MOTIVATING FACTORS OF UNFUNDED GRANT APPLICANTS TO CONDUCT INTERDISCIPLINARY RESEARCH: A QUALITATIVE STUDY

A Dissertation

by

AMANDA MAE GARR

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Chair of Committee,	Michael Beyerlein
Committee Members,	Khalil Dirani
	Larry Dooley
	Patricia Goodson
Head of Department,	Mario Torres

May 2021

Major Subject: Educational Human Resource Development

ABSTRACT

A general recognition of the complex problems existing in the world today has brought a societal understanding that one discipline may not possess the knowledge, skills, or tools to solve these problems on its own. As a result of this recognition, scientists have begun making concerted efforts towards working across disciplinary boundaries in an attempt to address complex problems by using multiple perspectives. Increasing support for interdisciplinary approaches can be seen through the creation of interdisciplinary agencies, foundations, and university programs. This study was conducted within the context of an interdisciplinary university program created at a southwestern U.S. Research I university in which interdisciplinary research teams were provided grant funding.

This qualitative study aimed to investigate the motivation of unfunded research team members to conduct interdisciplinary research as well as obtain more detailed information regarding the continued interdisciplinary work, or lack thereof, of participants who did not receive funding for their initial interdisciplinary project(s). In order to fulfill the purpose of this study, 10 semi-structured interviews were conducted with unfunded applicants of the university-sponsored interdisciplinary grants. The interviews were audio recorded and subsequently transcribed. The resulting interview transcriptions were analyzed using a thematic analysis.

The findings of this study are presented using a theoretical framework guided by Self-Determination Theory and Self-Directed Learning Theory. The results of this study

indicated a participant's underlying motivation to participate in ID research stems from a combination of both intrinsically and extrinsically motivating factors including problem-focused research and funding opportunities. The findings of this study also suggest the majority of the researchers took their unfunded grant proposals and repurposed them in order to apply for other funding opportunities. Participants also indicated it was detrimental to conduct interdisciplinary research until after securing a tenured position because some promotion and tenure guidelines do not favor interdisciplinary work. University culture and the origins of a participant's interdisciplinary research involvement are also discussed as factors of motivation to conduct interdisciplinary research.

This study concludes with a discussion of related interdisciplinary motivation studies, the implications this study has on the field of Human Resource Development, and suggestions for future research.

DEDICATION

I dedicate this dissertation to my Mom. I would give anything for her to be here and share in this accomplishment with me. She never allowed me to believe I was anything but capable of accomplishing greatness.

ACKNOWLEDGEMENTS

I would first like to thank my committee chair, Dr. Beyerlein, for his constant support and encouragement throughout my entire doctoral experience; he has shown me by example what it looks like to be a scholar and mentor. I would also like to thank my committee members, Dr. Dirani, Dr. Dooley, and Dr. Goodson for providing me the guidance and feedback I needed to complete this research.

I would also like to acknowledge the hard work of the Interdisciplinary Research and Evaluation (IDRE) Team at Texas A&M University. The IDRE Team's commitment to conducting thorough research laid the foundation for the concepts and data utilized in this dissertation.

I want to extend my appreciation to my peers Bhagyashree, Jiacheng, and Sarayu for the countless phone calls, Zoom meetings, and emails where they motivated me to continue writing. We started our Ph.D. journeys together as classmates, and have ended them together as friends.

I would like to thank each of my friends and family members for their patience and steadfast support over the last four years. My friends and family have been the foundation upon which I have been able to build a life I love, and I am deeply grateful. I am also appreciative of Becky, Jazz, and Survivor for keeping me company during countless hours at my computer.

Finally, I would like to thank my husband, Dillon, for his love, support, and inspiration throughout this journey. I thank you for your unwavering belief in me and your continuous mantra of “You didn’t come this far to only go this far.”

CONTRIBUTORS AND FUNDING SOURCES

Contributors

This work was supervised by a dissertation committee consisting of Professors Michael Beyerlein, Ph.D. [advisor], Khalil M. Dirani, Ph.D., Larry M. Dooley, Ph.D., of the Department of Educational Administration and Human Resource Development and Professor Patricia Goodson, Ph.D. of the Department of Health and Kinesiology.

All other work conducted for the dissertation was completed by the student independently.

Funding Sources

This work was made possible in part by the Office of the Vice President for Research at Texas A&M University under Grant Number [TAMU 290341]. This study's contents are solely the responsibility of the author and do not necessarily represent the official views of the Office of the Vice President for Research.

NOMENCLATURE

ID	Interdisciplinary
HRD	Human Resource Development
NCI	National Cancer Institute
NIH	National Institutes of Health
NSF	National Science Foundation
SPORE	Specialized Programs of Research Excellence
CTSA	Clinical and Translational Science Award
PI	Principal Investigator
VPR	Vice President for Research
IDRE	Interdisciplinary Research and Evaluation
SDL	Self-Directed Learning Theory
SDT	Self-Determination Theory
COVID 19	Coronavirus disease 2019

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

CHAPTER I

INTRODUCTION

The following chapter aims to provide the necessary context and background information for a holistic understanding of this dissertation study. Each of the subsequent topics will be discussed in further detail in later chapters.

Background

The 21st century is inundated with complex problems requiring the innovation of complex solutions. Complex problems such as climate change, terrorism, and poverty have come to be known as "wicked" problems, implying that they are "complex, ambiguous and uncertain… [and] cannot be solved, but rather resolved" (Naime, 2020, p. 65). A general recognition of the complex problems existing in the world today has brought a societal understanding that one discipline may not possess the knowledge, skills, or tools to solve these problems on its own. One positive interpretation of why interest in research across disciplines has risen is the belief that scientists have come to recognize the most difficult and challenging problems may require partnerships across traditional disciplinary boundaries (Breckler, 2005). As a result of this interpretation, scientists have begun making concerted efforts towards working across disciplinary boundaries in an attempt to address complex problems by using multiple disciplinary perspectives.

The act of researchers working with one another, despite their disciplinary affiliations, has come to be known as "interdisciplinary research" in the literature.

Increasing support for interdisciplinary approaches can be seen in the United States through the creation of interdisciplinary (ID) federal and state agencies, foundations, and university programs. The National Cancer Institute (NCI), National Institutes of Health (NIH), and the National Science Foundation (NSF) have shown increasing encouragement for interdisciplinary collaboration and boundary crossing through ID grant funding (Jacobs & Frickel, 2009). For example, NCI established the Specialized Programs of Research Excellence (SPORE) grants in which funding was provided to diverse research teams with the aim to "…support projects that will result in new and diverse approaches to the prevention, early detection, diagnosis, and treatment of human cancers" (www.nih.gov). The SPORE grants were initially launched in 1992 and continue to be awarded to date with an emphasis on interdisciplinary research.

NIH's creation of the Clinical and Translational Science Award (CTSA) program in 2006 is yet another example of support for interdisciplinary research (Leshner et al., 2013). CTSAs comprise a group of over 60 medical research institutions and are a product of NIH's efforts to support transdisciplinary approaches in science by addressing the long delays in translating scientific discoveries into practice. Such delays in translating scientific discoveries into practice are often a product of cultural and administrative barriers; the CTSAs work to identify solutions for reducing these barriers.

In recognition of interdisciplinary research's importance, a Southwestern public land-grant Research I university located in the United States (henceforth referred to as 'The University') created a 10-year, $100 million-dollar initiative that began in Fall 2017 and was implemented with the intention of building upon The University's

commitment to advancing transformational learning, enhancing discovery and innovation, and expanding impact on its community, state, and nation through the use of interdisciplinary research. The funding provided by The University aims to make grant money available to ID teams formed by eligible faculty on campus. The specifics of the initiative are described in the following sub-section.

The Initiative

The initiative comprises two funding programs: Small Grants and Large Grants. The Small Grants are intended to be seed grants structured in such a way that three tenured or tenure-track faculty members from at least two colleges at The University work together for 12-24 months to accomplish an interdisciplinary project. The Small Grants have an additional requirement in which one of the members of the triad must be an Assistant Professor. During the first round of the initiative, 100 Small Grant teams were selected and funded at $30,000 each, with additional funding available for undergraduate student researchers.

The Large Grant teams are required to be led by a principal investigator (PI) who is an eligible faculty or faculty-equivalent researcher at The University. The Large Grant requirements do not specify a number of team members, but instead necessitate participation from faculty within varying colleges with the appropriate disciplinary expertise to complete the team's goals. In the first round of the initiative, a mix of smaller and larger scale awards totaling seven million dollars funded 8 Large Grant teams with an average of 11 members each.

At the conclusion of the first round of the initiative, Small and Large Grant participants were invited to attend a symposium held on The University's campus in order to present the work they had done over the last year. The symposium is an occasion in which the funded Small and Large Grant teams are expected to present their progress. Each Small Grant team presents their research to date in a poster session, and each Large Grant team conducts a 20-minute presentation.

Although each of these grants requires team membership from multiple disciplines, the mere presence of members from multiple disciplines does not imply interdisciplinary research is being conducted. Genuine interdisciplinary research begins to occur after the team members work cohesively from their disciplinary perspectives to solve a problem and there is no guarantee that each team achieved true ID research by definitional standards.

Problem Statement

The University's recognition of the importance of interdisciplinary research and subsequent creation of the Small and Large Grant Initiative produced a vehicle in which ID research was encouraged throughout The University's campus. Eligible faculty of The University were offered the opportunity to apply for a portion of a $10 million dollar per year grant that encourages them to participate in research that purportedly has the ability to solve complex and 'wicked' problems.

The research problem associated with this study lies between two major notions; the first notion is that the existing body of literature suggests that ID research has the ability to aid in the solving of complex problems, and the second notion is that The

University has created an opportunity for ID projects to be funded through the Small and Large Grant Initiative. These two notions led me to a desire to better understand the motivating factors that led The University faculty to apply for the Small and Large Grants. Essentially, I want to know what motivated the unfunded participants of the Small and Large Grants to apply for a grant with an interdisciplinary component. The motivations of participants could stem from a genuine belief that ID research is beneficial and can lead to the solving of complex problems as the literature suggests, or from a variety of other influences either intrinsic or extrinsic in nature.

Furthermore, this study sought to obtain data which helped to know the outcomes of the unfunded grant proposal ideas. Because time and effort had already been invested in the constructing of the Small or Large Grant application, I wanted to know if the unfunded idea proposed in Round One of funding was further pursued in some way, shape, or form by the research team.

Purpose Statement

The purpose of this qualitative study was to better understand the motivation for research team members to conduct interdisciplinary research and obtain more detailed information regarding the continued ID work, or lack thereof, of participants who did not receive funding for their initial ID project.

Research Questions

The following are the research questions I attempted to answer while conducting my dissertation study:

1. What motivates unfunded grant principal investigators (PIs) or team members to involve themselves in interdisciplinary research teams?
2.. How do unfunded grant PIs' or team members' failure to obtain funding through internal grant opportunities change their path for developing the proposed idea?

Significance of the Study

This study aims to add to the paucity of literature surrounding motivation to participate in interdisciplinary research teams. There is a distinct lack of empirical studies within the literature in which researchers' motivation to conduct ID research is explored The ever-increasing need for interdisciplinary research in order to solve complex problems, coupled with an increase in technological ability to communicate across disciplines and geographic distances, creates a niche in which this study's findings could lead to practices that potentially increase researcher's engagement and participation in interdisciplinary research.

This study is conducted within a context that allows for a better understanding of why faculty are motivated to participate in interdisciplinary research. Because one of the goals for the Small and Large Grant Initiative is to build upon The University's commitment to advancing transformational learning, this study could be used by The University in conjunction with the reports produced by the Interdisciplinary Research and Evaluation (IDRE) Team in order to gauge if the Small and Large Grant Initiative is meeting its aforementioned goal.

Theoretical Framework

By applying the lenses of Self-Determination Theory (Deci, 1992; Deci & Ryan, 1985; Ryan & Deci, 2000a, Ryan & Deci, 2000b) and Self-Directed Learning Theory (Deci & Ryan, 1985), this dissertation study aims to explore the motivations of team members to participate in interdisciplinary research.

Self-Determination Theory

Self-Determination Theory (SDT) is a motivation theory that proposes an individual can become self-determined when their psychological needs of autonomy, competence, and relatedness are all fulfilled (Deci & Ryan, 1985). Autonomy, in the context of SDT, refers to "the need to self-regulate one's experiences and actions" (Deci & Ryan, 1985, p.10). The second psychological need, competence, refers to one's "need to feel effectance and mastery" (Deci & Ryan, 1985, p.8) and the third need, relatedness, refers to feeling socially connected and cared for by others (Deci & Ryan, 1985). SDT theorizes that when autonomy, competence, and relatedness are achieved in unison, a person will experience autonomous motivation, thus they will behave in a way conducive to meeting their predetermined goals because they want to, rather than because of an external influence.

It would be an oversimplification to say that individuals who participate in interdisciplinary research are motivated by a sole source of inspiration at any given time. Human behavior is complex, but SDT aims to capture this complexity by making distinctions between different types of motivation such as differentiating between intrinsic and extrinsic factors. SDT is included in the theoretical framework of this

dissertation study because a participant's motivation to conduct interdisciplinary research could stem from a combination of both intrinsic and extrinsic factors. Defining the characteristics of an individual's motivation allows for a deeper understanding of why ID research is important to them.

