nature of the collaborative teaching process, which deviates from traditional lecture-centric approaches. By integrating diverse perspectives and teaching styles, cross-college co-teaching fosters dynamic learning environments that prioritize active engagement and teamwork over passive instruction. Moreover, faculty members recognize the broader importance of collaborative work in shaping the future of various fields. They view co-teaching to not only enhance student learning but also to promote personal and professional growth among educators. This embrace of collaboration in the classroom reflects a broader societal shift towards interconnectedness, positioning cross-college co-teaching as a driver of educational innovation in the evolving landscape of higher education.

In conclusion, the collaborative co-teaching experiences discussed among faculty members showcase the transformative potential inherent in transdisciplinary collaboration and innovative pedagogical approaches. These discussions highlight the reciprocal learning process, wherein educators exchange diverse perspectives and insights, fostering a culture of collegiality and mutual respect. Despite the challenges encountered, such as balancing responsibilities and integrating expertise, faculty members undergo serious personal and professional growth, refining their teaching methods and gaining insights into disciplines beyond their own. The collaborative teaching dynamic not only improves the standard of teaching but also creates a community of

lifelong learners within academic institutions. Moreover, the faculty members' reflections show the importance of embracing innovation and intentional pedagogy in preparing students for real-world applications, marking a fundamental shift in the perception of education's purpose. By engaging in collaborative teaching partnerships, educators create dynamic learning environments that prioritize student engagement, foster transdisciplinary dialogue, and drive educational innovation forward. Through ongoing collaboration and reflection, faculty members continue to evolve, embracing change and innovation as essential components of their professional development and commitment to excellence in education.

4.5.4 Sustainability

In higher education, the concept of sustainability extends to encompass the viability of educational initiatives. Within this context, the M3 program has sparked discussions about the long-term sustainability of cross-college co-teaching courses. As turnover, institutional dynamics, and student preferences come into play, stakeholders have wrestled with the challenges of maintaining transdisciplinary education initiatives over time. Key themes have emerged regarding the sustainability of cross-college co-teaching within the M3 program. Central to these discussions is the issue of equality in faculty teaching loads and funding allocation, which presents both logistical and ideological hurdles. Questions surrounding the allocation of resources and recognition of teaching efforts have prompted stakeholders to consider the broader implications of integrating transdisciplinary education into the institution. Administrative perspectives shed light on the complex nature of sustainability efforts, emphasizing the need for alignment across various departments. Furthermore, navigating administrative complexities requires not only financial support but also a cohesive vision and collaborative ethos among stakeholders. Faculty voices further underscore the importance of fostering a culture of innovation and collaboration within academia. While acknowledging the challenges of implementing and sustaining cross-college teaching initiatives, faculty members advocate for creating inclusive environments where transdisciplinary learning thrives. They emphasize the value of breaking down disciplinary barriers to promote creative problem-solving and prepare students for the complexities of the modern workforce. Through the following information, it becomes apparent that sustaining transdisciplinary programs requires a concerted effort to address structural barriers and promote cultural shifts within higher education institutions. From reimagining tenure and promotion criteria

to fostering collaborations, stakeholders are called upon to champion innovative approaches that prioritize lifelong learning. In this context, the sustainability of cross-college co-teaching programs emerges as a pedagogical need but also as a strategic necessity for higher education institutions seeking to remain relevant. As stakeholders grapple with the challenges and opportunities of transdisciplinary education, the journey towards sustainability unfolds as a collective endeavor rooted in shared vision and commitment to educational innovation.

Throughout the M3 programs' existence the question of will the co-taught courses be sustained over time throughout turnover, working with the general nature of the institution, and students desire to take the course. In reviewing interviews, the following ideas arose around the long term and the short-term sustainability of a cross-college co-teaching program to support transdisciplinary education in higher education. The idea round inequality of recognized teaching load and funding are thoughts that resonated throughout many interviews; however, it could be viewed in the following way:

“I still think that one of the biggest things that really deserves a solid conversation is on resources, on who gets paid what for teaching classes, we can kind of get away with while we have a grant to pay for people's hours or give teaching releases or this or that. But you know, [the engineering/technology teacher] is getting full credit for this for the class and I'm getting full credit for the class. But that's not sustainable. Like you couldn't do that across the university. You'd run out of teachers. Like you wouldn't have enough people to teach all the credits that need to get taught, given the system that we're in with the kinds of classes”.

Addressing the challenges of sustainability in cross-college co-teaching programs requires an understanding of the structural and systemic factors at play. As highlighted in interviews, the issue of resource allocation, particularly in terms of faculty workload and compensation, emerges as a critical consideration. The sentiment expressed regarding the inequities in teaching load distribution underscores the need for a more equitable and sustainable approach to cross-college collaboration. While grants may temporarily alleviate some of these pressures, a long-term solution necessitates a fundamental reevaluation of institutional practices and policies surrounding teaching assignments and compensation. Failure to address these disparities undermines the sustainability of co-teaching initiatives. Thus, moving forward, it becomes important to engage in meaningful conversations and collaborative efforts aimed at creating a more equitable and

sustainable environment for cross-college teaching in higher education. Additionally, the need for creating equality for faculty teaching loads and funding is seen as a crucial step in making cross-college teaching feasible.

However, the implementation of such initiatives poses challenges, particularly in large institutions where weighty shifts in enrollment and class structures may be required. The role of faculty personality and their perception of their role in higher education emerges as a vital factor in sustaining co-teaching pairs. Administrators emphasize the importance of a feedback loop to recognize the value of co-taught classes, emphasizing the need for tangible results to sustain such initiatives. Throughout discussions, the notion of value is both questioned and supported, highlighting the complexity of sustaining cross-college teaching programs. The administrative aspect of implementing cross-college teaching initiatives involves various departments, as highlighted by an administrator who discusses the intricate coordination required to sustain such programs:

“There's what I think of as an administrative leg of the stool...everybody from like the business office to the registrar, they all have to be aligned on how are you going to co-list a course and if money is changing hands across departments, how does that happen from the business offices, right? If department heads are contributing some funds in some way, how is that all tabulated? ...the third piece of it for me is you'd mentioned... a Living Learning Community. So, there's like a student affairs element to this too. It's like students support it's also advising, it's like there's all that element of it... without recommending any solutions...it's just an acknowledgement, that's just a lot of pieces to put together right to sustain a program.”

Navigating the administrative aspect of implementing cross-college teaching initiatives involves various departments, from the business office to the registrar, all needing alignment on matters like course cross-listing and financial transactions. This includes organizing contributions from department heads and ensuring smooth processes across departments. Additionally, there's a student affairs element, encompassing student support, advising, and the creation of Learning Communities. However, sustaining such programs requires addressing challenges such as faculty workload equality and funding allocation. Co-teaching at large institutions presents logistical hurdles and potential shifts in class structures. The importance of recognizing the value of co-taught classes through feedback loops has been emphasized, highlighting the need for tangible

results to sustain such initiatives. Throughout discussions, the idea of value has been both questioned and supported, showing the complexity of navigating and sustaining cross-college teaching programs. Additionally, considering the career aspirations of academic leaders such as Deans and Provosts, whose journey to higher positions often relies on the narrative of their accomplishments rather than solely on quantifiable metrics, the following has been said:

“Think about the career objectives of Deans and Provosts. Some of them want to go on to be university presidents. And when you are going to be a university president, the storytelling around your last position is more important than hard metrics. In some sense, having an amazing story about some transdisciplinary program, which everybody thinks is fun and sexy and oh, we should all be doing this and everything.”

Demonstrating successful initiatives within academia is crucial for career advancement, particularly for individuals aspiring to higher leadership positions such as Deans, Provosts, or even university Presidents. Interviews have suggested that showcasing a single impactful achievement, such as championing transdisciplinary initiatives, can elevate an administrator from a “dean at a good school” to higher leadership positions such as a “dean at a great school”. This underscores the importance of tangible accomplishments in advancing one's career within the academic hierarchy and the illusiveness that transdisciplinary ventures can hold for a stakeholder's futures prospects. The idea that transdisciplinary initiatives, exemplified by the M3 program, can advance one's career highlights the acknowledgment of the value of transdisciplinarity, a concept often unexplored in higher education. However, while the allure of transdisciplinary initiatives is undeniable, the interviews reveal a common struggle among stakeholders in both initiating and sustaining such endeavors within the complex dynamics of an institution. While people are intrigued by transdisciplinary initiatives whether for future job prospects, research, or transforming education, they often struggle to initiate and sustain such endeavors within the complex dynamics of an institution. The interviews tell us that for this type of program to be sustained:

“We need to reflect our different backgrounds, help solve the same problem together and I really enjoy everything that's been done in that area with design innovation minor and now, can we get more of it. Who else needs to be teaching, who else needs to be at the table, helping? I'm not smart enough to know who those

people are, but there's got to be other people that they can touch in and bring into the fold, if you will."

This quote emphasizes the importance of collaboration and inclusivity in sustaining transdisciplinary programs in higher education among stakeholders. This interview reflects on experiences and contributions made by individuals from diverse backgrounds towards solving common problems and the idea that for successful educational transformation stakeholders need to be willing to learn from each other and check their egos at the door. The administrators highlight the success of initiatives like the design innovation minor and express a desire to expand such efforts further. However, it's important to acknowledge their own limitations in identifying all the necessary contributors, suggesting that there are likely others who can bring valuable perspectives to the table. Overall, the quote underscores the need for continued engagement and involvement of a broad range of stakeholders to ensure the sustainability and success of transdisciplinary programs in academia.

In the changing landscape of higher education, transdisciplinary ventures not only foster innovation but also contribute to the sustainability of educational programs, ensuring their long-term success and relevance. The following quote highlights the critical need to transcend disciplinary boundaries in higher education to foster true innovation and provide students with the flexibility to develop their own curriculum.

"It's not about their discipline, it's crossing those discipline borders. And if they need to learn something in agriculture, they need to be able to go there and learn about it... and they need to have the flexibility to kind of build their own curriculum. We aren't there yet, by the way, not even close... true innovators, the reason that they're innovative in many cases is because they see beyond the traditional bond that everyone else seems to be constrained in. And so, for an innovation curriculum, you need to break down those barriers for the student and allow them to do what they need to do in order to truly innovate and get the experiences that they need to really do innovation. That's a real challenge right now".

Embracing transdisciplinary education as outlined in the quote represents a step towards sustainability of higher education. By transcending traditional disciplinary boundaries and empowering students to craft their own learning paths, institutions can create an environment conducive to true innovation and adaptability. This approach not only equips students with the

necessary skills for the job market but also positions higher education institutions as dynamic hubs of knowledge creation and dissemination. The concept of democratizing disciplines, enabling students to explore diverse academic fields to enhance their innovation and learning, is a strategy that can enrich higher education. Moreover, by responding to the demands for collaboration and experiential learning, universities can enhance their relevance and appeal to a diverse range of stakeholders, thus securing their place in the future of education. Therefore, embracing transdisciplinary approaches and providing students with the autonomy to navigate diverse fields of study represent essential strategies for ensuring the long-term sustainability and success of higher education institutions. However, there are identified constraints even with this type of thinking as identified by an administrator:

“I honestly think dollars are overrated as a constraint. I think the real constraint is time and attention...you're pulled in all kinds of different directions. And you are going to be pulled most strongly in the direction of things that you can fund...I think the first thing that has to be solved in terms of sustainability of transdisciplinary learning is how do you keep the principal's time and attention on this?”

While transdisciplinary approaches and student autonomy represent crucial elements for the sustainability of higher education, it's essential to recognize the practical constraints that administrators face, as articulated by the administrator above. The quote highlights a critical challenge: the scarcity of time and attention, often overshadowed by financial considerations. In a landscape where administrators are overrun with various responsibilities and priorities, allocating time and attention to sustain transdisciplinary initiatives becomes important. Therefore, addressing this constraint is fundamental in ensuring the sustainability and effectiveness of innovative educational endeavors. Efforts to streamline administrative processes, foster cross-college collaboration, and prioritize transdisciplinary initiatives within institutional agendas are essential steps toward overcoming this challenge and promoting the sustainability of higher education in the long term. However, an administrator had mentioned a strategy as follows:

“...this is another case where there is a solution, which is that department heads can negotiate with each other about this, which is fine, but what they're really trying to do is trying to find a set of conditions that are acceptable within an overall structure, that makes it hard to do this in a sustainable way.”