Self-Directed Learning Theory

Self-Directed Learning Theory (SDL) is an adult learning theory "in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, p. 18). SDL essentially states learners guide their own acquisition of new knowledge and information based on their desire to do so.

SDL was used as part of this study's theoretical framework by attempting to provide a rationale for the behaviors exhibited by those who engage in interdisciplinary research through the Small and Large Grants. Although securing grants is an essential aspect of the promotion and tenure process for most faculty, participating in *interdisciplinary* research is not a specific requirement. Depending on a researcher's disciplinary field, it is possible interdisciplinary publications can hinder their promotion and tenure process because disciplinary specialization is valued in the promotion and tenure criteria (Shrimpton and Astbury, 2011). SDL is one way to explain why the individuals participating in the Small and Large Grants initiative are engaging in interdisciplinary research even though they may be embedded in a promotion and tenure system that doesn't encourage interdisciplinary publications or research.

SDL could provide the rationale that a participant's motivation to conduct interdisciplinary research is rooted in their innate desire to learn and seek answers to the questions they ask, no matter the disciplinary boundaries present. SDL postures that an adult learner is motivated by "internal pleasures" to become a self-directed learner (Knowles et al., 1998). These "internal pleasures" may be akin to the concept of intrinsic motivation as it is described in the following section regarding Self-Determination Theory.

Methodology

This dissertation study was conducted using a qualitative research design. Semi-structured interviews were conducted with a sample of unfunded Small and Large Grant research team members in order to obtain the data necessary to answer the Research Questions. The participant sample was purposively selected from the population with the intention of collecting data from participants with an array of demographic perspectives.

In light of the events surrounding COVID-19, participants in this study were invited to partake in a virtual interview rather than a face-to-face interview. Each interview was audio recorded as participants were asked questions aimed at better understanding their motivation for participating in interdisciplinary research. The interviews were led and conducted by me, but an additional member of the IDRE Team was also present during the interviews in order to take field notes and provide an additional perspective is necessary. Participants were asked a predetermined set of interview questions that were supplemented by probing questions tailored to garner the maximum information about their experience.

At the conclusion of each interview, the resulting audio recording was transcribed, and analyzed using a Noticing, Collecting, Thinking (NCT) method adapted from the work of Seidel (1998) by Susanne Friese (2019). The data was then coded and a general thematic analysis (Lincoln & Guba, 1985) was conducted in order to identify the motivating factors displayed by participants. The methods employed in this study are described in greater detail in Chapter Three.

Limitations

One limitation of this study is caused by the delimitations to the study's population in order to maintain the manageability of the study's scope. It was necessary to constrain the population of this study to a context, specifically the participants in Round One of the Small or Large Grant Initiative at The University, rather than including any individual with a desire to participate in interdisciplinary research. Placing parameters on the scope of this study allowed for increased manageability and feasibility, but decreased the overall number of participants within the population of the study.

The conducting of semi-structured interviews presented an additional limitation; it is possible the data collected during interviews was influenced by participants' recollection bias and/or the natural preference by some participants to offer socially desirable answers. As will be described in further detail in Chapter Three, it has been shown participants may also self-report inaccurately as a result of telescoping, attribution, or exaggeration (Spalding University Library, 2020).

Lastly, because this study was conducted using qualitative methods, I, as the researcher, am the primary data collection tool. Although I identify my positionality and make a concerted effort to recognize my biases in Chapter Three, it is impossible to eliminate my biases altogether. The inclusion of an additional interviewer in the data collection process also aided in reducing possible bias, although it could not be eliminated completely. These limitations and how they were addressed are detailed further in Chapter Three.

Key Definitions

In order to maintain consistency, this sub-section defines the key terms employed in this study. The key terms to be defined consist of interdisciplinary research, transdisciplinary research, multidisciplinary research, discipline, and team science.

Interdisciplinary Research

While a variety of definitions for the term 'interdisciplinary research' have been suggested in the literature, this study uses Rosenfield's definition: "researchers working jointly, but still from disciplinary-specific bases, to address common problems" (1992, p. 1351).

Transdisciplinary Research

Rosenfield's definition of 'transdisciplinary research' is also used in this study. Transdisciplinary research is defined as "researchers working jointly using shared conceptual frameworks, drawing together discipline-specific theories, concepts, and approaches to address common problems. Representatives of different disciplines are encouraged to transcend their separate conceptual, methodological orientations in order

to develop a shared approach to the research, building on a common framework" (Rosenfield, 1992, p. 1353).

Multidisciplinary Research

Multidisciplinary research, as it is used in this study, is defined as "researchers working in parallel or sequentially from disciplinary-specific perspectives to address common problems" (Rosenfield, 1992, p. 1351).

Discipline

In order to understand researchers' motivation to work across disciplinary boundaries, it is important to maintain consistency regarding what a 'discipline' is. Given the university setting in which this study is to be conducted, the term 'discipline' is defined using an academic context. For the purpose of this study, the term "discipline" is defined as: "A branch of knowledge that frequently corresponds to divisions (programs), departments, or schools at the university level. Disciplines define boundaries that specify the objects of/under study, methodologies, purpose of study, and acceptable knowledge" (Beyerlein et al., 2020). The definition for 'discipline' was developed by the IDRE Team and used to clarify the term throughout the team's evaluation process.

CHAPTER II

LITERATURE REVIEW

Chapter Two presents the published literature relative to this study and provides necessary background information on the topics of interdisciplinary research, Self-Determination Theory, and Self-Directed Learning Theory. This chapter also provides the details of, and rationale for, the theoretical framework used to guide this study.

Introduction

Each of the topics covered in this chapter are integral to the context of this dissertation study. The first section of the literature review discusses the few studies that have investigated the relationship between motivation and interdisciplinary research. The next section surrounds the concept of interdisciplinary research and provides a deeper understanding of what differentiates ID research from other types of research and the origins from which interdisciplinarity emerged. The last two sections detail the history and applications of Self-Determination Theory and Self-Directed Learning Theory and provide a rationale for why each was selected as part of the theoretical framework for this study.

In order to collect the sources utilized in this literature review, I used Academic Search Ultimate (ASU) as my primary database, and Google Scholar as a secondary database. I searched each database using the keywords “interdisciplinary research” in combination with other keywords associated with this dissertation study including: “motivation”, “Self-Directed Learning Theory”, and “Self-Determination Theory”. I

elected to utilize ASU as my primary database because it searches 17,932 full-text journals, magazines, and books in a wide variety of fields of study. I elected to use Google Scholar as a secondary database because I wanted to search more generally for articles that may not have been included in my ASU search.

As I was conducting my literature search using the aforementioned keywords and databases, I scanned the reference lists of each of the produced articles in order to become familiar with the authors who were frequently cited, and the years associated with each publication. During my literature search I primarily focused on articles that were published in the last 10 years in order to include up-to-date literature, with the exception of seminal work surrounding each of the searched subjects.

Related Studies

To date, very few studies have examined an individual's motivation to participate in interdisciplinary research. In addition to a general lack of empirical research surrounding motivation to participate in ID research, the few studies that have been conducted regarding this topic have been conducted in contexts outside of the United States (Shrimpton & Astbury, 2011; Harris et al., 2009). In one related study, Shrimpton and Astbury (2011) conducted a qualitative study in which the motivations of researchers to conduct ID research were examined; this study was conducted with a sample of researchers from an array of disciplinary backgrounds and found that the motivations of researchers to conduct ID research "appear to be driven by a combination of instrumental, intrinsic and pragmatic motives" (p. 204).

Another related study conducted by Harris et al. examined the "motivations and challenges within interdisciplinary research and the driving force that brings such research teams together" (2009, p. 2). Harris et al. focused their qualitative case study more heavily on the motivation of researchers to create an ID research team with a secondary focus of understanding the barriers ID researchers encounter while conducting ID research. Harris et al. concluded the creation of a successful ID research team involved strong relationships and trust amongst team members. Harris et al. also concluded the challenges of conducting ID research include "learning to value the different types of information each discipline might produce" (p. 13) and the "structures of research institutions and career pathways within academia" (p. 9) are not conducive to conducting ID research.

Interdisciplinary Research

An increase in ID research interest is demonstrated by the increasing number of publications surrounding the topic over time. According to Wilson, the "jumping together of knowledge…to create a common groundwork of explanation" is the most promising path to scientific advancement (1998, p.8); this may be one of many explanations for an uptick in interdisciplinary interest.

Definition

Understanding the history and definition of ID research requires an ability to differentiate interdisciplinarity from other forms of collaborative research. As mentioned in Chapter One, interdisciplinary (ID) research is defined throughout this dissertation study using Rosenfield's definition: "researchers working jointly, but still from

disciplinary-specific bases, to address common problems" (1992, p. 1351). ID research is often used interchangeably in literature with the terms 'multidisciplinary' and 'transdisciplinary'. Although each of these types of collaborations is related and easily mistaken for one another, the differentiation between inter-, trans-, and multi-disciplinary must be made.

Multidisciplinarity (MD) is defined in this study as "researchers working in parallel or sequentially from disciplinary-specific perspectives to address common problems" (Rosenfield, 1992, p. 1351). The primary differentiation between ID and MD is the integrating and synthesizing of disciplinary perspectives that takes place in ID research, but not in MD research. In MD research, team members from each discipline maintain their disciplinary boundaries while informing other team members of their perspective on a problem based on their disciplinary training.

In this study, the term transdisciplinarity (TD) is defined as "researchers working jointly using shared conceptual frameworks, drawing together discipline-specific theories, concepts, and approaches to address common problems. Representatives of different disciplines are encouraged to transcend their separate conceptual, methodological orientations in order to develop a shared approach to the research, building on a common framework" (Rosenfield, 1992, p. 1353). In ID work the knowledge and methods of each discipline are used in order to address a problem, whereas in TD a new framework of knowledge and methods are created from which the team then operates from.

History

The history of interdisciplinarity is intertwined with the history of the academic disciplines themselves. Using disciplines to classify topics and order knowledge within schools and universities was being done as far back as the 18th century (Stichweh, 2001). Labeling a topic of learning as a 'discipline' became more necessary for implementing organization at the administrative level as colleges and universities became larger and had more students (Hammarfelt, 2020). The need for career preparation and specialization at the university level was also a likely cause for the specialization of disciplines during this time period. The early 20th century brought about new disciplines including Education, hence a focus on teaching became commonplace (Szostak, 2015).

In the 1960's, an emphasis was placed on making university education more practical, consequently making interdisciplinarity more prevalent (Szostak, 2015). In 1979 the Association for Integrative Studies (now The Association for Interdisciplinary Studies) was founded with the purpose of "promot[ing] the interchange of ideas among scholars and administrators in all of the arts and sciences on intellectual and organizational issues related to furthering integrative studies" (Association for Interdisciplinary Studies [AIS], 2020).

Encouragement for interdisciplinary collaboration and disciplinary boundary crossing can be seen in the United States through initiatives aimed to provide grant funding, establish various research consortia, and develop ID training programs. The aforementioned initiatives have been implemented by organizations such as the National

Cancer Institute (NCI), National Institutes of Health (NIH) and the National Science Foundation (NSF) (Jacobs & Frickel, 2009). In 1992, NCI established the Specialized Programs of Research Excellence (SPORE) grants in which diverse research teams were provided funding and tasked with improving the ways in which cancer is prevented, detected, diagnosed, and treated. In 2006 the NIH created the Clinical and Translational Science Award (CTSA) program, which consists of 60 medical research institutions working to break down the barriers delaying academic research from being translated into practical applications (Leshner et al., 2013).

Theoretical Framework

The theoretical framework used to guide this dissertation study was built using two interrelated theories concerning the topics of adult learning and motivation: (a) Self-Determination Theory (SDT) -- a motivation theory that posits the existence of, and relationship between, intrinsic and extrinsic motivation, and (b) Self-Directed Learning Theory (SDL), an adult learning theory that provides a rationale for when and why adults seek learning opportunities of their own volition.

Self-Determination Theory

Self-Determination Theory (SDT; Deci & Ryan, 1985) is the first theory I used to guide my dissertation study. SDT is a motivation macro theory grounded in humanistic psychology. Humanistic psychology focuses on viewing people holistically by observing their entire psyche and personal achievements for self-efficacy and self-actualization (Hergenhahn, 2009). SDT has been used as a theoretical framework in a

multitude of research fields and settings including education, organizations, and physical education/sports.

History and Definition

The initial work surrounding SDT began in the 1970's and was further refined in the mid 1980's by the work of Deci and Ryan. SDT diverges from the motivation theories preceding it, because it does not treat motivation as a unitary concept, but instead differentiates between internal and external motivational factors. The principal idea of SDT establishes a distinction between intrinsic and extrinsic motivation and accounts for both types as powerful forces in shaping how an individual behaves (Deci & Ryan, 2008). Intrinsic motivation is the execution of a task or activity because doing so provides the individual with satisfaction, whereas extrinsic motivation indicates that an individual completes a task because of an external influence such as a reward, deadline, or recognition (Deci & Ryan, 1985).

As previously stated, Self-Determination Theory is a macro theory and comprises five mini theories: Cognitive Evaluation Theory (CET), Organismic Integration Theory (OIT), Causality Orientations Theory (COT), Basic Psychological Needs Theory (BPNT), Goal Content Theory (GCT), and Relationships Motivation Theory (RMT). Each of the SDT mini theories emerged from a combination of laboratory and field research and is used to explain a set of motivationally based phenomena (CSDT, 2021).

It is important to note that SDT operates under the assumption that humans possess "evolved tendencies toward growing, mastering ambient challenges, and integrating new experiences into a coherent sense of self" (CSDT, 2020). SDT proposes

that in order to reach one's optimal self-determination, there are three factors that need to be nurtured: autonomy, competence, and relatedness. Deci and Ryan (1985) indicate in their work that each of the three factors are psychological, universal, and innate to all human beings.

The first factor, autonomy, refers to "the need to self-regulate one's experiences and actions" (Deci & Ryan, 1985, p.10). Autonomy is the degree to which an individual perceives he/she is able to make his/her own decisions and control his/her own behaviors. Deci and Ryan built upon the academic work of deCharms in order to further refine the idea of autonomy in relation to intrinsic and extrinsic motivation. deCharms' 1968 work established individuals as either a 'Pawn' or an 'Origin' based on how they perceived their locus of causality. "An Origin is a person who perceived his behavior as determined by his own choosing [internal locus of causality]; a Pawn is a person who perceives his [*sic.*] behavior as determined by external forces beyond his control [external locus of causality]" (1968, p. 274). The higher an individual's autonomy, the closer he/she is to feeling self-determined.

The second psychological need, competence, refers to one's "need to feel effectance and mastery" (Deci & Ryan, 1985, p.8). White (1959) originally coined the term 'competence' and defined it as "an organism's capacity to interact effectively with its environment" (1959, p. 297). Deci (1971) built upon White's research on competence by determining that people who receive unexpected positive feedback on a task show an increase in their intrinsic motivation to do the task. An increase in intrinsic motivation

when given unexpected positive feedback is theorized to be a result of the feedback fulfilling an individual's need for competence.

The third psychological need, relatedness, refers to feeling socially connected and cared for by others (Deci & Ryan, 1985). It is important to note the term 'relatedness' is synonymous with the term 'belongingness' throughout the SDT literature. Relatedness comes from an individual's perception of how well they feel they have a place in their community. The more socially connected a person feels to their community, the higher their level of relatedness and of self-determination. Figure 1 below is based on the work of Deci and Ryan (2000b) and depicts the relationship between the three factors comprising SDT.

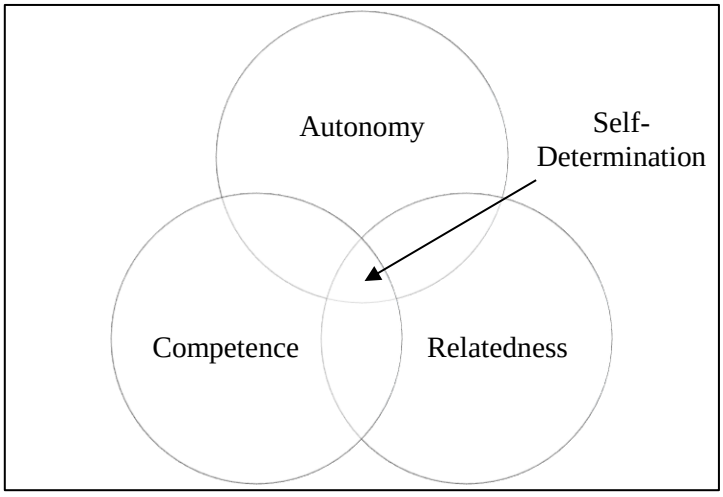

Figure 1 Relationship among autonomy, competence, relatedness, and self-determination.

Within SDT there is a continuum of motivational orientations ranging from amotivation to autonomous motivation (Deci & Ryan, 1985; Ryan & Deci, 2000a; Reeve et al., 2004). On one end of the continuum is amotivation, meaning an individual doesn't

possess any motivation to complete a task or activity (Ryan & Deci, 2000a). Amotivation occurs when all three psychological needs are not met. On the other end of the continuum is autonomous motivation, which suggests an individual completes a task or activity because they freely choose to do so (Ryan & Deci, 2000a). Autonomous motivation, tantamount with the idea of being intrinsically motivated, suggests all three of an individual's psychological needs are fulfilled and the task or activity has been assimilated into the person's lifestyle and self-system (Ryan & Deci, 2000a).

Application

SDT's ability to explain why people do what they do has led to its usage as a theoretical framework in a multitude of research and practical contexts. The Center for Self-Determination Theory (CSDT) provides publications related to SDT on their website. The CSDT website divides the publications into 22 different research and practice areas, each with subsections for including niche subjects (2020). The research and practice areas in which SDT has been applied run the spectrum from education to the workplace, although very few studies of interdisciplinarity have utilized SDT within their theoretical frameworks.

A qualitative study conducted by White and Jha (2018) took an interdisciplinary approach to evaluating the well-being and self-determination of individuals in rural Zambia by evaluating whether SDT could be applied in an African context. In White and Jha's study, the three factors central to SDT were used to create the research question "Does qualitative analysis of Zambian life histories, generated through open, minimally structured interviews, identify competence, autonomy and relatedness as critical to

wellbeing?" (2018, p. 153). The results of the study suggested "…that an interdisciplinary framework is possible and that SDT provides a good basis to build on" (p. 160), but the psychological grounding of SDT is important to take into consideration when using it in an interdisciplinary setting.

Although SDT has not been widely used in interdisciplinary research, it has been widely used in a multitude of areas including both academic and practical applications. In the field of education, teaching styles have been proposed and tested with the aim of increasing student autonomy, thus allowing for students to reach a higher level of intrinsic motivation to learn (Cheon et al.,2020; Zhou et al., 2019; Aelterman, et al., 2019, Jungert et al., 2019). Research focus has also been placed on teachers in education settings using SDT by exploring the motivation of teachers to teach (Benita et al., 2018; Gorozidis & Papaioannou, 2014).

SDT has also been widely used in organizational research in order to better understand employee motivation. Some researchers have used SDT as a way to better understand how extrinsic rewards, such as money, help to motivate employees (Manganelli, & Forest, 2020; Thibault et al., 2016; Olafsen et al., 2015) while others have used SDT to examine employee goal setting in the workplace (Zhang et al., 2015; Gagné, 2018).

Rationale

I selected SDT as part of the theoretical framework guiding this dissertation study because I wanted to understand the motivation the unfunded Small and Large Grant applicants exhibited when they decided to apply for an interdisciplinary grant.

SDT provides a lens in which the type of motivation shown by these applicants can be classified as either intrinsic or extrinsic. Once the type of motivation propelling individuals to apply for ID grants is identified, the principles that comprise SDT could be applied in order to increase motivation for ID research.

Utilizing SDT within the theoretical framework of this dissertation study also allowed for more relevant real-life implications to be suggested for future interdisciplinary initiatives. According to SDT, a university aiming to increase the amount of ID research produced would need to create a psychological environment in which autonomy, competence, and relatedness can be fostered. Applying the lens of SDT could show which of the three factors are most in need of attention and improvement at The University.

Self -Directed Learning Theory

Self-Directed Learning Theory (SDL) is the second theory I used to guide my dissertation study. SDL is an adult learning theory "in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles 1975, p.18). SDL places the learning process and environment in the hands of the learner rather than in the hands of a formal teacher or mentor.

History and Definition

SDL as a formal adult learning theory was established in the 1970's, but SDL is not a new concept. People have been acquiring knowledge and skills in independent and

informal settings for as long as humankind has existed. According to Hiemstra (1994), Greek philosophers including Socrates, Plato, and Aristotle engaged in self-study. Tough published a book in which a collection of self-directed learning studies, referred to as "self-teaching projects" (1967, p. 4), were detailed. In 1975, Knowles published a work titled *Self-Directed Learning: A Guide for Learners and Teachers* in which foundational definitions and assumptions surrounding SDL as a theory were established.

Although self-directed learning is an ancient concept, the invention of one thing has changed the path of SDL in an extraordinary way… the Internet. Public access to the Internet in 1991 completely changed the landscape of self-directed learning. The World Wide Web gives millions of people access to massive amounts of information and an opportunity to create and maintain social connections through email, forums, and social media platforms. The Internet gives the "potential for resource access any time, any place, any path, any pace" (Hiemstra, 2009, p.25), leading to people having access to the information necessary to participate in self-directed learning.

Application

The ASU and Google Scholar searches I conducted did not reveal any interdisciplinary studies in which self-directed learning was part of the theoretical framework. Although I wasn't able to find a substantial connection between ID and SDL in my preliminary search, I did find the literature surrounding SDL spans a multitude of disciplines.

Similar to SDT, SDL has been heavily used in both primary and secondary education research. Many recent SDL studies have been conducted with the intention of

finding the best practices for better engaging those present in an online learning environment (Park, 2020; Adinda & Mohib, 2020; Al Mamun et al., 2020).

SDL also has been used within the context of organizations, particularly in the tech industry. Lemmetty and Collin (2019) used SDL as a theoretical framework for their study because trends have shown that organizations have begun placing the responsibility for continued learning in the hands of the employee, thus leading employees to seek learning opportunities on their own. Another study on SDL in the workplace evaluated employee performance in relation to their readiness to self-learn and found that the higher an individual's Self-Directed Learning Readiness Score (SDLRS), the higher the chance they were highly formally educated and were outstanding performers (Guglielmino et al., 1987).

Rationale

I selected SDL as part of the theoretical framework for this dissertation because an adult's natural orientation is task or problem-centered learning (Knowles, 1975). In the university setting there is typically no formal education for faculty to learn how to conduct interdisciplinary research. The complex problems the participants in this study decided to investigate, the disciplinary associations of the people on their team(s), and the questions they seek to answer are all areas they needed to investigate on their own. One could argue that Small and Large Grant applicants' decision to conduct research is self-directed and, therefore, so would be their learning process.

Conclusion

The material in this chapter provided the background and context for answering the two RQs guiding this study by providing the history of, and literature associated with, each of the major concepts. This chapter also provided the theoretical framework guiding this dissertation study, and the rationale for why each theory was chosen. The subsequent chapter is concerned with the methodology used for this study. Chapter Three details the complete study design and data analysis procedures used with the intention of answering this study's RQs.

CHAPTER III

METHODOLOGY

Chapter Three includes the details of this study's epistemological underpinnings, study design, target population and sample. This chapter also aims to detail this study's data collection and analysis procedures and describe the ethical considerations made for the protection of the human subjects involved.

Epistemology

Before describing the specific methods employed in this dissertation study, it is important for me to fully communicate the epistemological underpinnings guiding it. Epistemology is a philosophical branch concerned with how knowledge is created and comprises multiple paradigms aimed to explain how knowledge and truth are created and interpreted (Mertens, 2014). A paradigm can be viewed as a set of basic beliefs surrounding the concepts of knowledge and truth; it is used to guide one in asking questions such as 'what is truth?', 'what is knowledge?', and 'who is allowed to create knowledge?' (Guba & Lincoln, 1994).

Understanding the epistemological roots of this study is crucial to recognizing the assumptions under which this study was conducted. By describing the epistemological underpinnings of this study, I am providing a deeper insight into how I relate my scholarly work to the world around me, how I situate and understand myself in relation to the research I am conducting, and how I perceive and discover knowledge from the data I collect (Anastas, 2002).

Constructivist Paradigm

This dissertation study was conducted within the constructivist paradigm, propagating the assumption that knowledge is socially co-constructed, and each person has his/her own version of truth based on his/her life experiences and position in the world (Guba and Lincoln, 1994). The aforementioned paradigm implies that a particular set of assumptions were made concerning how knowledge is created and who has the ability to create knowledge. Within the constructivist paradigm, it is understood that knowledge is socially constructed by the individuals who are active in the research process (Mertens, 2014). The researcher aims to create knowledge by understanding the lived experiences of participants through qualitative methods such as interviews, observations, and document reviews (Mertens, 2014).

I have chosen to operate within the constructivist paradigm for this dissertation study because it aligns with my personal worldview and allows for a robust use of qualitative methods to derive meaningful conclusions. I am drawn to constructivism's ability to involve both the researcher and the participant in the research process in order to create a multi-faceted depiction of an individual's experience. The underlying assumptions of the constructivist paradigm parallel my own assumptions of what research is at its core.

Positionality

In qualitative research the researcher is the instrument for data collection. The only means for readers to trust the "calibration" or the adequacy of the instrument is to have researchers disclose their position, the topic being studied, and the people being

interviewed (Lincoln & Guba, 1985). Understanding the researcher's positionality in the world and in relation to the participants of a study is necessary because "a researcher's background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions" (Malterud, 2001, p. 483–484). The qualitative nature of this study necessitates I present my positionality as a researcher and acknowledge the biases that may accompany my lived experiences.