The sustainability of this cross-college co-teaching program in higher education faces barriers due to the traditional structure of the institution, as indicated by the administrator's insight. While negotiating between department heads is a potential solution, it often operates within the confines of an overarching institutional structure that inherently complicates sustainable implementation. The bureaucratic nature of higher education institutions, with their established hierarchies, academic departments, and administrative procedures, creates rigid boundaries that can stifle innovation and collaboration across disciplines. This structural rigidity makes it challenging to establish and maintain conditions conducive to sustainable cross-college co-teaching initiatives. Thus, while individual negotiations may yield temporary solutions, the broader institutional structure must be addressed to facilitate long-term sustainability and effectiveness in transdisciplinary education. Therefore, a faculty member suggested that:

"...having a place where faculty can converge, new programs can grow, they can live and not have to go through every unit's red tape and politics...it can be in that one spot. So, I think that can be sustained if the university invests in something like that...they do have to put you know some money with what they're saying. So, I think that that is a good strategy to allow these things to exist and sustain. I think that might be the only one the other one is the financial model of the university. They will not foster new things. Departments are not incentivized to do new things with teaching and learning anyways."

Addressing the challenges posed by the institutional structure requires a fundamental shift in approach, as suggested by the faculty member. Establishing a dedicated space where faculty can collaborate and innovate without being encumbered by bureaucratic hurdles and departmental politics is a viable strategy for fostering sustained transdisciplinary initiatives. In fact, there is a place on campus that is supposed to be championing these endeavors. However, implementing such changes faces considerable resistance within the existing financial model and incentive structures of universities and at the department level as well. While investing in collaborative spaces represents a step in the right direction, it necessitates a realignment of institutional priorities and resource allocation. Moreover, the prevailing departmental incentives often prioritize traditional teaching and research models over innovative pedagogical approaches, making it difficult to instigate meaningful change. Thus, while feasible solutions exist, the entrenched nature of institutional practices and financial models presents barriers to their implementation and brings

into question the sustainability of the M3 program. Furthermore, a faculty member had given the example of:

“I'm going to give the example of [this university], we've created something we're calling the innovation college, it's a virtual college, and that has its own leadership team is going to work with all 10 colleges, there's funding with it, so that we can intentionally break down the barriers between the colleges. So, when a business faculty member wants to co-teach in the Polytechnic, this virtual college will actually pay the business school. So, they can pick up another faculty member to cover the course that that person has left. So, we have actually created a neutral transdisciplinary college to facilitate these kinds of transdisciplinary efforts. There's also money in there to get faculty teams from different colleges to work together to propose new transdisciplinary kinds of programs like the one that we're doing right now. And so, there is money for this program that they want to take even further. And so, the innovation college is how we're doing it”.

The creation of the Innovation College represents a promising step towards fostering collaboration and breaking down disciplinary silos within academia. By providing a dedicated platform and financial resources to support transdisciplinary initiatives, the Innovation College facilitates the integration of faculty expertise across diverse academic domains. This approach promotes innovative teaching and research. However, despite the initial momentum gained through the Innovation College and its associated funding, the long-term sustainability of transdisciplinary programs like the M3 initiative remains uncertain. As the faculty member highlights, the reliance on grants and funding streams poses a challenge to the program's continuity once these financial resources are exhausted. Without a sustainable funding model and institutional support of higher education, the viability of such initiatives may be compromised, raising questions about their long-term impact and effectiveness in fostering cross-college co-teaching for transdisciplinarity. Therefore, while the Innovation College represents a milestone in promoting transdisciplinary efforts, ensuring the success of programs like the M3 initiative requires a concerted effort to address structural barriers and establish sustainable funding mechanisms within the broader institutional framework. However, another administrator ponders the incentives for this type of work:

“Regarding monetary financial incentives, it doesn't usually work. I do agree with the idea that if somehow innovative co-teaching slips into the tenure and promotion

document here in the College of Liberal Arts, you can move the needle, but now that doesn't have to be done by a policy change, but by adding examples of things you could do to get brownie points under teaching. And that's that could be done. It is doable. It takes a little bit of finagling. But this is what this grant is supposed to do right to find ways to modify change and prove documents and policies in a way that promote sustainability, and I would invest in this idea."

The insights provided by administrators shed light on the complex challenges facing the sustainability of co-teaching initiatives in higher education. While financial incentives alone may not suffice to drive meaningful change, integrating innovative pedagogical practices like co-teaching into tenure and promotion criteria could serve as a powerful catalyst for institutional transformation. By acknowledging and rewarding faculty engagement in transdisciplinary collaboration, universities can incentivize and institutionalize practices that promote sustainability and adaptability. Furthermore, initiatives such as the M3 program, which receive support from grants specifically aimed at hurdling institutional barriers to promote cross-college co-teaching for transdisciplinary education, serve as trailblazers in driving systemic transformations within academia. These endeavors cultivate an innovation-conducive environment and show the critical need to incorporate transdisciplinary approaches into higher education's core. As exemplified by the perspective of a faculty member, universities must pivot towards equipping students with the skills to navigate complex, ambiguous problems, recognizing that the landscape of academia and the workforce is evolving rapidly. As a faculty member had pointed out:

"I think that universities which focus on teaching students to solve well defined problems are going to be not a business very long, they will be replaced by algorithms, and expert systems and all the rest. So, if we are to have a future, as an institution, it's got to be that we are training students to be more effective in solving problems that don't have obvious or well-known answers".

As technological advancements continue to reshape industries and redefine the nature of work, the ability to approach problems that require multiple disciplines becomes increasingly valuable. By incorporating transdisciplinary methodologies into the curriculum, universities can equip students with the skills and mindset needed to tackle real-world challenges that defy conventional disciplinary boundaries. This proactive approach enhances students' problem-solving abilities and

provides them opportunities to learn from and work with students from other disciplinary homes, mirroring experiences that they will have in the workforce. Transdisciplinary learning environments provide students with opportunities to develop these sought-after skills through hands-on experiences, transdisciplinary projects, and exposure to diverse perspectives. By prioritizing transdisciplinary education, higher education institutions position their graduates as versatile professionals capable of making meaningful contributions. To continue on with this type of initiative, a faculty member mentioned that:

“we need to keep doing it and not let size be a limitation, figure out how we can grow with the desire of the students, and at the same time continue to promote it and continue to seek partners to teach...the challenge I think is going to be how do we start weaving all of this together to be best...in terms of design and innovation curriculum”.

To sustain initiatives like cross-college co-teaching for transdisciplinary education, it's important for institutions to remain adaptable to transform for students to gain competencies required from employers. As emphasized by the faculty member, scalability should not be hindered by institutional size but should instead be seen as an opportunity to innovate and grow. This entails a continuous commitment to promoting transdisciplinary approaches and creating partnerships across disciplines to enrich the learning experience. However, the real challenge lies in seamlessly integrating these diverse elements into the curriculum framework to optimize the design and delivery of innovative educational programs. By addressing these challenges head-on and making a community based around collaboration and innovation, higher education can work to have success and impact in preparing students to excel in the dynamic world. Navigating the complexities of scaling up educational initiatives requires a concerted effort to address challenges while leveraging opportunities for success and impact, thereby ensuring that higher education remains adaptable and responsive to the evolving needs of students and society. Scaling up educational initiatives presents both opportunities and challenges, particularly when striving to enhance the sustainability of innovative programs in higher education. As institutions seek to expand the reach and impact of successful initiatives like the M3 program, considerations regarding resource allocation, logistical complexities, and pedagogical efficacy come to the forefront. The following quote demonstrates the importance of scaling up while highlighting the

need for strategic planning and mindful resource management to navigate the inherent challenges associated with program expansion.

"...scaling up, if you try to do that with multiple courses it becomes a little bit more resource intensive, but that's why you have to be kind of mindful in the way..."

The quote captures the dynamics involved in scaling up educational programs to accommodate broader participation and engagement. While expanding initiatives like the M3 program across multiple courses holds the promise of reaching a larger student population and fostering transdisciplinary learning experiences, it also introduces complexities that must be carefully addressed. Resource intensiveness emerges as a central concern, as scaling up requires additional funding, faculty support, and administrative infrastructure to sustainably accommodate increased demand and ensure the program's effectiveness. Moreover, logistical challenges such as coordinating collaborations, managing course logistics, and maintaining pedagogical coherence across diverse disciplinary domains further highlights the need for strategic planning and mindful implementation strategies. Thus, while scaling up represents a big step towards enhancing sustainability and impact of the M3 program, it also necessitates creating a balance of goals with practical considerations.

Within higher education shifting perceptions of its value in response to changing workforce dynamics, transdisciplinary ventures emerge as crucial endeavors. However, transdisciplinary ventures can be viewed as crucial in the landscape of higher education, many people have discussed that higher education and the value attached to it is shifting as the workforce is constantly changing:

"I think a program like this one where the goals of the program are to make them job ready with the skill set that it's not just what you know, but how you use what you know, and how you collaborate with other people. How you incorporate lifelong learning into "Hey, maybe I don't know all the answers" and especially for really big, complicated problems whatever field of study you went into, you're not going to be enough. You're going to have to get input from other experts and, you know, this is the type of training that's needed for that."

The changing nature of the workforce requires a reevaluation of the traditional approach to higher education. In this shifting landscape, programs that can utilize transdisciplinary learning opportunities are becoming recognized as essential for providing students with experiences that mirror what the students will see in the workforce. As expressed by stakeholders, these programs aim to create a workforce that can work well doing collaborative problem-solving and be lifelong learners. Our modern-day society faces complex challenges that require multifaceted solutions, therefore the ability to collaborate across disciplines and integrate diverse perspectives becomes indispensable.

In the following quotation the administrator reflects on their experience within higher education and their role in engaging with various stakeholders, where they offer insights into the challenges and opportunities facing universities today, and how cross-college co-taught classes for transdisciplinary education in the pursuit of innovation are at the forefront of adding value back to higher education:

“...having been in higher education for as long as I have been and being in the role that I'm in I've had the opportunity to kind of break through some of these silos and talk to a lot of different faculty a lot of different systemic groups that run the systems like the registrar and the enrollment folks and financial aid, regulatory and all the people that make the university run. So, from that viewpoint, I would say a program like this is critical to have if institutions like this want to survive what's coming. And what's coming is that we can't sustain this level of enrollment forever. Like at some point, the numbers are going to go down, whether it's because we have to increase tuition or if it's just because people are realizing they don't want a four year degree for that cost of money when they could do a trade school and you know, make just as good money, or better money right out of the gate. And universities are starting to be asked a lot of questions over the last 10 years of how job ready our students when they leave.”

The administrator's perspective shows the importance of innovative programs in navigating the changes of higher education. This quotation encapsulates a broader conversation about the future viability of traditional higher education models and the imperative for innovative solutions to sustain institutional relevance and effectiveness. Additionally, innovation stands as a cornerstone of progress in higher education, shaping the future across disciplinary sectors. Among the dynamic of structural factors, both advantageous and challenging, innovation remains a constant force driving social and educational advancement. Within this, the imperative to create a community of

transformation within educational institutions becomes increasingly evident. As echoed by voices from the university, innovation is not merely a fleeting trend but an enduring necessity for the future of higher education. Embracing this ideology, institutions like this one strive to equip students with the skills essential for change in a complex world. Thus, the assertion emerges that this university, with its commitment to innovation and ethical practice, occupies a prime position in preparing future generations to navigate and shape the evolving landscape of tomorrow, as seen from this administrator:

“I can't imagine a world in which innovation is ever going to become less. Because of a lot of these bigger structural factors for good and for bad. And so, if we can train students to do this kind of work and do it ethically right, and do it using collecting great sources of data, like I think [the university] is at the forefront”.