At its core, I believe research is a systematic investigation into what is currently unknown. I believe research is a way for humans to bring order to an unorganized world and anyone who is capable of understanding how to employ the tools used to conduct research should be able to contribute to the body of knowledge. Research is able to provide logical, informed answers to the questions researchers pursue based on the knowledge they have at the time the question is being asked.

I became involved and interested in the topic of interdisciplinary research after being selected for a Graduate Research Assistant (GRA) position on the IDRE Team. My role as a GRA during the IDRE Team's evaluation of the Small and Large Grant Initiative at The University led to my curiosity surrounding the motivation of grant applicants to participate in interdisciplinary research. This dissertation study is a subsequent investigation into the motivating factors driving Small and Large Grant applicants to participate in ID research, as well as an investigation into how these

applicants pursue their proposed grant idea once informed that their proposal wasn't funded.

As described in Chapter One, the IDRE Team comprises faculty members and students from various departments and disciplinary backgrounds. Since becoming a member of an inherently interdisciplinary evaluation team I have become increasingly more biased towards a belief that ID research is important in both academia and policy making in order to solve complex problems. Prior to my involvement with the IDRE Team I did not have experience with ID research, nor was I familiar with the grant application process associated with obtaining a Small or Large Grant.

As a female conducting this study, I paid distinct attention to ensuring that the female representation of the participant sample was at least proportional to the population. Throughout the data collection process I didn't feel my female positionality influenced the interview process as much as the power differential between myself and the participants did. I am a doctoral student who conducted interviews with experienced academic researchers, therefore there was a distinct power differential between myself and the participants based on professional hierarchy.

Study Design

In addition to the Small and Large Grants funded by the initiative each year, the university also funded an IDRE Team to evaluate the initiative as a whole. In order to ensure proper evaluation of the initiative, the IDRE Team developed a multi-level, mixed methods research design in which data from surveys, bibliometrics, interviews,

and social network analyses were collected and utilized to provide feedback to the Vice President for Research's Office (VPR) at The University.

The IDRE Team currently comprises eight members: three full or tenure track professors and five graduate students. All eight team members contribute to conceptualizing, developing tools, collecting, and managing evaluation data, as well as writing reports and disseminating findings. I was part of the IDRE Team as a full time Graduate Research Assistant for approximately two years and now maintain a voluntary role on the team. I assisted in the creation of the survey instrument, prepared IRB submissions, and aided in the conceptual thinking during the team meetings. It is important to describe the context of the IDRE Team prior to detailing the methods to be employed in conducting this dissertation study because this study utilized a data set collected in conjunction with the work of the IDRE Team during their evaluation process.

The mode of inquiry for this dissertation study is a basic qualitative study design. The decision to employ qualitative methods to collect data for this dissertation study was appropriate because semi-structured interviews allow for an exploration of the research topic for a deeper understanding of the problem (Creswell, 2005). A qualitative mode of inquiry was also selected for this dissertation because of qualitative research's ability to allow participants to share their perspectives and stories associated with why they became involved in interdisciplinary research. Collecting data using interviews allows for a more in-depth understanding of the participants' perspectives and lived experiences surrounding their participation in their Small or Large Grant team.

As was previously mentioned in Chapter One, a limitation of using semi-structured interviews to collect participants' experiences is the possibility of self-report inaccuracy as a result of telescoping, attribution, or exaggeration (Brutus et al., 2013). Telescoping refers to the idea of an interviewee misplacing events within a timeline, particularly when recalling the frequency of an action or event. Attribution refers to an interviewee exhibiting an internal locus of control when experiencing positive outcomes, but exhibiting an external locus of control in regard to negative outcomes. The aforementioned self-report inaccuracies can decrease the soundness of a study; therefore, I intended to not only maintain an awareness of these inaccuracies, but also asked non-leading questions and confirmed participant's answers through probing questions. Additional actions I took while conducting this dissertation study to ensure maximum trustworthiness are described in the 'Instrument Verification' section later in this chapter.

Although the aforementioned limitations surround interviews as a data collection method, interviews remain the best fit for data collection in the context of this dissertation study because they acknowledge each human's experience is diverse and allow for the exploration of human behavior and experiences (Holstein & Gubrium, 1995). Conducting interviews also aligns with the constructivist epistemological paradigm within which this dissertation study is being conducted; interviews are conducive to the exploratory, contextual nature of this study.

Research Questions

The following are the research questions intended to guide this qualitative dissertation study:

1. What motivates unfunded grant principal investigators (PIs) or team members to involve themselves in interdisciplinary research teams?
2. How do unfunded grant PIs' or team members' failure to obtain funding through internal grant opportunities change their path for developing the proposed idea?

Sample

The target population for this study consisted of all unfunded applicants in the Round One (2018) Small and Large Grant Initiative at The University (N=744). Table 1 below depicts the number of applicants who submitted proposals in Round One for both Small and Large Grants.

Table 1 Number of Round One Small and Large Grant applicants

Grant Type	Unfunded PIs	Unfunded Members	**Total**
Small	58	32	**90**
Large	48	606	**654**
Total	**106**	**638**	**744**

In order to answer the two Research Questions guiding this dissertation study, the participant sample needed to consist of individuals who applied for funding in Round

One of the Small and Large Grant Initiative, but did not receive funding. The participant sample was selected using purposive sampling techniques. A purposive sampling technique, also known as a deliberate sampling technique, is a sampling method in which participants are chosen to be included in a study based on their particular characteristics, with the intention of gaining multiple perspectives (Sullivan & Forrester, 2019). Purposive sampling was utilized in order to ensure the diversity of the participant pool and provide representation from an array of disciplinary and demographic backgrounds. The criteria used to select the interview participants was based on the grant type they were not funded for, their role on their interdisciplinary team, The University college(s) they were associated with, and their general demographic information. Using the aforementioned characteristics as selection criteria allowed me to conduct interviews with participants who had experienced producing an ID research proposal idea from varying perspectives.

Instrumentation

Instrumentation is the tool or method through which data are being collected. This dissertation study used interviews as the primary data collection instrument. Field notes were also taken during interviews with the purpose of collecting additional data.

Interview Questions

I developed a set of interview questions to be utilized during the interview process. I created the interview questions by using a combination of examples from interdisciplinary literature and published interdisciplinary dissertations. I presented the interview questions to the IDRE Team in order to engage in a collaborative discussion

with the aim of critiquing and editing the questions to best fit this dissertation study. Once the interview questions were established, I conducted in-depth, semi-structured interviews with unfunded Small and Large Grant participants. The set of interview questions to be used in the interviews are listed in Appendix A and have been IRB approved as of July 1, 2020 (IRB NUMBER: IRB2019-0021). The interview questions in Appendix A were intended to be all inclusive, but I supplemented the predetermined interview questions with probing questions as necessary.

Instrument Verification

In order to ensure trustworthiness in this qualitative study, I requested participant-checking of interview transcripts and substantiated interview data with other sources of information such as fellow members of the IDRE Team who were present during the interview and field notes. “Engaging multiple methods, such as, observation, interviews and recordings will lead to more valid, reliable and diverse construction of realities” (Golafshani, 2003, p.604), hence the reason I decided to triangulate the interview data with field notes and IDRE Team member perspectives. I made a point to acknowledge and remain transparent in regard to my personal and/or professional biases during the interviews and interpretation of the data.

Data Collection

The following sections detail this study’s recruitment, selection, and interview procedures. The following sections also describe the reasoning for the number of interviews conducted in this study as well as a brief overview of the data analysis process.

Participant Recruitment

The process of identifying and recruiting participants was initiated using a comprehensive list of all Round One Small and Large Grant applicants provided by the Office of the Vice President for Research at The University. The comprehensive list included the name, email, demographics, and grant information for each Round One applicant. For the purpose of this study, the comprehensive list was trimmed to include only individuals who were not funded in Round One of the initiative.

Once the list was trimmed to the appropriate population, participants were then selected for this study based on the purposive sampling technique previously described in the 'Sample' section above. I sent emails to 10 purposively selected applicants at a time containing an invitation to take part in this study. Applicants were emailed three times, one initial email and two reminder emails. When an applicant either declined to participate or did not respond to the final reminder email, they were removed from the sample and 10 different applicants were purposively selected and emailed in regard to participating in the study. In total, 31 applicants were emailed an invitation to participate and 10 interviews were ultimately scheduled.

When an individual expressed interest in participating, they were directed to a website that allowed them to input their availability to participate in an interview. Once a convenient interview time for the participant and the interviewers was established, the participant was provided a Zoom link to a virtual meeting space and emailed the Informed Consent Form (Appendix B) to be reviewed prior to the interview.

Interview Process

As a result of the COVID-19 pandemic, all of the interviews for this dissertation study were conducted either by telephone or virtually. Each of the interviews were conducted by at least two IDRE Team members; I took the lead role of asking both the predetermined and probing interview questions and the other interviewer took detailed field notes. With participants' permission and as outlined in the Informed Consent Form, the interviews were audio recorded for transcription and analysis. At the start of each interview, interviewers introduced themselves, exchanged pleasantries, and I reviewed the consent form with each participant. I then utilized the open-ended questions in Appendix A to guide each interview and delve deeper into a participants' response using probing questions when clarification was necessary.

Saturation

Standard qualitative research practice recommends researchers reach "saturation" when deciding on the size of a sample; when no new perspectives or points-of-view emerge from the data, researchers should stop sampling (Sim et al,, 2018). The recruiting and interviewing of participants were occurring simultaneously. The simultaneous conducting of interviews and recruiting of additional participants allowed for the level of data saturation to be observed as the interviews were being conducted. After conducting 10 interviews, I evaluated the saturation level of the data and determined the information I was collecting had become redundant, therefore I discontinued data collection.

Data Analysis

Each of the 10 interviews were audio recorded. The resulting audio files from each of the interviews were transcribed using the Konch™ transcription software. Konch™ operates using artificial intelligence rather than a live transcriptionist, therefore I needed to verify the accuracy of the transcript by manually cleaning the data; the resulting transcripts required me to 'clean' them by ensuring their accuracy in identifying the correct speakers, adding the necessary punctuation, and correcting areas in which the audio quality did not allow for accurate transcription. The cleaning and accuracy process predominantly involved me listening to the audio recordings while following along with the written transcription in order to ensure that the participants' spoken words aligned with the transcribed text.

Once I completed the transcription cleaning process, the clean version of the interview transcript was emailed securely to the interviewee for participant-checking. The process of participant-checking required the electronic transfer of a participant's transcript from me to them and vice-versa using FileX, The University's password-protected and encrypted file distribution system. Two of the 10 participants took the opportunity to make changes to their transcripts. The changes each of them made were primarily to the punctuation of the transcript and providing clarity to sections of the transcript labeled "inaudible". The modifications made by both participants were not substantive and didn't change the essence of the content. Once checked by the participant, I analyzed the resulting transcripts using a Noticing, Collecting, Thinking (NCT) method adapted from the work of Seidel (1998) by Susanne Friese (2019). The

data was then coded and a general thematic analysis (Lincoln & Guba, 1985) was conducted in order to identify how well the participant perspectives aligned with the theoretical assumptions of this study's framework.

A general thematic analysis was chosen as the analysis technique for this qualitative dissertation study, because it allowed me to identify common themes within the data in an exploratory fashion and decide which themes were applicable to the research questions posed in this study. A thematic analysis also allowed me to break down the text of each transcribed interview into units of data and code each unit with a meaningful label. The coding process for this dissertation study was not done a priori from theory, but instead was structural in nature, meaning the codes emerged from the data based on the research goals and questions posed in this study (Ryan & Bernard, 2003).

As I continued conducting an open coding process, I created a code book to use as a guide to help analyze the interview data. The code book was essential to analyzing the qualitative data collected in this dissertation study because it provided me with a formalized operationalization of the codes (deCuir-Gunby et al., 2011). The code book served to define the reasoning as to why a unit of data was coded the way it was by providing each code's name/label, an in-depth definition of the code, and examples of the code within the data. In order to maintain organization of the code book, this portion of the data analysis process took place within the ATLAS.ti Cloud software. A more detailed account of the coding process is described in Chapter Four.

Ethical Considerations

As with any human subjects' research, this dissertation study presented risks to its participants. According to the Institutional Review Board (IRB) at The University:

> Regulatory definition of minimal risk is that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests (45 CFR 46.102(h)(i)).

Based on the definition provided by The University's IRB, this dissertation study posed minimal risk to participants. Although the risks associated with participating in this dissertation study were minimal, I aimed to decrease risk to participants as much as possible.

The first way I intended to decrease risk to participants was by utilizing archival data that was collected with the knowledge and approval of The University IRB. All consent forms, email scripts, interview questions, and other materials associated with the conducting of this dissertation study were approved by The University's IRB prior to being distributed to participants. Participants were made aware of the purpose of the study prior to consenting to take part and were made aware of their ability to withdraw consent at any time during the course of the study.

The confidentiality of the data collected from participants was of utmost importance. All of the interviews for this dissertation study were conducted virtually, therefore no paper consent forms or physical documents were created. In order to

maintain the highest level of confidentiality possible, all consent forms and field notes were stored electronically in password-protected and encrypted files.