This university's leadership in educational innovation holds serious benefits for the sustainability of higher education. By spearheading initiatives aimed at fostering innovation through transdisciplinary learning, this university not only equips students with the necessary skills for success but also sets a precedent for other institutions to follow. As a trailblazer in preparing students to navigate complex challenges, this university contributes to the cultivation of a workforce capable of addressing issues of our time. This cross-college co-teaching approach for transdisciplinary in the pursuit of innovation, not only enhances the university's reputation but also elevates the standards and expectations for higher education institutions. Furthermore, the M3 program fosters collaborations and creates a community of excellence that extends from the faculty to the students, administrators, and advisors at the institution. Ultimately, the university's leadership in educational initiatives serves as a catalyst for positive change within the higher education landscape, driving forward the mission of preparing students to thrive in a transdisciplinary world. The discussion surrounding the sustainability of cross-college co-teaching programs within higher education shows the complexity of structural, systemic, and cultural factors involved. Stakeholders navigate with the challenges of institutional dynamics while championing innovative approaches that prioritize collaboration. The need for aligning incentives, promoting cultural shifts, and establishing sustainable funding mechanisms becomes apparent as institutions strive to retain value. Administrators and faculty members alike emphasize the importance of embracing transdisciplinary approaches to foster innovation and prepare students

for the complexities of the modern workforce. By transcending disciplinary boundaries and empowering students to craft their own learning paths, institutions can create environments conducive to lifelong learning and problem-solving. However, scaling up educational initiatives poses challenges related to resource allocation, logistical complexities, and pedagogy, showcasing the need for strategic planning and mindful implementation strategies. Despite the constraints posed by institutional structures and financial models, stakeholders remain committed to fostering a community around innovation and collaboration. Through initiatives like the M3 program and the establishment of dedicated platforms such as the Innovation College, universities work to break down disciplinary silos. By leading the way in educational innovation, institutions like this university not only prepare students for success but also set a precedent for change within higher education. Ultimately, the journey towards sustainability in cross-college co-teaching programs unfolds as a collective endeavor rooted in shared vision and commitment to educational excellence.

4.5.5 Creating a Community of Transformation

The research study, guided by the Communities of Transformation (CoT) framework, aimed to explore deep, transformational change in higher education teaching practice within the context of the M3 program. CoTs, characterized by their collective pursuit of growth and change, provided a theoretical perspective through which to examine cross-college co-teaching for transdisciplinary education in the pursuit of innovation. As seen in the previous finding sections, educational transformation, as articulated by faculty members, emphasizes the importance of providing students with a method for thinking beyond disciplinary boundaries. By encouraging practical application and hands-on experiences, educators aim to equip students with skills essential for success. This approach highlights the importance of moving beyond theoretical understanding to actively engage in real-world problem-solving scenarios. Success in cross-college co-teaching for transdisciplinary holds the potential for widespread impact within higher education, providing scalable models for innovation and community-building. This responsibility underscores the institution's commitment to driving positive change not only within its confines but also across the broader landscape of higher education. As described in Chapter 2, Communities of Transformation (CoT) involve a group of individuals who want to come together with the shared goal of collective growth and change. In this case for educational growth and change. The stakeholders involved are guided by the following driving philosophy: 1) everyone can be an

innovator, regardless of their background or interests, 2) impactful innovation does not happen in disciplinary silos alone, and 3) teaching in a different, more collaborative way. As a collaborative initiative, this model has been designed to synergize key strengths of an institution's engineering/technology, liberal arts, and business colleges/units to create a transformative undergraduate experience focused on the pursuit of innovation—one that reaches the broader campus community, regardless of students' backgrounds or majors. As the data has depicted, stakeholders involved in this CoT often engage in practices such as team meetings, summer workshops, and research initiatives to facilitate educational and structural change. This community provides a supportive environment where individuals can explore new ideas, challenge existing beliefs, and develop skills to effect positive change in themselves and the world around them. The concept emphasizes the power of community and collective action in fostering transformation. Educational transformation in the M3 as faculty mentions is:

“Providing students with a framework for thinking outside of the box or silo that they will eventually get firmly implanted in as they go forward.”

The initiative of providing students with a framework for thinking outside of traditional disciplinary boundaries is crucial for their intellectual growth and future success, and it aligns with the driving philosophy of providing learning that transcends disciplinary silos, which in this case is done through co-teaching. As seen during the classroom observations, the co-teachers within the co-taught classes encourage students to explore diverse perspectives and problem-solving approaches. As observed, the instructors strive to prevent students from becoming entrenched in narrow disciplinary silos commonly seen in traditional classrooms. The integration of disciplinary expertise ensures that students engage in transdisciplinary work at the intersection of various fields in teams consisting of students from different disciplinary backgrounds. This approach is recognized and valued because it emphasizes practical application over theoretical understanding, as the students are working together to solve a problem. It's not just about learning concepts in isolation; rather, it's about actively engaging in real-world scenarios and applying knowledge to solve complex problems. This hands-on approach not only enhances students' learning experiences but also equips them with skills that can be seen as essential for navigating an increasingly interconnected and dynamic world. As the interviews have described that:

“It's not just the theory it's the doing that's important.”

Especially when:

“The thing that [students] want that they can't get here...where do we go from here, because we cannot reach that here in the current setting, suggest”.

Bringing just one transformative experience to students can profoundly shape their educational journey and future endeavors. By providing opportunities for students to learn at the natural convergence point of disciplines and engage in hands-on experiences with students from outside their disciplinary home, educators aim to instill a mindset of innovation and creativity, especially in a place where these types of experiences can be lacking for many students. As seen above, where do we go from here? Where are the other places in higher education where we can foster these types of programs and communities that give students practical opportunities? Practical application is crucial, as it moves beyond theory to teach students to apply their knowledge in real contexts. Moreover, the faculty involved in these initiatives are the driving force behind the institution's community of transformation. Their passion for design and innovative thinking is evident in their dedication to expanding, sustaining and supporting this program, despite all of the institutional barriers encountered. Administration recognizes the importance of these faculty members' enthusiasm and commitment to fostering a culture of innovation. As evidenced by the development of programs like the Ambassador Program, which is a program consisting of student leaders who are involved in the design and innovation minor and come from diverse disciplinary backgrounds. The ambassadors work to help students who are a part of the larger community in the labs, they put one vents, and have their own team meetings. This demonstrates faculty's instrumental efforts in creating impactful learning experiences for students from every disciplinary home, that expand beyond the classroom. The cross-college co-teaching initiative seemed to be a catalyst for the creation of a larger community extending beyond the instructors. Furthermore, the faculty involved with this program are the wheels that keep the community of transformation running, as administration had recognized that the co-teachers:

“Passion for understanding how that they can bring design and innovation thinking to more students, and I had thrown out kind of an aside about this Ambassador

thing, which then blossomed into a whole program. So that's, it's neat to see these things kind of happen and develop. I really appreciate that Ambassador Program and the things that they're doing and the excitement that those students have."

Within the framework of a CoT, the faculty members actively drive the momentum of change, serving as agents of change in transforming undergraduate education. It is evident through the passion for the M3 program as well as the creation of the ambassador program centered around students, that the faculty has created a community that has blossomed from faculty to students. This collaborative effort, led by passionate faculty members, underscores the transformative potential inherent in CoT's. Through the leadership of the faculty as well as that of the students involved in the ambassador program, these stakeholders propel the community forward, creating an environment where innovation thrives, and meaningful change in higher education takes root. Furthermore, the design and innovation minor has made design spaces and created a space where students from all over campus can collaborate and innovate together. The community that has emerged on the student level, identified themselves through the minor name, as seen in the following:

"I hear students now on campus, they'll say oh I'm a major mechanical engineering, and I'm also minoring in design and innovation. That's how they introduce themselves".

The identification of students with the design and innovation minor marks a crucial stride in fostering a CoT within the educational landscape. By embracing the minor, students transcend traditional disciplinary boundaries and participate in a collective endeavor to innovate and collaborate across diverse academic domains. The emergence of a community, as evidenced by students proudly identifying themselves with the minor, highlights the transformative impact of transdisciplinary education. When students introduce themselves as not just their majors but also design and innovation minors, that signals a shift towards a mindset of transdisciplinary thinking. The collaborative efforts of both faculty and students have cultivated a sense of belonging and ownership within this community. Active participation and engagement in the shared goals ultimately led to the creation of a community that has spread beyond educators to students. The recognition and embrace of the design and innovation minor by students demonstrates a crucial

step towards building and sustaining vibrant community of transformation, as other stakeholders involved in the program can hear, and see firsthand the transcendence of disciplinary boundaries and the innovations that arise from the formation of a community.

Additionally, the stakeholders within the program are mindful of the danger of becoming an "island of innovation." Instead, the stakeholders advocate for a more inclusive approach centered on fostering a CoT. By encouraging innovation and collaboration during students' undergraduate years, there is positive change not only within the institution but for the future of all higher education. The speaker below articulates a sense of responsibility towards avoiding the pitfalls of an "island of innovation" model, emphasizing the broader vision of implementing a CoT approach. This responsibility underscores our commitment to creating a more active and connected educational community:

"I would also say it's our charge, there is this model that we should try really hard not to turn into, which is called an island of innovation situation, and what's different about that, from what we're actually trying to do, which is a broader, how we can take a communities of transformation approach here, which is a philosophy driven, intentional, and the kind of activities you have map on to creating the type of learning environment and community that you mean to have, in our case for innovation, education, and create the kind of networks while people are in school, both as undergraduates, and hopefully where they're attached to a strong community of people that are interested in innovation and, and work and run with that in a lot of different ways. So, I think if we succeed, that can be amazing. For us here, and, and for what we could develop in higher education that is scalable, more broadly. This would be transformative, as I'm indicating, for us and beyond. And that would be important to do. So, I think there's a responsibility."

Creating a community of transformation within higher education holds importance for both students and faculty. For students, such a community offers a dynamic learning environment where they can engage in innovative practices and collaborations. It provides opportunities for students to explore diverse perspectives, challenge conventional wisdom, and develop critical thinking skills essential for success in today's complex world. Moreover, a community of transformation fosters a sense of belonging and ownership among students, empowering them to take an active role in shaping their educational experiences. For faculty, this initiative presents an opportunity to revitalize teaching practices, inspire creativity, and promote lifelong learning. By participating in a community focused on transformative education, faculty members can exchange ideas,

experiment with new pedagogical approaches, and enhance their professional development. Nevertheless, preventing the transformation into an island of innovation necessitates ongoing support from external factors to sustain this model, which are not always met as seen in previous sections. Therefore, a cultural shift within higher education is crucial for programs like the M3 to exist; however, resistance may surface among faculty members who juggle their faculty members duties along with communicating the program's value constantly to sustain the initiative. Therefore, to foster a community of transformation, this initiative must prioritize cultivating an environment conducive to collaboration, transparency, and adaptability in higher education. However, even with those efforts the rugosity of traditional structures and systems in higher education can make true transformation a challenge.

This research study, guided by the CoT perspective, explores the transformative changes occurring, and not occurring in higher education within the context of the M3 program. CoTs, characterized by their collective pursuit of growth and change, provide a theoretical perspective through which cross-college co-teaching for transdisciplinary education in the pursuit of innovation is examined. The educational transformation articulated by faculty demonstrates the importance of guiding students to think beyond disciplinary boundaries, emphasizing practical application and hands-on experiences. Faculty dedication to fostering innovative thinking, exemplified by initiatives like the Ambassador Program, has gained traction among students from diverse backgrounds, fostering a sense of community within the institution. Looking ahead, the program aims to continually embrace a CoT approach focused on intentional, philosophy-driven practices, thereby avoiding isolation as an "island of innovation" and creating scalable models for innovation and community-building in higher education. The stakeholders involved in this CoT actively pursue educational growth and change, guided by a philosophy emphasizing inclusivity, collaboration, and innovative teaching. By synergizing the strengths of engineering/technology, liberal arts, and business colleges/units, the program creates a transformative undergraduate experience accessible to all students. The culmination of these efforts has contributed to limited changes within higher education; however, stakeholders are united in their pursuit of innovative teaching practices and collaborative learning experiences for faculty and students, but ultimately cannot break down the traditional structures and systems that inhibit barriers. Moving forward, it is imperative for all stakeholders within the M3 program, and higher education, to sustain their

dedication and continue collaborative work to enhance the impact of the program on student learning and the broader landscape of academia.