The process of participant-checking required the electronic transfer of a participant's transcript from me to them and vice-versa. In order to maintain confidentiality during this process, the participant's interview transcript was emailed to them via FileX. FileX is a file distribution system used by The University that allows for a participant's transcript to remain password-protected and encrypted when distributed through an email.

CHAPTER IV

FINDINGS

Introduction

The following chapter presents the results of this study. I will begin by detailing the data analysis process utilized to ascertain my findings, then I will provide a brief description of each participant, and will conclude this chapter by presenting the findings associated with each of this study's Research Questions.

As stated in Chapter One, this study was conducted with the purpose of better understanding the motivation for research team members to conduct interdisciplinary (ID) research. Furthermore, this study aimed to obtain more detailed information regarding the continued ID work, or lack thereof, of participants who did not receive funding for their initial ID project. In order to carry out the aforementioned purpose of this study, the following research questions were used to guide semi-structured interviews with participants:

1. What motivates unfunded grant principal investigators (PIs) or team members to involve themselves in interdisciplinary research teams?
2.. How do unfunded grant PIs' or team members' failure to obtain funding through internal grant opportunities change their path for developing the proposed idea?

Participant Overview

In order to protect the identities of this study's participants, they will be known as Participant A, B, C, D, E, F, G, H, I, and J. Furthermore, only the necessary attributes of each participant will be provided in order to provide context for the participant's experiences, while ensuring the confidentiality of their identities.

Each of the 10 participants interviewed were selected because they submitted a proposal for a Round One (2018) interdisciplinary grant sponsored by The University, but were not selected to receive grant funding. The sample of participants in this study included Assistant Professors, Associate Professors, and Full Professors from multiple colleges at The University including the College of Agriculture, College of Education, College of Engineering, College of Geosciences, College of Liberal Arts, School of Public Health, College of Science, and University Libraries. The study sample included unfunded grant applicants of both the Small and Large Grant types and also included both Principal Investigators (PIs) and non-PI team members. Table 2 below provides a summary of the grant type, job title, and college to which each participant belongs.

Table 2 Overview of Participant Demographics

Participant	Grant Type	Professorial Ranking	College
A	Small	Assistant Professor	University Libraries
B	Large	Professor	Education
C	Large	Professor	Liberal Arts
D	Large	Professor	School of Public Health
E	Small	Assistant Professor	Liberal Arts
F	Small	Associate Professor	Engineering
G	Large	Associate Professor	Geosciences
H	Large	Assistant Professor	Engineering
I	Small	Professor	Agriculture and Life Sciences
J	Small	Professor	Science

Data Analysis Process

I began the data analysis process by uploading the interview transcripts into ATLAS.ti Cloud, a data management software designed to maintain and organize textual data. Once I uploaded the transcripts into ATLAS.ti, I read all 10 interview transcripts from beginning to end without taking notes or coding any of the data. I started by reading the transcripts in their entirety with the intention of fully immersing myself in the data before beginning the coding process.

I began reading the transcripts again, this time conducting an initial exploratory open coding of the transcription as is standard when conducting a thematic analysis. During this portion of the analysis process I tagged words, phrases, and/or sentences within each transcript that seemed interesting to me or I felt could be pertinent to the overall purpose of the study. Each tagged portion of the transcript received a descriptive label known as a 'code'. The process of analyzing data is typically non-linear and recursive (Seidel, 1998) therefore I revisited the transcripts three times with the intention of discovering new codes and combining repetitive codes. The initial exploratory open coding process led to the tagging of 250 quotations within the transcripts.

Once I completed the process of tagging words, phrases, and/or sentences within each transcript, I assessed the codes I had created with the intention of collapsing repetitive codes, giving each code a definition and/or criteria, and grouping similar codes together using a common word. Some tagged quotations from the transcripts were marked with more than one code if the quotation applied to more than one content area.

The ATLAS.ti software allowed for me to quickly generate and organize a code book. The code book served as a singular location in which a code's name, definition, and theme could be found and was used as a means to ensure consistency when coding the transcripts. Table 3 below provides an example of a code book entry; the full code book utilized in this study can be found in Appendix C.

Table 3 Example of Code Book Entry

CODE	DEFINITION	THEME
OUTCOME: Applied elsewhere	Participant mentions that the unfunded idea was proposed to another funding source.	PROPOSAL OUTCOME

Once I finalized the codes, I then grouped them by creating code 'themes'. A code theme indicates a particular set of codes were grouped together because they could be categorized by a common idea. For the purpose of this study, seven different themes were identified based on the common idea they embodied. Table 4 below details the seven themes I identified, the codes included within each theme, and the number of times each code was tagged.

Table 4 Emergent Themes Identified During Data Analysis

Theme	Number of Codes	Codes Included Within the Theme
MOTIVATION	66	ENTHUSIASM: To conduct ID research (12) MOTIVATION: Curiosity (5) MOTIVATION: Discovery (6) MOTIVATION: Exploration (2) MOTIVATION: Extrinsic (5) MOTIVATION: Intrinsic (17)

Table 4 Continued

Theme	Number of Codes	Codes Included Within the Theme
		MOTIVATION: Pressure (4) MOTIVATION: Problem focused (5) PROMOTION AND TENURE: Damaging (7) PUBLICATIONS (3)
ID TEAM LEVEL	47	ID TEAM FACTORS: General (5) ID TEAM FACTORS: Trust (4) ID TEAM FORMATION (9) TEAM DYNAMICS: Feedback (2) TEAM DYNAMICS: General (9) TEAM DYNAMICS: Leadership (5) TEAM FORMATION: Cold calling (3) TEAM FORMATION: No prior collaboration (3) TEAM FORMATION: Relationship prior to grant (1) TEAM FORMATION: Seeking expertise (7)
PERCEPTIONS	47	ATTITUDE: Resilience (5) Certain Disciplines More Equipped for ID Research (2) CULTURE (7) PERCEPTION: Initiative (6) PERCEPTION: Minimal effort (6) PERCEPTION: Of ID (3) PERCEPTIONS: Of specific disciplines (14) PERSPECTIVE: Offered by particular discipline (4)
OUTCOMES	34	APPLIED ELSEWHERE: Funded (1) APPLIED ELSEWHERE: Not funded (3) OUTCOME: Applied elsewhere (10) OUTCOME: Reapplied (7) OUTCOME: Will not reapply (4) OUTCOME: Will reapply (3) OUTCOME: Collaboration ceased after proposal (2) OUTCOME: Collaboration continued after proposal (4)

Table 4 Continued

Theme	Number of Codes	Codes Included Within the Theme
ORIGINS OF ID	24	CATALYST: For ID Research (3) EXPERIENCE: Previous ID (12) ID ORIGINS: Individual level (7) ID ORIGINS: Systemic level (2)
ID PARTICIPATION	17	ID PARTICIPATION: Consistent (1) ID PARTICIPATION: Increase (3) MULTIPLE GRANTS (4) PRIORITIZATION OF ID (5) RESEARCH AGENDA (4)
COLLABORATION	16	COLLABORATION: Desired disciplines (5) COLLABORATION: Outside of The University (4) COLLABORATION: With other disciplines (7)

Findings

The findings offered in this chapter will be presented using the two Research Questions guiding this study as the central focus. I will first present the findings directly associated with motivation (RQ1) and then the outcomes of unfunded proposal ideas (RQ2). I will conclude this section by presenting the themes peripheral to the Research Questions guiding this study that will enrich the discussion and implications provided in Chapter Five.

Motivation to Participate in ID Research

The theme ‘Motivation’ encompasses all of the codes pertaining to a participant discussing their reasoning for participating in interdisciplinary (ID) research. As was previously described in Chapter Two, Self-Determination Theory (SDT) classifies motivating factors as either intrinsic or extrinsic in nature. The motivating factors to

conduct ID research reported by participants in this study were both intrinsic and extrinsic in nature, although the frequency with which participants detailed intrinsically motivating factors far outweighed the frequency with which participants detailed extrinsically motivating factors.

Intrinsic Motivation

Every participant interviewed indicated a desire to conduct ID research because they were in some way intrinsically motivated to do so. Each participant cited at least one intrinsic motivator to conduct ID research. Although the specific reasons for conducting ID research were unique for each participant, the common intrinsic motivators described included general enjoyment from the experience, discovering new knowledge, exploring areas outside of one's core discipline, and solving problems that are unable to be solved without the aid of another discipline.

According to Deci and Ryan (1985), intrinsic motivation occurs when an individual executes a task or activity because doing so provides the individual with satisfaction. Many participants indicated their intrinsic motivation by making statements in which they expressed varying levels of fulfilment from conducting ID research. For example, Participants A, G, H, I, and J (n= 5) each described some aspect of their experience surrounding their involvement in the ID grants as "exciting". Participants D and G both used the term "fun" to describe their ID research. Participant G went so far as to say:

> I've gotten great enjoyment out of all these [ID] grants. I think it's been fun. Like I said, I view it as a way to get creative and try out different things, and if it

> doesn't go anywhere, then it's not a loss, it's knowledge gained and new collaborations.

A recurring motivating factor to conduct ID research amongst this study's participants was the idea of crossing disciplinary boundaries in order to solve a problem. The findings of this study indicate each of the participants were initially led to conduct interdisciplinary research as a result of a desire to focus on a particular problem that required expertise, knowledge, or technical ability provided by a discipline different than their own. Participant I indicated they conducted research with other disciplines for the purpose of solving a problem by stating:

> I'm doing it [ID research] by default because I'm interested. I mean, it's a natural thing. I've gotten to the end of the solution set for the real problems that are occurring. My set of solutions are not sufficient. So if you're problem based, you go to the edge of your discipline and once you do as well as that, you have to get out of it… So that's the reason I'm going outside my discipline. It's because my solution set has come to an end.

When Participant C was asked their primary reason for doing ID research, they simply stated they were, "following the problem". Participant C furthered their answer by stating, "it's about the knowledge, not turf" when referring to crossing disciplinary boundaries in order to pursue their scientific inquiries.

Five participants specified 'discovery' as a motivating factor for conducting ID research. When a quotation within a transcript was tagged as 'discovery', it implied a participant mentioned they do ID research for the purpose of discovering new

knowledge or information. One example of a participant conducting ID research for the purpose of discovery can be seen in the interview of Participant H:

> I think the driving force is the appeal from the interdisciplinary research itself… Interdisciplinary research helps us to broaden our vision and to a certain degree betters [you] to think about your focus area and I also feel there are a lot of things that can be explored and discovered.

Participant A described their motivation to conduct ID research as having, "to do with knowledge, learning, and understanding". Similar to the concept of discovery, three participants specified curiosity as a motivating factor to conduct ID research, including Participant J who stated:

> My main motivation is I think initially it was driven by curiosity. It's curiosity driven because you don't know a certain part and you want to get it done and it's interesting… I think the overall motivation initially is curiosity, and afterwards it just forms a routine.

Participant A also mentioned curiosity as a motivating factor by referring to themself as a "broadly curious person" and implied this personality trait was reflected in their research agenda by conducting ID research in order to satisfy their curious nature.

All 10 participants cited at least one reason to conduct ID research that stemmed from intrinsic motivation, but some participants also mentioned extrinsic factors. The following section presents the findings related to extrinsic motivation from this study.

Extrinsic Motivation

According to Deci and Ryan (1985), extrinsic motivation implies an individual completes a task because of an external influence such as a reward, deadline, recognition, etc. The extrinsic motivation to participate in ID research stemmed from a perceived pressure to participate in ID research in order to obtain funding. Participants felt extrinsically motivated to conduct ID research because pressure was being placed on them to do so by funding agencies and the "higher ups" (Participant E) of the university.

Three participants indicated part of the motivation driving them to conduct ID research is centered around the idea that funding agencies are awarding grants to those who are conducting ID research. Essentially, if academics are not proposing ID projects, they won't receive grants from funding agencies who have shifted their focus to ID research. Funding agencies pivoting towards a more ID outlook have required the participants to add ID elements to their existing research agendas. Participant B articulated this point by stating, "that's one of the problems with the grant programs in the US. They tell you how to change and you fall in line, and if you don't change in those ways, you don't get the money."

Participant E perceived the pressure to conduct ID research not only at the individual level, but at the disciplinary level as well:

> There is some push for more multidisciplinary studies… People are still trying to figure out if we want to do this for the sake of [the field], or do we want to do this because there is this push like at the federal level, where you get all these

> grants if you do multidisciplinary research and we want those grants, so let's go that way.

One participant discussed the purely monetary reward of participating in ID research with disciplines known for their practical applications. Participant J stated:

> But if you're sitting in a, let's say, chemistry department without reaching out, those opportunities are not there because the only way is probably through National Science Foundation… NSF also supports interdisciplinary teams, but the more practical ones. It's not about fundamental science, if it's not application or engineering, you can't get it. So you have to go out to engineers so that's the only way to achieve that. Out of necessity, I would say otherwise you wouldn't have the money to support the students, right?