4.6 After the Show

Throughout my observations in co-taught courses, my role underwent variations in each setting. In *Designing Technology for People*, I was physically present almost every week until midway through the semester. The first class of the semester, upon talking with the instructor of the morning section, I was directed to occupy a chair positioned against the wall, akin to where the teaching assistant had traditionally sat. There, I observed the majority of classes. As subsequent classes commenced, I found myself in the same spot, immersed in a routine of 50-minute lectures followed by two-hour labs, with both sections consecutively scheduled on Mondays. While there were instances where I felt disengaged, there were also moments of active involvement, including offering guidance to students and eventually delivering a lesson on criteria and constraints. The journey to assuming a teaching role was characterized by a mix of excitement and amusement. However, I witnessed an anthropologist taking the lead in the classroom, relegating the co-teacher to tasks such as attendance rather than fostering an equal partnership. This was compounded by the promotion of the previous co-teacher to department head, underscoring the importance of effective training for new instructors. However, despite the new instructor's seeming disparity in the co-teaching relationship, the urgency to fill the vacancy left little time for comprehensive training.

As the course progressed, I found myself leading a lesson on engineering and technology, a subject outside the primary instructor's disciplinary background. Drawing from the previous co-teachers' materials, I injected my own insights into the content delivery. Although the lesson was well-received, it lacked the integration of transdisciplinary elements, primarily focusing on engineering and technology. This realization prompted reflections on the need for collaboration with co-teachers to align lesson content with the program's overarching objectives. In hindsight, I acknowledged the oversight in connecting the lesson to the anthropological aspect of the course, highlighting the importance of cross-disciplinary dialogue in co-teaching scenarios. If given the opportunity to co-teach again, I aspire to engage in meaningful exchanges with fellow instructors to broaden perspectives and align instructional approaches with the program's core philosophy.

Furthermore, throughout my observations, I've noticed a consistent trend wherein one instructor predominantly assumes the lead role across all classes. While in two instances, this dominance can be attributed to turnover, in another class where both instructors have collaborated for over two academic years, a primary instructor still emerges. This primary figure, hailing from the engineering/technology discipline, is invariably positioned near the podium, initiating and concluding classes, sending messages to students, and holding programmatic responsibilities. Reflecting on my own inadvertent contribution to this dynamic, I recall instances where, as the person responsible for attendance, I reinforced the primacy of the engineering/technology instructor by exclusively sending attendance forms to this individual. Consequently, I posit that while advocating for cross-college co-teaching in pursuit of transdisciplinary education appears straightforward and commendable, breaking away from the convention of a single lead instructor necessitates a conscious effort to rewire ingrained habits. I remain skeptical that achieving the ideal co-teaching dynamic can be accomplished within a single semester or even ten, but I maintain optimism that as long as co-teachers remain receptive to mutual learning and share the common goal of fostering student engagement beyond disciplinary confines, progress is indeed feasible

4.7 Summary

This chapter presented the findings from the data collection and analysis techniques used to form the case study of the M3 cross-college co-teaching initiative. The data included interviews from stakeholders (faculty, advisors, administrators), classroom observations using participant observation (*Prototyping Technology for People: Making Decisions & Thinking Strategically and Designing Technology for People: Anthropological Approaches*), and document analysis of both the co-taught courses. From the three data sources, various themes were identified regarding cross-college co-teaching and the potential emergence of a CoT through co-teaching approaches. The implications of these findings will be elaborated upon in Chapter 5, where they will be considered alongside the conclusions drawn from this study, as well as recommendations for future endeavors and research pertaining to this pioneering educational model.

5. CONCLUSION, DISCUSSION, & RECCOMENDATIONS

5.1 Introduction

This chapter focuses on the understanding of this case study's results, through themes identified throughout the data. Additionally, this chapter discusses the recommendations for future practice and future research around cross-college co-teaching for transdisciplinary education in the pursuit of innovation. The chapter concludes by suggesting recommendations for additional research in the field.

5.2 Conclusion of the study

The purpose of this case study was to understand how cross-college co-teaching is enacted in higher education. To address this research objective, a case study of the co-teaching collaboration in the M3 program was conducted while also applying the theoretical perspective of CoT to analyze how co-teaching may support the emergences of a CoT for institutional transformation. This case study used data in the form of interviews, observations, and document analysis. The interviews for this study were conducted with administrators, advisors, and faculty. The interviews were semi-structured approximately one hour long, amounting to around 33 hours of total interview data for this project. Along with the interviews, observations were conducted for the co-taught classes, some of the observations done in person and some observations were conducted via recordings. The observations were utilized to corroborate the interview data around co-teaching. Furthermore, document analysis of the co-teaching materials was utilized to see how cross-college co-teaching is enacted even through the teaching material. These data points were analyzed and coded to an existing project codebook. The results from the three data sources were triangulated to identify relevant themes that address the study's research question and to develop the recommendations and discussions points related to understanding how cross-college co-teaching can be enacted in higher education considering the structure of institution.

The data from this study showed that cross-college co-teaching allowed opportunities, challenges, and strategies to emerge. To put it simple, the results have shown that while cross-college co-teaching can seem like a simple idea, it really is a complicated process to enact, but one that can provide valuable outcomes for students, faculty, and the institution if the appropriate

transdisciplinary strategies are put into place organizationally. For example, the participants involved in the study saw the value in having multiple disciplines converge within the undergraduate education realm—while they believed resulted in more engaging learning experiences for students and the establishment of a transdisciplinary research team that continually investigated and improved how co-teaching is implemented across colleges. In addition, the participants did highlight common challenges with working across colleges due to the traditional structure of higher education institutions. These challenges include assigning teacher credit among three different colleges for co-teaching, navigating the registrar to show that a class is co-taught and advisors getting students enrolled in a cross-listed class, finding a classroom to support active learning, and getting administrators to see the value in a cross-college co-teaching initiative. Furthermore, the data depict that faculty need to spend more time working on creating and implementing a cross-college co-taught class in comparison to a traditionally run class due to the level of integration of the content, the teaching methodology, and the nature of transdisciplinary education. Due to the challenges involved with navigating the traditional systems and structures of the institution, cross-college co-teaching is likely not an initiative that many will take on. But the findings suggest that cross-college co-teaching for transdisciplinarity can be enacted in higher education through motivated faculty members engaging in the collaboration, having supportive administration, and advisors. If implemented with invested stakeholders, it appears that cross-college co-teaching can provide value that goes beyond enhancing undergraduate education alone and expands to new educational and research collaborations among academics sparking innovation and fostering lifelong learners. To help others implement this approach to achieve true transdisciplinary learning, the data also displays a story of how cross-college co-teaching can be enacted in higher education. For example, the data shows us that:

1. *The Setting* is not just a backdrop but a critical element of the success or failure of cross-college co-teaching programs. *The Setting* section in this thesis includes sub-sections around institutional structure, administrative policies, and the role of academic advisors. These components shape the environment, either facilitating or impeding the realization of transdisciplinary education through co-teaching efforts. Firstly, the institutional structure serves as the foundation on which cross-college co-teaching initiatives are built. Institutions may vary in their organizational setups, ranging from centralized to decentralized models. In settings characterized by rigid disciplinary silos, collaboration

becomes inherently challenging. Deep-rooted departmental boundaries and administrative hierarchies can inhibit transdisciplinary dialogue and cooperation. Overcoming these barriers requires deliberate efforts to bridge the divide. Secondly, administrative leadership, including department heads and deans, wields considerable influence in shaping the institutional landscape. Their support and endorsement of cross-college co-teaching is pivotal in trying to break down disciplinary barriers and promoting transdisciplinary education. Leaders who recognize the value of transdisciplinary approaches are more likely to work with initiatives that encourage faculty collaboration across colleges. Thirdly, academic advisors play a crucial role in navigating institutional barriers and facilitating student participation in co-taught classes. In settings marked by disciplinary silos, advisors often find themselves confronted with logistical challenges when attempting to integrate students from diverse academic backgrounds into transdisciplinary courses. Nevertheless, resourceful advisors adeptly navigate bureaucratic hurdles, leveraging their knowledge of institutional policies to advocate for student inclusion. In essence, The Setting serves as a landscape that shapes the pathways of cross-college co-teaching programs. Overcoming disciplinary silos for transdisciplinary education necessitates a coordinated effort to address institutional structures, garner administrative support, and empower academic advisors. By recognizing the pivotal role of The Setting and actively working to cultivate an environment conducive to collaboration, higher education institutions can unlock the transformative potential of cross-college co-teaching for faculty and students alike.

2. *The Characters* within a co-taught course play a pivotal role in ensuring its success. This section of the thesis delves into various aspects of the co-teacher's involvement, encompassing teacher dynamics, turnover, finding the teachers, and co-teacher relationships. Teacher dynamics demonstrates the differences between instructors originating from diverse disciplinary backgrounds. Each brings their unique expertise, teaching styles, and perspectives to the collaboration, however figuring out how to combine their traditional teaching roles into one shared concept comes with a learning curve. The process of negotiation and adaptation is crucial for fostering effective collaboration and maximizing transdisciplinary instruction. Turnover presents a serious challenge to the continuity of co-taught courses. As faculty members transition due to promotions, sabbaticals, or other reasons, the stability and coherence of the co-teaching arrangement

can be disrupted. New instructors necessitate adjustment as they familiarize themselves with their roles and acclimate to the principles of cross-college co-teaching for transdisciplinary education. Moreover, ensuring that incoming faculty share a commitment to the values and objectives of collaborative teaching becomes imperative for sustaining the momentum of the co-taught courses. Next, finding the teachers poses its own set of challenges, particularly in identifying individuals willing to invest the additional time and effort required for successful cross-college co-teaching for transdisciplinary education. Amid competing demands such as research obligations, departmental responsibilities, and personal pursuits, recruiting educators who prioritize transdisciplinary collaboration can be challenging. Negotiating issues surrounding workload distribution, credit allocation, and recognition becomes paramount in incentivizing faculty participation and fostering a culture conducive to co-teaching initiatives. Lastly, co-teacher relationships highlight the interpersonal dynamics between instructors and their impact on collaborative teaching efforts. Not all faculty members possess the compatibility to forge effective partnerships conducive to transdisciplinary learning. Understanding and navigating these relationships is crucial for mitigating potential conflicts and fostering a harmonious environment conducive to collaborative pedagogy. Cultivating mutual respect, open communication, and a shared vision for transdisciplinary education are essential ingredients for nurturing productive co-teacher relationships. Therefore, the ideal candidates for these roles should be educators who exhibit a genuine eagerness to exceed conventional expectations in higher education, demonstrating an ongoing commitment to advancing transdisciplinary educational endeavors. They should possess a strong desire to engage in collaborative learning, embracing the opportunity to work alongside colleagues from diverse disciplinary backgrounds and hone their communication skills in this dynamic setting. Moreover, they should embody a spirit of mentorship, readily extending support to new faculty members and guiding them towards recognizing the inherent value of transdisciplinary initiatives. Negotiating differences, addressing turnover challenges, recruiting committed educators, and fostering positive co-teacher relationships are essential elements in ensuring the longevity and effectiveness of transdisciplinary education initiatives.

3. *The Performance* of cross-college co-teaching is the sum of navigating and working with different stakeholders to implement the classes. The section, labeled *The Performance*, had subsections of Student Engagement and Transdisciplinary Learning, Beyond Disciplinary Barriers, and Innovation. When cross-college co-teaching is enacted, students are participating in active learning that is engaging, through the method of transdisciplinarity. Therefore, the performance of cross-college co-teaching must have students actively learning. The implementation of co-teaching must break away from siloed disciplinary approaches, but rather students should be encouraged to explore topics from multiple perspectives, fostering an understanding from multiple disciplinary lens. Cross-college co-teaching should challenge the constraints of disciplinary boundaries for students and instructors. Furthermore, co-teachers need to bring together their diverse expertise and integrate their respective disciplinary lenses to create a rich learning environment. Lastly, one of the most notable identifiers of the co-taught classes is innovation. Innovation manifests in various forms, including pedagogy, personal identity, and product development. Co-teachers should leverage their combined expertise to develop lessons that combine disciplinary expertise to spark innovative ideas and have students work to solve and design solutions. Moreover, students from all disciplinary homes need to feel empowered to explore new ideas and approaches within the classroom.
4. Within *The Encore* section, the focus shifts towards outlining the next steps and envisioning the future trajectory of the initiative. This section is subdivided into five key components, Professional Development Opportunities, Shared Language, Teacher Transformation, Sustainability, and Creating a Community of Transformation. Central to the continued success of cross-college co-teaching is professional development opportunities. These opportunities should cater to both co-teaching teams and the broader group involved. Engaging events, workshops, and seminars play a pivotal role in aligning instructors' teaching practices, philosophies, and work to foster relationships. Special emphasis should be placed on training new faculty members in the art of co-teaching for transdisciplinary classes, equipping them with the necessary skills and insights to navigate transdisciplinary collaboration effectively. An important step for transdisciplinarity, involves linguistic agility. Educators should weave language from both disciplines into their teaching, fostering a seamless fusion that transcends traditional disciplinary

vocabulary boundaries. By employing a shared language approach, instructors enrich the learning experience, providing students with a comprehensive understanding of concepts from multiple perspectives. Furthermore, a hallmark of successful cross-college co-teaching is the transformative impact it has on educators themselves. As instructors engage in collaborative teaching practices and embrace transdisciplinary approaches, they undergo personal and professional transformations. This self-awareness and evolution among teachers signify the program's efficacy in fostering innovative pedagogical practices and inspiring lifelong learning. As for the sustainability of cross-college co-teaching, efforts should be made to establish structures and mechanisms that support ongoing collaboration and innovation. Sustainability initiatives may include the development of administrative support systems, the cultivation of strategic partnerships, and the implementation of measures to assess and enhance program effectiveness over time. Lastly, at the heart of The Encore section lies the aspiration to create a vibrant and dynamic community of transformation within the educational landscape. This community transcends individual classrooms and institutions, encompassing educators, students, administrators, and other stakeholders committed to collaborative learning and innovation. Building such a community requires fostering a culture of trust, collaboration, and shared vision. Through open dialogue, collective reflection, and meaningful engagement, stakeholders can co-create transformative educational experiences that inspire positive change and drive continuous improvement. In conclusion, the Encore section of a cross-college co-teaching program serves as a roadmap for advancing transformative education. By prioritizing professional development, shared language, teacher transformation, sustainability, and community building, stakeholders can pave the way for a future characterized by innovation, collaboration, and lifelong learning.

While this case study looked at classes involved in a cross-college co-teaching initiative, the results can hopefully be used to contribute to the discourse around transdisciplinary education in higher education, specifically deployed through cross-college co-teaching. Additionally, these results can aid to further understand how disciplinary silos can be transcended in higher education. These understandings can be used to inform other cross-college co-taught classes for transdisciplinary education, the development of other programs in higher education to transcend disciplinary boundaries, and future research that wants a deeper understanding of this initiative.

5.3 Discussion of Results

5.3.1 Can cross-college co-teaching be enacted in higher education today?

This cross-college co-teaching program presented an opportunity to see how cross-college co-teaching can be enacted in higher education. Cross-college co-teaching for transdisciplinarity in the pursuit of innovation is possible through many stakeholders, and especially the faculty who work as instructors within Designing Technology for People: Anthropological Approaches and Prototyping Technology for People: Making Decisions & Thinking Strategically. The absence of incentives for faculty to engage in cross-college co-teaching poses a barrier to the widespread adoption of such initiatives in higher education institutions. Despite the potential benefits of collaborative teaching for transdisciplinary learning and innovation, several factors contribute to the reluctance of faculty to participate in cross-college co-teaching programs. Engaging in cross-college co-teaching requires faculty members to navigate complex administrative processes and negotiate issues such as credit allocation, funding, and responsibilities with their colleges, deans, and department heads. The bureaucratic challenges associated with coordinating transdisciplinary courses can be daunting, particularly when there are no institutional mechanisms in place to facilitate such collaborations. Additionally, at many institutions, promotion and tenure metrics prioritize quantitative measures of academic output over the quality of teaching and educational innovation. Faculty members may perceive cross-college co-teaching as a risky endeavor that does not align with traditional criteria for career advancement. Without clear recognition and rewards for engaging in collaborative teaching initiatives, faculty are less incentivized to invest time and effort into cross-college co-teaching. In the absence of tangible incentives, such as financial compensation, reduced teaching loads, or professional development opportunities, faculty may perceive cross-college co-teaching as an additional burden rather than a rewarding endeavor. Without clear benefits for participating in collaborative teaching initiatives, faculty members are less motivated to invest their time and energy in cross-college co-teaching. In academic environments where research productivity is prioritized over teaching excellence, faculty members may prioritize their research commitments over engaging in collaborative teaching initiatives. The pressure to publish in prestigious journals and secure external funding often takes precedence over innovative pedagogical practices, leading faculty to allocate their time and resources accordingly. Institutions that lack a culture of collaboration and transdisciplinary engagement may struggle to

foster cross-college co-teaching initiatives. Faculty members may feel isolated within their disciplinary silos and may be hesitant to venture outside their comfort zones to collaborate with colleagues from other departments or colleges. In summary, the absence of incentives, coupled with administrative hurdles and a research-centric culture, presents barriers to the widespread adoption of cross-college co-teaching initiatives in higher education. Overcoming these challenges will require institutions to recognize and reward collaborative teaching efforts, provide support for navigating administrative processes, and foster a culture of collaboration and innovation among faculty members. Without concerted efforts to address these barriers, cross-college co-teaching is unlikely to gain traction at other institutions.

In conclusion, while this cross-college co-teaching program has illuminated the potential of collaborative teaching for transdisciplinary learning and innovation, the numerous barriers and challenges outlined here underscore the weighty hurdles that educators face in adopting similar initiatives. The absence of tangible incentives, coupled with bureaucratic complexities and a research-centric culture, presents formidable obstacles to the widespread adoption of cross-college co-teaching in higher education. Without meaningful recognition, support, and a shift towards a culture of collaboration and innovation, it is evident that many educators may find the prospect of engaging in cross-college co-teaching untenable. As such, unless institutions take decisive steps to address these barriers and foster an environment conducive to collaborative teaching, the widespread implementation of cross-college co-teaching initiatives is likely to remain elusive for the foreseeable future.

5.3.2 Can cross-college co-teaching emerge as a CoT?

The CoT theoretical perspective applied to this research depicted the framework of which the cross-college co-teaching initiative was guided by. The CoT framework relies upon: “1) a compelling philosophy, 2) a living integration of the philosophy to create a new world of practice, and 3) a network of peers to break isolation and brainstorm revisions in practice” (Shadle Liu et al., p.476). Whereas the driving philosophy of the M3 program is that anyone can be an innovator, impactful innovation does not happen in silos, and as a result teaching should involve transdisciplinary pedagogical approaches. The perspective of Community of Transformation (CoT) was employed to evaluate the potential for establishing a community of transformation by implementing cross-college co-teaching.

To ensure the success and emergence of a Community of Transformation (CoT), it is imperative to establish a clear and shared understanding of the goals among stakeholders. When all parties comprehend the objectives of the transformation, they can coordinate their efforts effectively within the cross-college co-teaching initiatives. Collaboration and communication are vital for transcending disciplinary boundaries in the classroom. The introduction of new instructors, whose roles may sometimes be ambiguous or misaligned with their co-teachers, underscores the importance of professional development within cross-college co-teaching. Additionally, leadership plays a pivotal role in guiding and facilitating the transformation process. The faculty involved, particularly those leading the project, should inspire and empower faculty members, advisors, and administrators, advocating for necessary changes and providing support and resources to sustain and enhance the program. This approach helps to elucidate the driving philosophy behind cross-college co-teaching. Establishing trusting relationships is essential to enable co-teachers to embody the guiding philosophy within their classrooms. Co-teachers should adopt innovative teaching methods, fostering an environment where both instructors and students learn in novel ways that transcend conventional disciplinary confines. This approach nurtures the belief that innovation is accessible to all individuals. This can be done through educators engaging with colleagues from different disciplines and colleges to form a supportive network. Furthermore, utilization of online platforms for communication should be used to maintain ongoing communication and collaboration among peers, even outside of formal meetings. This network should be the platform for sharing experiences, ideas, and challenges related to cross-college co-teaching, which in turn can create a sense of community and collaboration.

Despite the potential benefits of cross-college co-teaching programs in enhancing teaching practices and promoting transdisciplinary collaboration, various practical challenges impede the emergence and sustainability of a CoT. Administrative and institutional hurdles obstruct the ability of such communities to effect meaningful change, including constraints in funding, support, and the rigidity of traditional systems and structures. Despite the establishment of an innovation hub tailored for cross-college initiatives, the program failed to garner adequate promotion. Consequently, the program struggled to navigate the obstacles of cross-college programming without sufficient support. Turnover and concerns about program sustainability further complicate matters, necessitating continual advocacy for cross-college co-teaching's value to administrators. Furthermore, while there is recognition of the need to dismantle traditional barriers, tangible

actions to address these issues remain minimal. To combat higher education's rigidity, faculty involved in the M3 program have undertaken initiatives such as bi-weekly team meetings and a weeklong summer retreat to foster collaboration and ensure sustainability efforts. However, without broader institutional support and systemic changes, the potential for a community of transformation within cross-college co-teaching programs will remain constrained. It is unclear how the community will sustain over time, considering there are no institutional resources to aid in these endeavors.

In conclusion, the theoretical framework of Community of Transformation (CoT) guided the implementation of the cross-college co-teaching initiative, emphasizing the importance of a compelling philosophy, integration into practice, and peer network. The driving philosophy of the M3 program, promoting innovation and transdisciplinary teaching, aligns with the CoT perspective. However, despite efforts to foster collaboration and innovation, practical challenges such as administrative barriers, limited support, and institutional rigidity hinder the emergence and sustainability of a CoT. While faculty engagement and initiatives like bi-weekly meetings and summer retreats demonstrate commitment, broader institutional support is essential for long-term success. Without adequate resources and systemic changes, sustaining a community of transformation within cross-college co-teaching programs remains uncertain. Thus, there's a pressing need for institutional commitment to facilitate meaningful change and enable the realization of the CoT vision in higher education.

5.4 Recommendations

To date, educational stakeholders have limited research documenting how cross-college co-teaching programs foster transdisciplinary education and innovation in higher education. Drawing upon the literature reviewed in preceding chapters and insights derived from this study's three data sources, this section offers recommendations for the advancement of cross-college co-teaching initiatives and suggests avenues for future research in this domain.

5.4.1 Future Practice

Achieving success in cross-college co-teaching initiatives like the M3 program, aimed at fostering transdisciplinarity in higher education, relies on numerous factors falling into place.

From the success and challenges encountered from cross-college co-teaching for transdisciplinary in the pursuit of innovation within the M3 program it is advisable to:

1. For the continuation of cross-college co-taught courses, institutional support is imperative to sustain these programs effectively. This entails implementing specialized entities that function in similar ways to existing examples such as the Honors College and the College of Collaborative Emergent Studies. The Honors College is a college within this research-intensive university that offers students interdisciplinary learning experiences where instead of cross-listing the combined class titles, they are able to have a separate acronym, *HNRS*, which allows the proper listing for their interdisciplinary co-taught courses. As for the College of Collaborative Emergent Studies, this is a college at the University of Tennessee, that is opening doors for students to customize their educational experience by offering classes at emerging topics from the cut through conventional disciplines. Both of those colleges are actively providing solutions to working across colleges, which can serve as beneficial examples to learn from. The structures of those examples can provide the necessary resources, administrative frameworks, and academic oversight to facilitate collaboration across colleges. By establishing designated spaces for cross-college collaboration, navigating institutional barriers becomes more manageable, fostering an environment conducive to innovative teaching and learning practices. Furthermore, institutions embarking on cross-college co-teaching initiatives should prioritize the establishment of clear guidelines and protocols for distributing faculty workload across participating colleges. This can be achieved through collaborative planning sessions involving administrators and faculty members to ensure a fair and balanced allocation of teaching responsibilities and funding. The establishment of institutional support for cross-college co-taught courses is vital for the future of transdisciplinary education. Without such support, these innovative programs may struggle to sustain momentum and effectiveness. Ultimately, this support lays the foundation for the continued advancement of transdisciplinary education, preparing students to tackle complex real-world challenges by drawing on diverse perspectives and areas of expertise. Therefore, the establishment of institutional support is pivotal for the advancement of cross-college co-taught courses, ensuring students are equipped to address challenges through transdisciplinary education.

2. Institutions engaging in cross-college co-teaching initiatives should reassess their compensation structures to ensure fair remuneration for faculty members participating in these collaborative endeavors. Exploring various incentives beyond mere recognition, including financial rewards or alternative forms of acknowledgment, can serve to motivate faculty involvement. However, the question remains: are these incentives truly sufficient, and how can they be optimized to effectively encourage cross-college collaboration? Recognizing that such initiatives often demand more time and preparation compared to traditional lecture-based teaching, institutions may consider allocating additional resources. This could include providing course release time or offering professional development opportunities to ensure that faculty members are appropriately recognized and incentivized for their contributions to cross-college co-teaching programs. In conclusion, to ensure faculty members are adequately recognized and incentivized for their contributions to cross-college co-teaching programs, other incentives for faculty should be explored.