Participant J used engineering as a specific example of a practical and applied discipline that NSF purportedly favors when funding ID research. Although Participant J said the monetary reward is one of the reasons to participate in ID research, they concluded their answer to the question by suggesting the additional funding is for student support.

Promotion and Tenure

A prominent theme identified in this study was a general understanding that ID research was more accessible to tenured faculty than junior faculty because of the promotion and tenure guidelines in place at The University. In essence, participants in junior faculty positions at the time of their interview felt tenured faculty were in a position more open to conducting ID research because ID publications hinder faculty or staff during the promotion and tenure process. Six of the 10 participants did not have

tenure at the time of their Small or Large Grant application, but 1 had received tenured status by the time their interview was conducted. The findings of this study indicated participants in junior-faculty positions often didn't receive credit for publications in journals outside of their primary discipline, therefore participants felt ID research became a secondary part of their research agenda until they were granted tenure status. Participant E exemplified this idea and even went so far as to point out the promotion and tenure guidelines in their discipline discourages junior faculty from doing ID research:

> Even though there are incentives to try to be multidisciplinary, I think that those apply more to senior people that are not going to go for review… Even now if I talked with a junior guy that was just hired, I would tell her or him like, 'well, don't do it unless you have a very clear way where the things work well for [your primary discipline].

Additionally, the promotion and tenure guidelines at The University vary by department, creating a discrepancy between which disciplines value ID work in their promotion and tenure process. Participant A mentioned this discrepancy by asserting "I think there is the element of departments are autonomous and they can decide whether something counts or not for scholarship".

Outcomes of Proposals

The theme 'Outcomes' encompasses all of the codes pertaining to the result of the proposed research idea after it was not selected for funding in Round One of the internal grants. In order for a team to apply for either of the internal ID grants, they

would have already done work on the front end to complete the grant proposal. The proposal a Principal Investigator (PI) submits for funding consideration consists of the proposal idea itself, the team members, an award budget, and future directions for research. Although more work is necessary in order to apply for the Large Grant, the application process for both grants still requires researchers' valuable time and energy. The participants of this study took diverse paths after their Round One grant proposal wasn't funded. The outcomes for the proposal ideas and teammate collaborations are described in detail in the following sections.

Proposal Idea Outcome

The results of this study indicate the majority of participants revised or repurposed their unfunded proposal idea and continued seeking to secure funding for the proposal. Out of the ten participants in this study, seven took their unfunded grant idea and sought funding again from a combination of internal and external sources.

Participants B, F, G, and H used all or parts of their original grant proposal to apply in subsequent internal funding rounds. Participants B, F, and H received funding in a subsequent round of internal grants, while Participant G did not. Although they had not submitted a subsequent grant proposal externally at the time of their interview, Participant G mentioned plans to "incorporate some of the concepts we developed for that [Small Grant]" into proposals for external funding sources.

Some of the participants kept their original grant idea intact completely when applying for following grants, while others broke the original idea apart and used only pieces of it in subsequent grant applications. When Participant H was asked "Was the

idea for the first round then used to apply again in the second round, or was it a completely different idea?", they responded by stating:

> It's mostly the same idea, except… we polished it and made it more focused. And also, we were able to get more time to communicate with JPL [Jet Propulsion Laboratory]… Because the whole idea is that through [the Large Grant], the funded activities will lead to larger grants in the future, so we invested more time in the second round strengthening that part.

Two of the seven applicants applied to external funding sources with their original proposal idea when they were not funded internally through the initiative. Participant A was able to successfully secure funding for their original proposal in its entirety by combining awards from multiple smaller funding sources, whereas Participant I has yet to secure funding for their original proposal idea.

At the time of their interview, Participant J was the only participant who had reapplied for funds from both internal and external funding sources, but to no avail. Their subsequent grant attempts reached advanced selection rounds of internal funding opportunities, but had not been funded to date. When asked how they were going to proceed, Participant J commented, "we are still going to apply. Next year, actually, in the submission cycle, 2021. So we'll keep going until we get it funded or until I retire, I guess. It's never ending.".

Participants C, D, and E did not pursue their original proposal idea either internally or externally. Participant D didn't further pursue their original proposal idea because they saw the original grant proposal as a way of "getting some pilot data that

would be able to make [them] a stronger proposal, [they] just really didn't have a mechanism to get the pilot data." Participant E mentioned reapplying in subsequent internal funding rounds, but with an entirely different ID project than they proposed in the first round.

Team Collaboration Outcome

When applying for both the Small and Large Grants, the proposal was submitted by a team of ID researchers. Once a proposal was not selected to move forward in the grant application process, the team members then had to make decisions on how the team would move forward as a whole or in parts. Some team members continued collaborating with one another on projects outside of the original proposal, while others ceased collaborating when the original proposal was not selected.

Prior to forming a Round One Small Grant team, Participant J did not have a relationship with their team members; they sought out team members based on how their specific disciplinary expertise could add to the ID nature of the proposal. As a result of their working together on the Round One grant proposal, Participant J continued collaborating with one teammate in particular:

> After we got connected by this [Small Grant] bond, then we started serving on the committees and I got to learn his work… And then we actually applied for some funding, but also I think we published some papers together as well, so that's nice. And also, the students that are graduating. I actually was able to learn about their kind of science and engineering problem and then they became part of my research as well through collaboration.

Similar to Participant J, Participant A also continued collaborating with at least one of their Round One teammates after not receiving funding for their initial proposal. All of the team members, including Participant A, continued collaborating on their original ID proposal until it was funded by an external source and the subsequent project was completed.

Some collaborations extended past the unfunded Round One proposal, but were later affected by relocation to other universities. Participants A, F, and H had each continued collaborating with at least one member of their unfunded grant teams until that team member left The University. Participant F exemplifies this by stating:

> After the one guy left A&M I'm not really in touch with him anymore. And the other guy that we got the research from, the project forced us to meet a little bit more, but I wouldn't say that we are building some research program together now.

Six of the seven participants who repurposed their original grant proposal to apply for funding elsewhere continued collaborating with at least one of the original members of their unfunded grant team.

Peripheral Themes

The following section presents findings peripheral to the Research Questions guiding this study. Although these findings are not central to the Research Questions guiding this study, presenting them will enrich the discussion and implications provided in Chapter Five by supplying additional background and contextual information from participants.

University Culture

One peripheral theme identified in this study was a distinct lack of collaborative culture at The University. Five of the ten participants in this study cited the culture at The University as not conducive to participating in ID research. One of the reasons participants didn't feel the culture at The University was conducive to ID research was a product of soft sciences (i.e. psychology, political science, and sociology) being seen as lesser than hard sciences (i.e. biology, chemistry, and engineering). Participant C exemplified this point-of-view by stating "I think it's a general issue at this institution that the liberal arts are not highly regarded… I think that's a cultural matter that can't be immediately fixed". Participant D indicated the same notion by stating "I have encountered a feeling of 'you're not really a scientist you're a social scientist' when discussing working with previous ID teams at The University.

Participants also mentioned disciplinary silos as a barrier to collaborative culture at The University. Participant C stated The University was "…the most siloed place by far I've ever been with. You can't even get a cross departmental conversation going often." Participant I discussed silos being created as a reaction to protecting resources:

> I'll also point out that collaborative culture here [The University] is not good. There's a problem with that, and I'm not sure what it is… This is a big university that has a lot more specialties, but there seems to be a lot more barriers to actually playing. So I'm not sure why there's a lot more guarding of resources.

Interdisciplinary Origins

Another peripheral theme of this study was the way in which participants became involved in interdisciplinary research prior to their involvement with the Small or Large Grant research. Nine of the ten participants in this study reported engaging in ID research prior to their Small or Large Grant research team, although their level of engagement with ID research varied. Some participants were well versed in ID research and had been conducting research for most of their academic careers. Participant C stated their "work has been interdisciplinary since [they] started in the early 80s" and expounded on their answer by saying ID research was the primary type of research they engaged in.

Participant J described their previous involvement with ID research as working with multiple specializations of the same discipline (i.e. chemical engineering, civil engineering, electrical engineering, etc.) and clarified that the amount of ID research they engaged in was dependent upon the definition of 'interdisciplinary'. Some scholars would define specializations of the same discipline working together as interdisciplinary, while others would not.

Participant A was the only participant to have not engaged in any form of ID research until applying for their ID grant from The University. Although their prior participation in ID research was nonexistent, Participant A described their application for a Small Grant as a "catalyst" for the ID research they had conducted since applying.

Collaboration

The theme ‘collaboration’ encompassed codes in which participants disclosed a desire to collaborate with one or more researchers in a specific discipline other than their own. Some participants expressed a desire to collaborate with researchers within The University whose disciplinary expertise could add to their existing research. One example of this desired collaboration was exhibited by Participant I:

> We had a data set and we wanted to incorporate that with land planning and so we were looking for somebody in architecture to help us with that stuff, particularly some GIS analysis and maybe to extend it into the local areas

Participants H and I both expressed a desire to collaborate with professionals who had the ability to translate their research findings into public policy. When probed for their reasoning for wanting to collaborate with policy makers, Participant H responded by saying ”it's good to see your work being implemented and can really impact society”.

In some cases, participants expressed a desire to collaborate with researchers outside of The University. For example, Participant B described future plans for increasing their interdisciplinary research agenda by “making [the project] cross institutional within our system. Connecting with Michigan State, connecting with the two universities in Canada, and then with five in China”.

Participant A had already collaborated with researchers outside of The University at the time of their interview and said “I think one of the things that made this a very fruitful experience for us was not really in working together, which was fantastic, but also then bringing other people from other institutions here.”

Conclusion

Overall, the findings described in this chapter indicate a participant's underlying motivation to participate in ID research stems from a combination of both intrinsically and extrinsically motivating factors. Most of the participants in this study conducted ID research with the intention of addressing a specific problem or answering a specific research question. Participants felt disciplinary boundaries needed to be crossed in order to obtain the solutions or answers they were seeking. Furthermore, the results of this study suggest the majority of researchers took their unfunded grant proposals and utilized them to apply for other funding sources when possible. The majority of participants in this study who repurposed their original proposal idea continued collaborating with at least one of their original team members.

The results of this study also suggest participants in junior faculty positions could not fully dedicate their research agenda to ID projects until they maintained a tenured position because the promotion and tenure process in place at The University was not encouraging of research outside of their primary discipline. In addition to the promotion and tenure process not encouraging ID research, participants indicated the culture of the university was not conducive to collaborating across disciplinary boundaries. Lastly, the findings of this study indicated most (n=9) of the participants had previous engagement with ID research prior to applying for their Small or Large Grants from The University.

CHAPTER V

SUMMARY, DISCUSSION, AND FUTURE DIRECTIONS

Introduction

The preceding chapter detailed the data analysis process and subsequent findings of this study. Chapter Five includes a summary of the study, a discussion of the findings, implications for practice and Human Resource Development, study limitations, and recommendations for further research.

Summary of the Study

The following section provides a brief overview of this study in its entirety. The purpose, methods, and findings are summarized with the intention of providing the necessary context to discuss this study in detail.

Purpose of the Study

The purpose of this qualitative study was to better understand the motivation for research team members to conduct interdisciplinary research. This study also aimed to obtain more detailed information regarding the continued ID work, or lack thereof, of participants who did not receive funding for their initial ID project. The two Research Questions guiding this study were:

1. What motivates unfunded grant principal investigators (PIs) or team members to involve themselves in interdisciplinary research teams?

2.. How do unfunded grant PIs' or team members' failure to obtain funding through internal grant opportunities change their path for developing the proposed idea?

Methods

This dissertation study was conducted using a qualitative study research design. I conducted semi-structured virtual interviews with a sample of 10 unfunded Small and Large Grant research team members and PIs, 5 from Small Grants and 5 from Large Grants, in order to obtain the data necessary to answer the Research Questions. The participant sample was purposively selected from the population in order to collect data from participants with an array of demographic perspectives including gender, professorial ranking, college, department, grant type, and role in the grant proposal (PI or team member).

During each audio recorded interview, participants were asked a predetermined set of interview questions that were supplemented by probing questions tailored to garner the maximum information about their experience. At the conclusion of each interview, the resulting audio recording was transcribed, and I coded the transcripts using a general thematic analysis (Lincoln & Guba, 1985). After completing the coding process, I then categorized groups of codes by a common idea into one of seven different themes.

Findings

The findings of this study indicate a participant's underlying motivation to participate in ID research stems from a combination of both intrinsically and

extrinsically motivating factors. Although both types of motivating factors were present, the results of this study indicate a participant's motivation to participate in ID research relies more on their intrinsic desire to do so than on extrinsic benefits based on the frequency with which intrinsic motivators were discussed compared to extrinsic motivators. Participants indicated in some ways the expectations of the promotion and tenure process squelched their desire to conduct interdisciplinary research until they secured a tenured position.

The results of this study suggest the majority of the unfunded researchers (n=7) took their unfunded grant proposal and repurposed it in order to apply for either an internal or external funding source. Six of the seven participants who utilized their unfunded proposal idea in a subsequent grant continued to collaborate with at least one member of their original ID grant team.