By addressing these key areas, administrators can better support and facilitate the successful implementation of cross-college co-teaching programs, ultimately enhancing the quality of transdisciplinary education and promoting innovation within higher education.

Additionally, the advisors, when asked about their thoughts on the cross-college co-teaching program, had responded with “don’t”, as this is messy for instructors, students, and advisors to navigate. Therefore, with advisors being the people that often add students to and inform of classes to take, the following can be recommended:

1. To make cross-college co-taught courses accessible through the registrar, they must be cross-listed, indicating involvement of two professors from different colleges. However, the current cross-listing structure poses challenges for advisors. This underscores the necessity for a centralized system where such courses can be easily identified and enrolled in. Additionally, if the structures at the institutional level cannot transform, institutions should prioritize enhancing advisor training and support to effectively navigate the complexities of cross-college co-taught programs regarding the registrar. Furthermore, institutions should provide ongoing professional development opportunities to ensure advisors remain up to date with program requirements and best practices. Investment in advisor training and support is crucial for ensuring that students receive the guidance and assistance they need to navigate their academic journey effectively.

2. Advisors additionally mentioned that during their advising appointments sometimes the students and the advisor do not even end up getting to discuss classes. Limited advising time often prevents in-depth discussions about classes between students and advisors. This, coupled with complex cross-listed courses, reduces available time. To address this, implement standardized processes and documentation to aid advisors in navigating cross-college co-taught programs effectively. This involves creating comprehensive guidelines and resources for advisors, ensuring access to accurate information on program requirements, course offerings, and student placement. Establish streamlined communication channels among administrators, faculty, advisors, and stakeholders involved in these programs through regular meetings, workshops, and collaborative platforms. This fosters ongoing dialogue, idea sharing, and timely problem-solving. Enhanced communication and coordination among stakeholders improve the overall effectiveness of cross-college co-taught programs.

By implementing these recommendations, institutions can enhance their support structures for advisors and improve the effectiveness of cross-college co-taught programs, thereby fostering a more inclusive, innovative, and student-centered learning environment. Regarding faculty, instituting ongoing professional development sessions with co-teachers before and after each semester, along with a summer workshop involving various stakeholders and student ambassadors, can facilitate collaboration and enhance teaching quality. Furthermore, appointing a liaison to the team can streamline communication with administrators, ensuring they are kept informed of program progress, success, and the value provided to students. This approach also aids in turnover by ensuring continuity and clarity of roles within the co-teaching dynamics through targeted professional development efforts. The details of ideas for future practice for faculty are as follows:

1. To support co-teacher teams, institutions should prioritize continuous training. This includes sessions before and after each semester, subject to funding availability across colleges. Through instructors working together on things like grading, developing teaching material, and sharing ideas, the mutual exchange can allow the instructors to feel valued. Collaborative teaching enables new instructors to learn course procedures and expectations. Joint efforts in grading, material development, and idea sharing foster a sense of value among instructors. Given the identified issue of misaligned understandings of

responsibilities between new and experienced instructors, this approach can be particularly beneficial in addressing such discrepancies. Additionally, the continuation of summer retreats that involve various stakeholders can provide valuable insights and perspectives. These sessions aim to improve pedagogical skills, promote collaboration among co-teachers, and align with program objectives, benefiting both novice and seasoned faculty members. During co-teaching, such events prevent one teacher from dominating, ensuring equitable participation from both instructors. Furthermore, professional development can enhance the instructor's identity with being a transdisciplinary instructor, allowing them to identify themselves as more than their trained disciplinary background. While it is not always a perfect split of disciplinary content, the co-teachers should be developing their transdisciplinary knowledge relating to their course. Establishing clear role understanding and job descriptions is essential to provide faculty and co-teachers with explicit guidelines and expectations regarding their roles and responsibilities within cross-college co-teaching programs. Clarifying the objectives of initiatives and outlining the specific contributions expected from each participant is crucial to fostering a genuinely transdisciplinary educational setting for students. Without a clear vision and commitment to the driving philosophy, the integration of transdisciplinarity may be overlooked, highlighting the importance of clearly defining roles and aligning them with program objectives to ensure the success and effectiveness of such initiatives.

2. To enhance communication and collaboration within cross-college co-teaching programs, institutions should consider appointing a program liaison within the team, tasked with facilitating communication and collaboration among faculty, administrators, and other stakeholders. This ensures consistent dissemination of information to all administrators and advisors through a single point of contact who represents the program rather than any specific college. The liaison should provide regular updates to administrators regarding the program's progress, success metrics, and the value it provides to students. This proactive communication strategy helps mitigate challenges associated with turnover by maintaining continuity and institutional memory within the program, thereby promoting its long-term sustainability and effectiveness across diverse academic contexts.
3. Establishing mechanisms for documentation and knowledge sharing among co-teachers is essential for capturing best practices, lessons learned, and successful strategies within

cross-college co-teaching programs. Creating a centralized repository or platform for sharing this information can be particularly beneficial for new faculty members who may not have prior experience in instructional design or cross-disciplinary collaboration. By fostering a culture of information sharing and collaboration, institutions can facilitate continuous improvement and ensure the effective transfer of knowledge across diverse academic contexts.

Although full eradication of institutional barriers may prove challenging in the short term, the implementation of these recommendations can facilitate incremental progress and enhance accessibility to innovative educational opportunities for students, alongside fostering meaningful cross-college collaborations for educators. The administration's acknowledgment of the value of cross-college co-teaching for transdisciplinarity demonstrates a promising readiness to engage in collaborative efforts and instigate change within their sphere of influence. For faculty, transitioning towards a model that prioritizes collaborative planning with co-instructors not only can improve teaching quality and learning outcomes but also cultivates a culture of ongoing improvement. Moreover, introducing a liaison role to facilitate communication and coordination among advisors, administrators, and faculty members can streamline information dissemination about and provide support in navigating institutional barriers in higher education, particularly considering the multifaceted roles of faculty encompassing research, teaching, and administrative duties. Through concerted efforts to nurture meaningful relationships, improve communication across colleges, and prioritize collaborative pedagogy, universities navigate barriers, however fostering institutional transformation is not likely.

5.4.2 Future Research

The exploration of cross-college co-teaching environments presents a dynamic landscape ripe for further investigation and inquiry. As educators continue to embrace collaborative teaching practices to foster transdisciplinarity in undergraduate education, there remains a need to delve deeper into various facets of this pedagogical approach. This discussion outlines several avenues for future research aimed at shedding light on critical aspects of cross-college co-teaching environments and their impact on educational outcomes.

Further research exploring the use and impact of collaborative language in cross-college co-teaching environments, especially during periods of instructor absence, is crucial for several reasons. Firstly, understanding how co-teachers communicate and collaborate in the absence of one instructor provides insights into the resilience and adaptability of co-teaching dynamics. This research can shed light on how remaining instructors navigate challenges, maintain instructional continuity, and uphold the goals of the course during such periods, contributing to a deeper understanding of effective strategies for sustaining collaborative teaching practices. Additionally, investigating the use of collaborative language in these scenarios can illuminate the role it plays in maintaining student engagement, facilitating learning, and preserving the transdisciplinary nature of the educational experience. By examining how co-teachers communicate with each other and with students, researchers can identify patterns of interaction that contribute to the effectiveness of cross-college co-teaching environments, even in the absence of one instructor. This understanding is vital for informing pedagogical strategies aimed at enhancing student outcomes and fostering meaningful cross-disciplinary connections. Moreover, studying the impact of collaborative language during periods of instructor absence can provide valuable insights into the overall resilience and adaptability of cross-college co-teaching programs. By assessing how well co-teachers can maintain instructional coherence and support student learning in the absence of one instructor, researchers can identify areas for program improvement and develop targeted interventions to address potential challenges.

Furthermore, examining how instructors maintain their identity and expertise within cross-college co-teaching contexts is a critical area for future research with profound implications for enhancing collaborative teaching practices in higher education. Despite concerted efforts towards collaboration, questions persist regarding how instructors negotiate their disciplinary backgrounds and expertise within the transdisciplinary framework of co-taught courses. Understanding whether instructors prioritize their own disciplinary perspectives and how they navigate the integration of diverse disciplinary viewpoints is essential for fostering effective collaboration and promoting meaningful cross-disciplinary connections in the classroom. Research in this area holds the potential to illuminate instructor perceptions, practices, and challenges within cross-college co-teaching environments, thereby informing the development of targeted professional development initiatives for educators. By investigating how instructors reconcile their disciplinary expertise with the transdisciplinary nature of the course, researchers can identify effective strategies for

promoting collaboration, enhancing student learning outcomes, and fostering a cohesive instructional approach that embraces diverse perspectives. However, to conduct meaningful observations and gather actionable insights in this area, the development of an observation protocol specific to cross-college co-teaching is essential. Such a protocol would outline specific criteria and behaviors to observe during co-teaching sessions, including collaborative interactions between instructors, student engagement levels, and the integration of transdisciplinary concepts. Systematically observing and documenting these aspects would enable researchers to gain a comprehensive understanding of the strengths and weaknesses of the co-teaching model and identify areas for improvement. By developing an understanding of instructor perceptions and practices, informed by systematic observation and documentation, researchers can contribute to the ongoing refinement and enhancement of cross-college co-teaching programs.

Additionally, exploring alternative avenues for research, such as developing a comprehensive evaluation criterion for cross-college co-teaching programs, holds importance for advancing our understanding of collaborative teaching practices in higher education. These evaluation criteria serve as essential tools for assessing the effectiveness and impact of co-teaching initiatives, providing valuable insights into various dimensions of program outcomes. Establishing comprehensive evaluation criteria allows researchers to measure student learning outcomes resulting from cross-college co-teaching programs. By examining factors such as academic achievement, critical thinking skills, and disciplinary integration, researchers can gauge the extent to which co-taught courses contribute to students' overall educational experiences and academic success. This assessment is crucial for ensuring that co-teaching initiatives align with educational goals and objectives. Moreover, evaluation criteria for cross-college co-teaching programs should encompass faculty collaboration and satisfaction. This involves assessing the degree to which instructors effectively collaborate, communicate, and coordinate their efforts to deliver a cohesive and integrated educational experience for students. Understanding faculty satisfaction with the co-teaching model is essential for identifying factors that contribute to its success and sustainability, as well as addressing any challenges or barriers encountered during implementation. Additionally, evaluating student engagement in cross-college co-teaching programs is critical for assessing the extent to which students actively participate in and contribute to the learning process. By examining indicators such as attendance rates, participation levels, and student feedback, researchers can determine the effectiveness of co-taught courses in fostering student engagement

and promoting active learning experiences. To ensure comprehensive and meaningful evaluation of cross-college co-teaching programs, it is important to compare these metrics against those of traditionally run classes in higher education. By conducting comparative analyses, researchers can assess the relative effectiveness of co-teaching initiatives and identify areas for improvement or refinement. This comparative approach provides valuable insights into the unique strengths and challenges of cross-college co-teaching models, informing data-driven recommendations for program enhancement and optimization. Therefore, developing a comprehensive evaluation criterion for cross-college co-teaching programs is essential for assessing their impact, effectiveness, and sustainability in higher education.

Lastly, exploring the contextual factors that contribute to the success of cross-college co-teaching programs is crucial for gaining a comprehensive understanding of their effectiveness and impact within higher education institutions. By conducting research to depict the institutional environment in which these programs thrive, researchers can provide valuable insights into the broader picture of collaborative teaching practices and their implications. Employing an ecological framework to contextualize the success of cross-college co-teaching programs allows researchers to consider the multitude of factors and influences at various levels within the educational ecosystem. This framework encompasses individual, interpersonal, organizational, and systemic factors that collectively shape the outcomes of co-teaching collaborations. Understanding how these factors interact and influence one another is essential for identifying key determinants of success and failure and informing strategies for program improvement. At the individual level, factors such as faculty attitudes, beliefs, and teaching philosophies can impact the effectiveness of cross-college co-teaching initiatives. Interpersonal dynamics between co-teachers, students, and other stakeholders also play a crucial role in shaping the collaborative teaching experience and influencing program outcomes. Organizational factors, including institutional support, resources, and administrative policies, can either facilitate or hinder the implementation and sustainability of co-teaching programs. Additionally, systemic factors such as cultural norms, educational trends, and external pressures further influence the context in which co-teaching collaborations operate. By examining the interactions between these different levels of the educational ecosystem, researchers can gain an understanding of the contextual factors that contribute to the success of cross-college co-teaching initiatives. This assessment allows researchers to identify strengths and weaknesses within the institutional environment and develop targeted strategies for scaling

successful collaborations or addressing systemic barriers. Understanding the broader institutional context in which cross-college co-teaching programs operate is essential for informing policy decisions, resource allocation, and professional development initiatives aimed at enhancing collaborative teaching practices. By conducting research to depict the institutional environment and employing an ecological framework to contextualize program success, researchers can contribute to the ongoing refinement and improvement of cross-college co-teaching initiatives, ultimately enriching the educational experiences of students and educators alike.

In conclusion, the exploration of cross-college co-teaching environments offers a rich terrain for continued investigation and exploration. As educators increasingly adopt collaborative teaching practices to foster transdisciplinarity in undergraduate education, there exists a pressing need to delve deeper into various aspects of this pedagogical approach. The avenues outlined for future research in this discussion underscore the critical importance of further inquiry into cross-college co-teaching environments and their impact on educational outcomes. By pursuing these avenues of research, educators and researchers can contribute to the ongoing refinement and enhancement of cross-college co-teaching initiatives, ultimately enriching the educational experiences of both students and educators.

5.5 Summary

This chapter analyzed the results of this study regarding how cross-college co-teaching can be enacted in higher education, in a transdisciplinary manner in the pursuit of innovation. The conclusions taken from this study are informed by three data sources, which included faculty, advisor, and administration semi-structured interviews, classroom observations, and document analysis of teaching materials. Discussions were then formed around the results focusing on cross-college co-teaching within higher education, considering the institutional structural dynamics. Based on the literature discussed in earlier chapters, and the triangulation of the results, recommendations were made that focus on making changes to some aspects within the M3 program for the sustainability of the program and the cross-college co-teaching initiative.

This research aimed to address the challenge of overcoming institutional barriers to facilitate cross-college co-teaching. Nevertheless, the traditional structures and systems within higher education are barriers to swift adaptation and change. However, continuous research and information surrounding cross-college co-teaching for transdisciplinarity are important to better

understand its impact on the various stakeholders involved in collaborative efforts to begin other steps towards an institutional transformation. It is the hope of this researcher that this study is read by administrators, advisors, faculty, and other stakeholders involved in education, and be utilized to inspire a call to action to foster collaboration across traditional disciplinary boundaries as it could lead to innovation in many areas. The researcher hopes that this study is reviewed and discussed by those who want to bring authentic learning experiences that mirror workforce interactions to students through a pathway of collaboration and innovation. This research can be used as a review of what cross-college programs can look like in terms of their success, their challenges, and ideas for future change.

The data in this study suggests that cross-college co-teaching is a very possible initiative in higher education, and it is valuable. However, it poses its challenges such as finding the right faculty members who are invested in transdisciplinary collaboration and have a department head that supports the faculty, finding funding to support the faculty, being able to find a classroom that allows for active learning and innovation, and also, keeping administrators informed on the success of the M3 program in fostering a community of faculty and students amidst turnover. Demonstrating the value to new administrators becomes crucial during funding decisions. Overall, the resulting data can be used to provide more information surrounding cross-college co-teaching for transdisciplinarity in the pursuit of innovation, so that educators, administrators, and other educational stakeholders have the necessary information needed to make informed decisions as they attempt to transform undergraduate education through cross-college co-teaching for transdisciplinarity ventures.

APPENDIX A. CODEBOOK

Table A.1

Name	Description
Collaboration	Working in partnership (may focus on cooperating re: mutual interests and/or working to achieve shared goals)
Co-learning	involves participants engaging in activities and learning together - and coordinating efforts for understanding and problem-solving (may involve peer learning - e.g. among students, faculty) and how learning flows in many different directions
Co-learning Benefits	what is gained from co-learning (e. why is it advantageous and/or how does it promote good or helpful results)
360-degree learning	A “modern pedagogical approach” where student benefit from multidirectional instruction/perspectives, uses technology (e.g. digital learning tools), and has an industry focused agenda and hands-on approach, personalized approach, may involve modules and performance tracking
Co-learning Challenges	what makes co-learning more difficult (institutional barriers as well as interpersonal barriers)
Co-learning Enablers	what facilitates co-learning (makes the process easier, smoother or promotes it effectively happening)
Co-teaching	involves co-planning, co-instructing and co-assessing in the educational model
Co-teaching Benefits	what is gained from co-teaching (e. why is it advantageous and/or how does it promote good or helpful results)
Faculty transformation	A specific benefit of co-teaching where faculty go back to their disciplines with new approaches to thinking and teaching
Coteaching Challenges	what makes co-teaching more difficult (e.g., disincentives, institutional barriers as well as interpersonal barriers)
Coteaching Enablers	what facilitates co-teaching (e.g. incentives, values, makes the process easier, smoother or promotes it effectively happening)
Cross-college Operations	when colleges work together
Changes	New or evolved reasons of why or why not working with other colleges-is difficult or advantageous
Benefits	What makes cross-college desirable for faculty, administration, or students
Drawbacks	What makes cross-college operations not desirable for faculty, administration, or students

Advising	Any miscellaneous details about what it is like to advise students into different educational and career paths
Institutional barriers	what makes collaboration across colleges or schools difficult from the system, structures, or people at the institutional level
Advice to address institutional barriers	Suggestions, tips, or ways forward to solve institutional challenges that make co-teaching and co-learning possible
Cross-unit Collaboration (i.e., Departments)	when units (e.g., academic units such as departments), administrative units work together
Current Activities	what is being done now (e.g., education, jobs, teaching or researching roles)
Connection to M3 experience	How what they (students, alumni or faculty) do now in their roles, jobs, practices related to what they learned during the M3 program
Outputs of M3	What sorts of student, alumni, faculty success, and other indicators of program impact are collected or should be documented to measure/evaluate the program
Getting Started	embarking on a major endeavour, project or process
Joining the Program	Choosing to do the D & I courses/minor and being involved in its activities
Enrolment Motivations	reasons for signing up for the D & I courses/minor (peer-network, alumni connections, student ambassadors)
Enrolment Process	signing up/arranging to participate in the D & I program
Enrolment Process Challenges	what makes joining/signing up for the program more difficult (scheduling, advising, play of study)
Enrolment Process Enablers	what makes joining/signing up for the program easier (e.g., more convenient, promotes the process, advisors, ambassadors)
Enrolment Process (Nodes) Enablers	
Making the program	creating the Design and Innovation educational model (including the curriculum and learning community)
Collaborative Coursework	What things could change or be different about innovation education classes, course structure, etc
Program building process	actions performed in developing the educational model (and state goals in taking those actions)
Program Building Challenges	what makes program building more difficult (may include what delays or interferes with progress, impedes moving towards program building goals)

Program Building Enablers	what promotes program building (may make things easier, furthers the progress, supports or actively encourages program-building)
Program Impressions	What someone makes of the educational model/experience now (may include their understandings and opinions of the D & I program, as well reaction to the successes and research findings of the program)
Completing the Program	things that make finishing the course sequence possible or challenging. These could be internal or external pressures or enablers for the courses.
Course & Program Expectations	What was anticipated for the course/program.
COVID	anything related to COVID and how they were impacted (e.g., their learning experiences, world view, socialization)
Failure	when something does not go well (e.g., isn't accomplished, considered to have a not favourable outcome)
Favorite Program Experience	something specially remembered that occurred while in the course/program
Belonging_	A felt sense of connection to people, community, and place_
In relationship to other classes	Comparing or mentioning other courses taken that have design and innovation elements such as engineering, US, or qualitative research.
Program Change	ideas for program improvement and/or what should happen going forward
Recommending the Program	reasons why you would suggest that others take the course/minor -or not do so
Success	when something goes well (e.g., is accomplished, considered to have a favourable outcome)
Success and Failure	when something is considered to have the characteristics of both success and failure (e.g., may relate to how evaluated in what is accomplished and how outcomes are perceived)
Using the Learning	how the educational approach (learning in terms of knowledge, skills, experiences, self-reflection, transformation. etc) is then applied in different contexts
Program Motivations	reasons for developing the educational model
Sustainability	aspects of contribute or hinder the program maintaining over time.
Working partnerships	aspects of the program that rely on or are influenced by working with others.

Developing a community of transformation	Making a philosophy of transformation, a community of practice, and people who contribute and benefit from the community, and how you bring back those ideas, experiences, or approaches_
Driving Philosophy	The motivation behind co-teaching. 1. Teaching and learning in a new way 2. Anyone can be an innovator 3. No disciplinary silos
Living Integration of Philosophy	How the driving philosophy is being integrated into the classroom and other educational settings
Goals	directed sets of actions, things people want to accomplish
Goals Long Term	want to accomplish in the future, may require time and planning
Goals Short Term	Want to accomplish soon, can happen quickly
Innovation Education	education that focuses on preparing students to be innovators; have an innovative mindset (nurtures and prioritizes doing things differently and in ways that haven't been done before)
Broadening Participation	how might we reach out to a wider range of people, including those who may currently be under-represented in innovation education, discovering and nurturing talent
[University] Polytechnic High School	high school founded by [University] U and City of Indianapolis in partnership with "community, industry and academic leaders". Meant to prepare students to succeed in "technical STEM related post-secondary programs and high-tech careers
Who would be a good fit for D&I	characteristics of people who would like or alternatively those who would struggle with this program from alumni, students, or faculty perspectives
Who wouldn't be a good fit	
Defining Innovation	what makes a project, idea, or concept different than an improvement or invention. What is the essence of innovation.
Defining Innovators	ways that people self-identify or are identified by others as innovators
Institutional Transformation	what changes should occur in how institutions provide innovation education
Preparing Innovators	knowledge, skills and experiences that are important in innovation education
[University] Innovation Environment	this educational institutional arena and its focus on innovation across time and space (e.g., explore at different moments and in/across various parts of [University]);
[University] Innovation Education	knowledge, skills and experiences that are important in innovation education at [University]

[University] Does Well	What aspects of innovation education [University] performs well or "does what it should do" to be successful
[University] Innovation History	established record and accounts of how [University] (and its people) came up with new ideas, approaches, methods, technologies etc. (explore what/why considered to be a departure from what came before - and potential value-added by [University])
[University] Less Well	What aspects of innovation education [University] performs less well (or "does not do as well" to be successful)
Space and Place	The design, availability, and use of buildings, landscapes, and other spaces for innovation education
Research and Teaching Structures_	Purdue [University]'s models for innovation education and research (e.g., innovation hub, innovation college)
Future of Higher Education	What is the transformation needed in higher education (e.g., in response to questioning the value of higher education, changes to enrolment)
R1 Institutions	what role(s) R1 institutions (defined as top tier and having high research activity) should play in innovation and educational spheres
Changes to perspective	Different or evolved opinion about what an R1 institute can do to advance innovation education

APPENDIX B. INTERVIEW SCRIPTS

Faculty Interview #1

Thank you for taking the time to join me today. As you are aware, we are conducting a study related to the transformation of undergraduate learning to better prepare students to become innovators. This study is funded by the National Science Foundation and is centered around the Design & Innovation program supported by the technology, business, and liberal arts colleges. Today we will conduct an interview which will last about 30 – 40 minutes and involve asking you to share your knowledge and perspectives about innovation-focused education.

Okay, Let's Begin.

First, I would like to learn a little more about you. Could you a brief snapshot of yourself? Maybe just a quick summary of your background, current job role, research interests, and teaching experience? *Probe: In what ways/how do you see yourself as an innovator?*

1. What can you tell me about how [University] focuses on training students to be innovators? What is important to know?
2. Can you share what you know about the history of innovation education at [University]? *Probe: How has it changed over time (or not)?*
3. When it comes to innovation education, what do you think [University] does well? What does [University] do less well *Probe: Can you share some examples?*
4. So, from your perspective what are the most important elements for preparing college graduates to be innovative?
5. Are you familiar with the cross-college Design & Innovation program/initiative at [University]? If so, what can you tell me about the history of this initiative; what is important to know?
6. What was your motivation for participating in building the Design and Innovation program/courses?