The peripheral findings of this study indicated the culture surrounding interdisciplinarity at The University is not as conducive to crossing disciplinary boundaries as it could be. Participants indicated disciplinary silos and a general lack of collaboration made it difficult to create connections with researchers in other disciplines. It was also indicated that researchers in some disciplines are more motivated to conduct ID research than in other disciplines. Most participants in this study showed a history of ID involvement in previous projects and research opportunities.

Discussion of the Findings

In this section, findings are first discussed based on the Research Questions used to guide this study. The findings are then discussed within the context of the theoretical framework used to guide this research.

The findings of this study indicated ID research team PIs and team members involved themselves in ID research for predominantly intrinsic reasons. It is important to note that human behavior is complex and intrinsic and extrinsic motivation are not mutually exclusive. The complexity of human behavior allows for an individual to be motivated by both intrinsic and extrinsic factors at the same time. Although all 10 participants in this study were intrinsically motivated to participate in ID research in some form, many of them cited extrinsic motivators as well. The main extrinsic motivators described by participants included pressure to conduct ID research from funding agencies and seeking monetary resources for research projects.

Furthermore, this study sought to obtain data on the outcomes of the unfunded grant proposal ideas. The results of this study concluded the unfunded grant idea originally proposed in Round One of the initiative was further pursued in some way, shape, or form by participants. With only one exception, every participant who repurposed their unfunded grant proposal idea to apply for funding elsewhere continued collaborating with at least one of their original ID team members.

Very few empirical studies have investigated researchers' motivation to conduct interdisciplinary research, but the findings of this study coincide with the limited findings of related studies. Shrimpton and Astbury (2011) indicated researchers'

motivation to conduct ID research was "driven by a combination of instrumental, intrinsic and pragmatic motives" (p.204), which coincided with the findings of this study. Shrimpton and Astbury's study also presented the barriers to ID research described by participants such as time, funding, the detrimental effects of university promotion systems, and more. Although this study did not specifically evaluate the barriers to conducting ID research, the detrimental effects of university promotion systems was a major theme that arose during the data analysis process, again coinciding with the existing literature surrounding motivation and ID research.

One area that was not heavily discussed by participants, but was prevalent in team-based engagement and motivation literature was the concept of leadership. Half of the participants were listed as the PI on their proposed Round One ID grant and the other half were non- PI team members. Although some participants casually mentioned who the PI of their team was or the role the PI took in putting their team together, only one of the participants specifically mentioned the leadership style associated with their ID team leader. Extensive literature has been written regarding the leadership styles and techniques most beneficial to inter- and multi- disciplinary teams (Stokols, et al., 2008; Boone, 1990), so it was surprising not to encounter codes pertaining to leadership style as a motivator, or demotivator, of ID research during the data analysis process.

The following section provides a discussion of the findings in relation to the theoretical framework guiding this study. Each of the major findings will be discussed using the lens of Self-Determination Theory (SDT) and then Self-Directed Learning Theory (SDL).

Self-Determination Theory

As detailed in Chapter Two, Self-Determination Theory (SDT) is a motivation theory that proposes an individual can become self-determined when their three psychological needs of autonomy, competence, and relatedness are all fulfilled (Deci & Ryan, 1985). Becoming self-determined implies that an individual is driven by a need to grow and gain fulfillment because they are intrinsically motivated to do so. The primary purpose of this qualitative study was to better understand the motivation for research team members to conduct ID research. This study concluded that the primary motivation of participants to conduct ID research was intrinsic in nature. The intrinsic motivation to conduct ID research possessed by participants indicates their three psychological needs of autonomy, competence, and relatedness were fulfilled. The following subsections discuss each of the three psychological needs of autonomy, competence, and relatedness as they were exemplified in the context of this study.

Autonomy

In SDT, autonomy refers to "the need to self-regulate one's experiences and actions" (Deci & Ryan, 1985, p.10). Providing a person choice, acknowledging their feelings, and providing them opportunities for self-direction is shown to increase their feeling of autonomy (Deci & Ryan, 1985).

On the surface of this study's findings it may seem autonomy was lacking in participant's choice to conduct ID research, but after delving into the roots of where a participant's desire to conduct ID research came from, autonomy was certainly present. For example, Participant B cited feeling as if they didn't have an option but to

participate in ID research in order to obtain funding from larger funding agencies, but they also stated the origins of their ID interest came from a combination of their academic predecessor and cultural upbringing. At its core, the motivation to conduct ID research existed before Participant B ever felt pressure from funding agencies to do ID research, thus participating in ID research was something they chose of their own volition. This experience was consistent across all of the participants who mentioned pressure from funding agencies to conduct ID research.

Although participants experienced autonomy in choosing to conduct ID research, the majority of participants cited instances in which their autonomy was diminished because of the promotion and tenure system. Participants, predominantly those who were junior faculty at the time of their interview, felt they had to dedicate the majority of their time to their primary discipline rather than ID research because the promotion and tenure guidelines were not conducive to both conducting ID research and being granted tenure status. Participants voiced the promotion and tenure process dictated the types of journals they could publish in, the disciplines they were able to conduct research with, and to what discipline they were academically associated with, thus lowering their levels of autonomy.

Competence

The second psychological need, competence, refers to one's "need to feel effectance and mastery" (Deci & Ryan, 1985, p.8). SDT theorizes that when people have the knowledge and skills necessary to perform a task, they are more likely to work towards their predetermined goals. Most participants exhibited a problem-focused way

of thinking about research and pursued collaborations with those who possessed the knowledge and skills needed to solve the problem at hand. Essentially, participants sought out collaborations with researchers in other disciplines in an effort to add the necessary knowledge and skills to their own tool belt. When participants actively sought the knowledge and skills of a professional in another discipline, they were willing to admit their own lack of knowledge and aimed to find someone who was able to complement their research in a mutually beneficial way.

Social support and positive feedback are both ways to increase competence (Stoa et al., 2020). By presenting an ID research idea to another person with the intention of receiving their buy-in and subsequently agreeing to collaborate, social support is being received. When the continued collaboration occurred after the original idea was not funded in Round One, a participant may have felt continued competence because team members believed in the idea enough to continue pursuing it by applying for other funding sources.

Relatedness

Within the SDT literature, the term ‘relatedness’ is often used synonymously with the term ‘belongingness’; both terms refer to feeling socially connected and cared for by others (Deci & Ryan, 1985). The feeling of relatedness or belongingness occurs/can be found not only at the individual level, but at an environmental level as well. The findings of this study indicated the overall culture of the university was perceived as not very conducive to scholars crossing disciplinary boundaries in order to conduct ID research. By creating the Small and Large Grant Initiative, The University

recognized that its culture as a whole needed to be shifted to a more interdisciplinary mindset, hence the introduction of the Small and Large Grant Initiative. Providing a vehicle in which researchers at The University were encouraged to conduct the type of problem-focused research they were already intrinsically motivated to conduct, may be what gave them a sense of belongingness to The University.

Using SDT as a theoretical lens, participants' intrinsic desire to complete ID research suggests all three of their psychological needs of autonomy, competence, and relatedness were satisfied enough to be autonomously motivated. The fulfillment of all three psychological needs implies a participant conducted ID research because they genuinely wanted to. Furthermore, being autonomously motivated implies ID research has been assimilated into the way participants conduct research as a whole.

Self-Directed Learning Theory

Self-Directed Learning Theory (SDL) is an adult learning theory "in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, p. 18). SDL essentially states a learner guides their own acquisition of new knowledge and information based on their desire to do so. SDL posits an adult learner is motivated by "internal pleasures" to become a self-directed learner (Knowles et al., 1998). Based on the definition of "internal pleasures" provided by Knowles, it is seemingly synonymous with the concept of intrinsic motivation as it is used in SDT.

A recurring motivating factor to conduct ID research amongst this study's participants was the idea of crossing disciplinary boundaries in order to solve a problem. The findings of this study indicate each of the participants were initially led to conduct ID research as a result of a desire to focus on a particular problem that required expertise, knowledge, or technical ability provided by a discipline different than their own. SDL provides a rationale for why a participant would take the necessary actions to solve a problem without specific instruction or guidance to do so.

Self-Directed Learning Theory also coincides with the autonomy component as it is applied in Self-Determination Theory. When the participants of this study had the ability to decide on the content of their own investigation(s), they were practicing full autonomy over their research agenda. The participants took the initiative to decide what problem they wanted to investigate or solve, and then sought the learning materials and resources necessary to direct their own learning. Studies have indicated increasing the number of choices offered to an individual can actually increase their intrinsic motivation to complete a task (Zuckerman et al., 1978), thus providing a wide array of research opportunities could increase a researcher's intrinsic motivation.

Implications for Practice

The ever-increasing need for interdisciplinary research in order to solve complex problems, coupled with an increase in technological ability to communicate across disciplines and geographic distances, creates a niche in which this study's findings provide suggestions for practice that could increase researcher's motivation to participate in ID research. This study provides empirical evidence indicating the

promotion and tenure process, specifically at The University, needs to be adjusted in order to not penalize junior faculty for conducting ID research and subsequently publishing ID work.

Based on the findings of this study, one recommendation for practice would be to alter the promotion and tenure guidelines as they are established currently at The University. Oftentimes interdisciplinary publications may hinder faculty or staff during the promotion and tenure process because they don't always receive credit for publications in journals outside of their primary discipline. Altering the promotion and tenure system to be more inclusive of ID work would necessitate allowing tenure-track junior faculty to get at least partial credit for publishing articles in journals outside of their primary discipline.

The emergence of the 'publish or perish' notion in the academic world refers to the idea that "a faculty member's tenure is primarily a function of his or her success in publishing. It comprises a race against time that typically begins when the faculty member is hired and ends when the tenure decision must be made" (deRond & Miller, 2005, p. 322). In essence, an academic is expected to publish as often as possible in order to stay relevant and meet the expectations set forth by promotion and tenure guidelines. Setting aside the consequence of burnout that often accompanies the intense pressure to publish so often Chan et al., 2020; Mark & Smith, 2012; Watts & Robertson, 2011), if the promotion and tenure guidelines are not counting publications outside of one's primary discipline, academics are then being placed in a position to either publish

more in order to conduct ID research and still meet promotion and tenure requirements, or conduct research within their primary field and not pursue the ID research.

Implications for Human Resource Development

As a student of Human Resource Development (HRD), it is important to specifically address the ways in which the findings of this dissertation study can be applied to the field of HRD. Although the field of HRD does not have an official definition, it is agreed upon that HRD in and of itself is an interdisciplinary field with "a vast area of practice and knowledge" (Weinberger, 1998, p. 75). Distinguished HRD researcher, Richard Swanson, defines HRD as "a process of developing and/or unleashing human expertise through organization development and personnel training and development for the purpose of improving performance" (1995, p.208).

At their core, universities are workplaces and the academics conducting research within them are employees, therefore organization based HRD interventions are applicable for increasing the interdisciplinary capacity of a university. The findings of this study provide guiding points for HRD practitioners and those in leadership positions at The University to implement interventions aimed at increasing motivation to conduct ID research. Because the findings of this study identify the reasons researchers at The University are motivated to conduct ID research, HRD practitioners could use these findings to identify specific opportunities to develop The University in order to increase researcher performance.

Limitations

A limitation of this study that should be considered when conducting future research of interdisciplinarity is the absence of junior faculty from the ID research population. To clarify this statement, because the promotion and tenure process discourages junior faculty from conducting ID research, it is possible junior faculty are underrepresented in the sample of this study. Future ID research should take into consideration the likely underrepresentation of junior faculty when selecting a sample from an academic population.

Future Research

One suggestion for future research would be in the area of fixed and growth mindset After receiving rejection, people may react differently and display varying levels of resilience based on their personality and mindset. Carol Dweck's work (2006) surrounding fixed and growth mindsets as implicit personality traits (2006) could allow for an enhanced understanding of the continuance of ID research after rejection. Future research using implicit personality theory as a theoretical framework to evaluate the mindsets of those who conduct ID research may provide further insight into the motivations and successful encouragement of ID scholars. ID researchers who have a fixed mindset may approach interdisciplinary topics differently than those who possess a growth mindset, and thus further research on mindset and motivation could add to the literature surrounding ID research.

Another suggestion for future research would be a quantitative study with a larger sample of ID researchers in which the three psychological needs of autonomy,

competence, and relatedness as they are used in SDT are measured using Likert scales. Although this study provides a detailed perspective of each participant's experience, being able to generalize to a broader population could allow for increasing ID research at other universities and in varying contexts.

Conclusion

In conclusion, this study identified the primary motivating factors of PIs and team members to conduct ID research to be predominantly intrinsic in nature. Participants sought to discover new knowledge and answer their research questions with little to no regard to the disciplinary boundaries between them and the information they sought. Additionally, the results of this investigation showed most unfunded grant ideas originally proposed were repurposed and used to reapply for either internal or external funding. With only one exception, every participant who repurposed their unfunded grant proposal idea to apply for funding elsewhere continued collaborating with at least one of their original ID team members.