7. From your perspective, what do you see as a university's vision for innovation education going forward? How does this relate to transformative undergraduate learning? What role should R1 institutions play in this transformation?

Creating flexible and cross-disciplinary programs are often discussed as part of transforming and improving undergraduate education. One of the things the Design & Innovation program and its courses offer is co-teaching and co-learning from faculty and students with different backgrounds/majors. So, I want to ask a couple questions about this.

1. What do you see as the benefits of having cross-disciplinary programs where faculty from different areas co-teach courses and students co-learn with others from different majors/colleges?
2. What do you see as the drawbacks of having cross-disciplinary programs?
3. What is it like teaching courses with other instructors who have different backgrounds and expertise? *Probe: How did it impact your teaching experience (Can you tell me more about that?)*
4. From your perspective, how, and in what ways, can faculty work across academic units/colleges to co-teach undergraduate courses? How can they be evaluated/supported to do so? What institutional barriers are there to making this happen?
5. How do you think innovative approaches to teaching and learning, such as co-teaching and co-learning across academic units, can be scaled across the campus and beyond? How can these educational transformations be sustained over time?
6. How, and in what ways, can innovation education be positioned to reach larger and more diverse audiences?
7. What other thoughts would you like to share about innovation education at [University] generally and the Design and Innovation program specifically?

Faculty Interview #2

Thank you for taking the time to join me today. As you are aware, we are conducting a study related to the transformation of undergraduate learning to better prepare students to become innovators.

Today we will conduct an interview which will last about 30 – 40 minutes and involve asking you to share your knowledge and perspectives about innovation-focused education.

Having been involved with the M3 project for over a year, I will ask you some questions related to creating a transformative and cross-college undergraduate program. It is my understanding we interviewed you previously, so some of these questions will be the same. However, we would like you to think about how your experience and perspective have changed over time.

1. First, what do you see as the benefits of having cross-disciplinary programs where faculty from different areas co-teach courses and students co-learn with others from different majors/colleges? *Probe: How has this changed?*
2. What do you see as the drawbacks of having cross-disciplinary programs? *Probe: Are any of these newly discovered drawbacks or have evolved? Can you tell me more?*
3. From your perspective, how, and in what ways, can faculty work across academic colleges to co-teach undergraduate courses? *Probe: How has your perspective changed?*
4. What institutional barriers are there to making co-teaching happen? *Probe: Are any of these newly discovered barriers? Can you tell me more?*
5. What is it like teaching courses with other instructors who have different backgrounds and expertise? *Probe: How did it impact your teaching experience? How have these experiences changed? Can you tell me more about that?*
6. What has been your experience with your working and teaching partnerships? *Probe: How have they evolved over time?*
7. How do you think innovative approaches to teaching and learning, such as co-teaching and co-learning across academic units, can be scaled across the campus and beyond? How can these be sustained over time? *Probe: Has your opinion changed? How so?*

From your perspective, what do you see as a university's vision for innovation education going forward? How does this relate to transformative undergraduate learning?

What role should R1 institutions play in this transformation? *Probe: Has your perspective changed? How so?*

8. How, and in what ways, can innovation education be positioned to reach larger and more diverse audiences?
9. As your experience and perspective has changed, how does this influence your thoughts on the course work, the design and innovation program, and innovation education at [University]?
10. Are there any other thoughts would you like to share about innovation education at [University] generally and the Design and Innovation program specifically?
11. What else do you think we should be investigating about as we go forward?

Faculty Interview #3

Thank you for taking the time to join me today. As you are aware, we are conducting a study related to the transformation of undergraduate learning to better prepare students to become innovators.

Today we will conduct an interview which will last about 40 minutes and involve asking you to share your knowledge and perspectives about innovation-focused education.

Having been involved with the M3 project for some time, I will ask you some questions related to creating a cross-college undergraduate program. Some of these questions may be the same, however we want you to think about when answering these questions how your perspective has changed or new discoveries regarding transforming higher education and how to sustain these initiatives.

1. First, what do you see as the newly discovered benefits of having cross-disciplinary programs?
2. What do you see as newly discovered or persistent drawbacks of having cross-disciplinary programs? [*Probe: Can you give a story or an example?*]
3. As an instructor, are there any new discoveries to co-teaching courses? [*Probe: Is this something you would want to continue, why or why not? Do you think co-teaching for you possible long term? If you were teaching with someone different, would you continue to co-teach a course? Can you tell me more*]
4. From your perspective are there any new opportunities faculty can work across academic colleges to co-teach undergraduate courses? How can cross-college co-teaching initiatives be sustained or not?
5. What are the most critical institutional barriers to making co-teaching and co-learning happen? What strategies have you used to overcome these barriers, and can these strategies be sustained and scaled?
6. What role should R1 institutions play in this transforming undergraduate learning? [*Probe: Has your perspective changed? How so?*]

7. How, and in what ways, can cross-college programs be positioned to reach larger and more diverse audiences? [*Probe: What role does a learning community, competitions, etc., or other D&I activities play (or doesn't) in reaching more students? What role do advisors play?*]
8. Since being with this program early on, tell me a story about how your perspective has changed in what is and isn't possible for transforming higher education at an institution like [University]?
9. Are there any other thoughts would you like to share about cross-college education at [University] generally and the Design and Innovation program specifically?

Advisor Interview #1

Thank you for taking the time to join me today. As reminder from the email I sent, we are conducting a study related to the transformation of undergraduate learning to better prepare students to become innovators. This study is funded by the National Science Foundation and is centered around the Design & Innovation Minor supported by the technology, business, and liberal arts colleges. Today we will conduct an interview which will last about 30 – 40 minutes and involve asking you to share your knowledge and perspectives about advising students towards different educational and career pathways like those interested in design and innovation.

Okay, Let's Begin.

First, I would like to learn a little more about you. Could you provide a brief snapshot of yourself. Maybe just a quick summary of your background, current job role, professional interests, and what you like about working with students? [*Probe: What areas have you advised for?*]

1. To get started, are you familiar with the Design and Innovation Minor? Do you know it is a cross-college program? Can you tell me what you know about it? [*Probe: What colleges does it cross-over with? What type of training does the program offer? What classes are part of it? How many credits does someone have to take to complete the minor?*]
2. How did you find out about the Design and Innovation minor? [*Probe: And then how did you learn about the elements and pathways of this minor? Did you have enough information and where would you go to get more information?*]
3. What is the process like for getting students from your college signed up for classes and enrolled in the minor? [*Probe: When and how do you engage with students to discuss this minor as an option for their plan of study? What administrative tasks have to be completed in order to get a student enrolled?*]
4. What sort of students have you worked with to enroll in the minor? [*Probe: How do students find out about the minor and what was your role (Note to interviewer: keep in mind the different ways students find about the minor and what are the advisors' role in that)? What are their majors, backgrounds, career interests, or personal interests? What motivates these students to sign up for these classes?*]
5. In your opinion, why do some students not join the minor who might otherwise be a good fit for these types of courses? [*Probe: How can advisors help?*]

6. What are the challenges to enroll students in a cross-college program like the Design & Innovation minor? And what could be done to address these challenges?
7. From your perspective, what are some potential strategies to reach a larger and more diverse audience of students? [*Probe: What are the types of students that would benefit or enjoy in this minor? How can we get more students from your college involved? What role can advisors play in this?*]
8. What feedback have you heard from students about the Design & Innovation program/courses? [*Probe: How do they talk about it? What are their favorite experiences? What could be changed or improved on?*]
9. How and in what ways can an institution like [University] cultivate cross-college programs like the Design and Innovation minor? [*Probe: Do you think cross-college programs are important, why or why not?*]
10. How can advisors be better utilized to develop and support cross-college initiatives?
11. Is there anything else I should have asked you?

Administrator Interview #1

Thank you for meeting with me today. Before we get started, I am going to give you a bit of background about this project:

With the vision that every student at [University] can be an innovator- the Mission Meaning Making program (known as M3) set out to educate students in a new way. It was sponsored by the Deans of 3 colleges (technology, business, and liberal arts colleges). This partnership is aimed at creating high-quality, cross-disciplinary education - in Design and Innovation.

Funded by the NSF, this project is about transforming undergraduate learning and scaling transdisciplinarity-- at R1 universities. We know that impactful innovation does not occur in silos, and it requires institutional support to last. And so, today we will share a # of key research findings and ask you about your ideas for long term feasibility of programs that integrate cross-college teaching and learning.

In the handout we sent you, there was a quick summary of some M3 program highlights.

These include:

- There is a strong and broad interest in the M3 collaboratively-taught courses (so far 827 students have taken one or more of the classes),
- Rapid growth in the new Design & Innovation minor (it now has 300 minors since its creation 3 years ago) and
- The program has one of the fastest-growing learning communities on [University]'s campus (118 students signed up in the first two years)
- Participating students have secured over \$300,000 for their ideas and creating start-ups.

Our research also highlights what students want from transdisciplinary learning. They value and learn a lot from bringing together different expertise. Students want to gain skills, work together, and “fail safely” while learning how to engage with complex challenges. They want to be ready for the work world and to do important, meaningful things. It has been gratifying to hear how students often use their M3 experiences as examples for employers of how they are prepared to be innovators and problem-solvers.

Despite some early success in program implementation, our NSF grant focuses on examining barriers and enablers for institutional transformation. We investigate in detail what can contribute to the sustainability of programs like M3 - at [University] and beyond. Next, we are looking to

expand this important work by applying for the next NSF IUSE Cultural Transformation Level-2 grant in July. At this point we need your input on how to scale in order to reach the vision that every student is an innovator.

Questions:

In getting started, we'd like to ask you about what initial reactions you have to the M3 program - and the story of its development so far? These could come from what you know about the program, the materials we shared with you – and even the summary I just gave here?

Thank you for sharing those thoughts. Considering the bigger picture, how does a program like M3 relate to the future of higher education at [University]?

Now I'd like to ask you some broader **questions related to supporting, incentivizing, and valuing transdisciplinary learning. These questions are driven by things we found in the research.**

1. **Incentives:** We found that many university structures are not aligned to support and scale transdisciplinary education. Our data show that partnership across colleges may begin with great excitement. Even when success occurs though, keeping mutual agreements in place can be challenging. Some challenges include things like administrative turnover, academic territory issues, and changing resource priorities. *What are your thoughts about the value of transdisciplinary education and how to incentivize and sustain these efforts? What metrics for success should be used in evaluating them?*
2. **Cross-College Co-Teaching:** We found cross-college co-teaching (with two faculty from different colleges in the same room at the same time) to be valuable because it supports integrated learning. Yet this co-teaching model faces challenges (such as it affects faculty teaching loads, and difficult to schedule, etc.). *What are your thoughts on cross-college co-teaching? What would you advise faculty who are interested in co-teaching?*
3. **Novel Structure:** We found that an ongoing issue is the need for a program or minor to have an “academic home” within traditional higher education. This implies ownership by a discipline that can involve academic territory and create problems with coordination (e.g.,, curricular approvals). *How could a transdisciplinary program such as M3 live outside of an academic home? What would it take to sustain this in our institution or more broadly?*

How can institutions develop new structures for working across units (e.g. like for curricular approvals)?

4. **Increased Automation:** We found that as academic systems get automated to assist in scheduling courses and registering students, these systems cannot easily recognize or account for new or different programming. *What are your thoughts about this emergent issue?*
5. **Funding Models:** We found that funding models for transdisciplinary education vary across institutions. Sometimes departmental funding is partially based upon student credit hours rather than solely the number of majors enrolled. This approach can potentially incentivize departments to draw more students from different backgrounds and majors to their unique programs—spurring educational innovation to occur. *What are your thoughts on establishing departmental funding models to promote transdisciplinary education initiatives?*
6. In addition to the issues we raised, what else would be important to think about for breaking down educational silos - at [University] and in higher education?
7. Hearing about our work, what next steps do you suggest for the M3 program? (Probe re; research, teaching, implantation, collaboration...)

Thanks: Thank you for your thoughts and your time today. We really appreciate and benefit from your insight and support. We are excited to keep going with the project and are looking forward to submitting the next grant. Add instructions for how to share additional thoughts with us...

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