This study addresses the paucity in the literature surrounding motivation to conduct ID research by providing the underlying motivating factors behind why researchers conduct ID research rather than monodisciplinary research. The findings of this study support the theoretical framework built by Self-Determination Theory and Self-Directed Learning Theory for researching motivation to conduct ID research. This study used SDT to evaluate a participant's level of fulfillment in the three psychological needs of autonomy, competence, and relatedness in order to justify their autonomous motivation to conduct ID research. The use of SDT in the theoretical framework of this

study provided a justification for why participants sought information and knowledge despite disciplinary boundaries and a lack of support from the promotion and tenure system in which they are embedded.

REFERENCES

Adams, J. D., Black, G. C., Clemmons, J. R., & Stephan, P.E. (2005). Scientific teams and institutional collaborations: Evidence from U.S. universities, 1981–1999. *Research Policy, 34*(3), 259–285. https://doi.org/10.1016/j.respol.2005.01.014

Adinda, D., & Mohib, N. (2020). Teaching and instructional design approaches to enhance students' self-directed learning in blended learning environments. *Electronic Journal of e-Learning, 18*(2), 162-174. https://doi.org/10.34190/EJEL.20.18.2.005

Aelterman, N., Vansteenkiste, M., Haerens, L., Soenens, B., Fontaine, J. R. J., & Reeve, J. (2019). Toward an integrative and fine-grained insight in motivating and demotivating teaching styles: The merits of a circumplex approach. *Journal of Educational Psychology, 111*(3), 497–521. https://doi.org/10.1037/edu0000293

Al Mamun, M. A., Lawrie, G., Wright, T. (2020). Instructional design of scaffolded online learning modules for self-directed and inquiry-based learning environments. *Computers & Education, 144.* https://doi.org/10.1016/j.compedu.2019.103695

Anastas, J. W. (2002). Why Epistemology Matters [Keynote address]. 16th Annual Symposium on Doctoral Research, Ohio State University, Columbus, Ohio, United States.

Association for Interdisciplinary Studies. (n.d.). *Mission.* https://interdisciplinarystudies.org/

Benita, M., Butler, R., & Shibaz, L. (2019). Outcomes and antecedents of teacher depersonalization: The role of intrinsic orientation for teaching. *Journal of Educational Psychology*, *111*(6), 1103–1118. https://doi.org/10.1037/edu0000328

Beyerlein, M., Goodson, P., McLeroy, K., Patterson, M., French, P., Garr, A., Lu, Jiacheng, Sankar, S., Wang, W., Yu, C.L-H. (2020). *Evaluation of the President's Excellence Fund T3 and X-Grants Initiative: Round 1*.

Boone, E. J. (1990). Crossing Lines. *Journal of Extension, 28*(3). Retrieved from http://www.joe.org/joe/1990fall/tp1.php

Breckler, S. (2005). The importance of disciplines. *Psychical Science Agenda, 34*(5). Retrieved from https://www.apa.org/science/about/psa/2005/10/ed-column

Brutus, S., Aguinis, H., & Wassmer, U. (2013). Self-reported limitations and future decisions in scholarly reports: Analysis and recommendations. *Journal of Management*, *39*(1), 48-75. https://doi.org/10.1177/0149206312455245

Center for Self-Determination Theory. (n.d.). *Research.* https://selfdeterminationtheory.org/research/

Chan, H., Mazzucchelli, T. G., & Rees, C. S. (2020). The battle-hardened academic: An exploration of the resilience of university academics in the face of ongoing criticism and rejection of their research. *Higher Education Research & Development*, *5*, 1-15. https://doi.org/10.1080/07294360.2020.1765743

deCharms, R. (1968). *Personal causation*. Academic Press.

Cheon, S. H., Reeve, J., & Vansteenkiste, M. (2020). When teachers learn how to provide classroom structure in an autonomy-supportive way: Benefits to teachers and their students. *Teaching and Teacher Education*, *90*. https://doi.org/10.1016/j.tate.2019.103004

Creswell, (2005). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (2nd ed.) .Pearson Education.

deCuir-Gunby, J. T., Marshall, P. L., & Mcculloch, A. W. (2011). Developing and using a codebook for the analysis of interview data: An example from a professional development research project. *Field Methods. 23*(2). 136-155. https://doi.org/10.1177/1525822X10388468

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology. 18*(1), 105–115. https://doi.org/10.1037/h0030644

Deci, E.L. (1992). *The relation of interest to motivational behavior: A self-determination theory perspective.*

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum Press.

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology*, *49*(3), 182–185. https://doi.org/10.1037/a0012801

Dweck, C. S. (2006). *Mindset: The New Psychology of Success*. Penguin Random House LLC.

Friese, S. (2019). *Qualitative data analysis with ATLAS.ti* (3rd ed.). SAGE Publications.

Gagné, M. (2018). From strategy to action: Transforming organizational goals into organizational behavior. *International Journal of Management Review, 20*, S83-S104. https://doi.org/10.1111/ijmr.12159

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report. 8*(4). 597-607. https://doi.org/10.46743/2160-3715/2003.1870

Gorozidis, G., & Papaioannou, A. G. (2014). Teachers' motivation to participate in training and to implement innovations. *Teaching and Teacher Education, 39*, 1-11. https://doi.org/10.1016/j.tate.2013.12.001

Guba, E. G., & Lincoln, Y. S. (1994). *Competing paradigms in qualitative research*. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (p. 105-117). Sage Publications, Inc.

Guglielmino, P. J., Guglielmino, L. M., & Long, H. B. (1987). Self-directed learning readiness and performance in the workplace. *Higher Education, 16*, 303-317. https://doi.org/10.1007/BF00148972

Hammarfelt, B. (2020). Discipline. *Knowledge Organization, (47)*3, 244-256. https://doi.org/10.5771/0943-7444-2020-3-244

Harris, F., Lyon, F., & Clarke, S. (2009) Doing interdisciplinarity: motivation and collaboration in research for sustainable agriculture in the UK. *Area 41*(4), 374-384. https://doi.org/10.1111/j.1475-4762.2008.00859.x

Hiemstra, R. (1982). *Self-directed adult learning: Some Implications for Practice*. In T. Husen & T. N. Postlethwaite (Eds.), International encyclopedia of education (2nd ed.), Pergamon Press.

Hiemstra, R. (2009, April 20). *How the internet is changing self-directed* learning [Conference proceeding] Annual Regional Conference, Albany, New York. https://roghiemstra.com/Internet-SDL.pdf

Hergenhahn, B. R. (2009). *An introduction to the history of psychology*. Cengage Learning.

Holstein, J. A & Gubrium, J. (1995). *The active interview.* Sage Publications.

Jacobs, J. A., & Frickel, S. (2009). Interdisciplinarity: A critical assessment. *Annual Review of Sociology, 35*(1), 43-65. https://doi.org/10.1146/annurev-soc-070308-115954

Jungert, T. Östergren, R., Houlfort, N., & Koestner, R. (2019). The impact of support on growth in teacher-efficacy: A cross-cultural study. *International Journal of Educational Management, 33*(4), 753-767. https://doi.org/10.1108/IJEM-08-2017-0195

Knowles, M. (1975). *Self-directed learning: A guide for learners and teachers*. The Adult Education Co.

Knowles, M., Holton, E., III, & Swanson, R. (1998). The adult learner (5th Ed.). Gulf Publishing.

Landty, A. T., Forest, J., Zigarmi, D., Houson, D., & Boucher, È, (2017). The carrot or the stick? Investigating the functional meaning of cash rewards and their

motivational power according to self-determination theory. *Compensation and Benefits Review, 49*(1), 9-25. https://doi.org/10.1177/0886368717750904

Lemmetty, S., Collin, K. (2020). Self-directed learning as a practice of workplace learning: Interpretative repertoires of self-directed learning in ICT work. *Vocations and Learning 13*, 47–70. https://doi.org/10.1007/s12186-019-09228-x

Leshner, A. I., Terry, S., Schultz, A. M., & Liverman, C. T. (2013). *The CTSA program at NIH: Opportunities for advancing clinical and translational research*. National Academies Press.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Sage Publications.

Malterud, K. (2001). Qualitative research: Standards, challenges and guidelines. *Lancet, 358*(9280), 483-488. https://doi.org/10.1016/S0140-6736(01)05627-6

Manganelli, L., & Forest, J. (2020). Using self-determination theory to understand when and how money buys happiness: A cross-sectional and intervention study. *Applied Research in Quality of Life*. https://doi.org/10.1007/s11482-020-09875-6

Mark, G., & Smith, A. P. (2012). Effects of occupational stress, job characteristics, coping, and attributional style on the mental health and job satisfaction of university employees. *Anxiety, Stress & Coping, 25*(1), 63-78. https://doi.org/10.1080/10615806.2010.548088

Mertens, D. M. (2014). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods.* Sage Publications.

Naime, M. (2020). Defining wicked problems for public policy: The case of Mexico's Disappearances. *Gestión y Análisis de Políticas Públicas, 12*(23), 64-80. https://doi.org/10.24965/gapp.i23.10648

Olafsen, A. H., Halvari, H., Forest, J., Deci, E. L. (2015). Show them the money? The role of pay, autonomy support, and justice in a self-determination theory model of intrinsic work motivation. *Scandinavian Journal of Psychology, 56*(4), 447-457. https://doi.org/10.1111/sjop.12211

Park, J. Y. (2020). The effect of self-directed learning strategies on e-learning pre-learning of nursing students: Focusing on the flow experience. *Journal of Korean Academy of Fundamentals of Nursing, 27*(1), 52-63. https://doi.org/10.7739/jkafn.2020.27.1.52

Reeve, J., Jang, H., Carrell, D., & Jeaon, S. (2004). Enhancing student' engagement by increasing teachers' autonomy support. *Motivation and Emotion, 28*(2), 147-169. https://doi.org/10.1023/B:MOEM.0000032312.95499.6f

deRond, M., & Miller, A. N. (2005). Publish or perish: Bane or boon of academic life. *Journal of Management Inquiry, 14*(4), 321-329. https://doi.org/10.1177/1056492605276850

Rosenfield, P. L. (1992) The potential of transdisciplinary research for sustaining and extending linkages between the health and social sciences. *Social Science and Medicine, 35*(11), 1343-1357. https://doi.org/10.1016/0277-9536(92)90038-r

Ryan, G. W., & Bernard, H. R. (2003). Techniques to identify themes. *Field Methods 15*(1), 85-109. https://doi.org/10.1177/1525822X02239569

Ryan, R. M., & Deci, E. L. (2000a). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Ryan, R. M., & Deci, E. L. (2000b). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227-268. https://doi.org/10.1207/S15327965PLI1104_01

Seidel, J. V. (1998). *Qualitative data analysis.* Qualis Research.

Shrimpton, B. & Astbury, B. (2011). Motivations for doing interdisciplinary research: Results from an Australian qualitative study. *International Journal of Interdisciplinary Social Sciences, 6*(1), 195-206. https://www.doi.org/10.18848/1833-1882/CGP/v06i01/51990

Sim, J., Saunders, B., Waterfield, J., & Kingstone, T. (2018). Can sample size in qualitative research be determined a priori? *International Journal of Social Research Methodology, 21*(5), 619-634. https://doi.org/10.1080/13645579.2018.1454643

Spalding University Library: Organizing Your Social Sciences Research Paper. (2020, May 7). Retrieved from https://library.spalding.edu/ss-research

Stichweh, R. (2001). Scientific disciplines, history of.. *International Encyclopedia of the Social and Behavioral Sciences, 20,* 13727-137231. https://doi.org/10.1016/B0-08-043076-7/03187-9

Stoa, R., Fogaça, J., & Johnsen, L. (2020). Feel the pressure: Stress and intrinsic motivation in collegiate swimmers. *Journal of Issues in Intercollegiate Athletics, 13*, 273-291. http://csri-jiia.org/wp-content/uploads/2020/08/RA_2020_13.pdf

Stokols, D., Misra, S., Moser, R. P., Hall, K. L., & Taylor, B. K. (2008). The ecology of team science: Understanding contextual influences on transdisciplinary collaboration. *American Journal of Preventive Medicine, 35*(2), S96-S115. https://doi.org/10.1016/j.amepre.2008.05.003

Sullivan, C., & Forrester, M. A. (2019). Doing qualitative research in psychology (3rd ed.). Sage Publications.

Swanson, R. (1995). Human resource development: Performance is the key. *Human Resource Development Quarterly*, *6*(2), 207-213.

Szostak, R. (2005). Interdisciplinarity and the teaching of public policy. *Journal of Policy Analysis and Management, 24*(4), 853-863. https://doi.org/10.1002/pam.20146

Tough, A.M. (1967). *Learning without a teacher: A study of tasks and assistance during adult self-teaching projects*. Learning Concepts.

Watts, J., & Robertson, N. (2011). Burnout in university teaching staff: A systematic literature review. *Educational Research, 53*(1), 33-50. https://doi.org/10.1080/00131881.2011.552235

Weinberger, L. A. (1998). Commonly held theories of human resource development. *Human Resource Development International*, *1*(1), 78-93. https://doi.org/10.1080/13678869800000009

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66*(5), 297-333. https://doi.org/10.1037/h0040934

White, S. C., & Jha, S. (2018). Towards an interdisciplinary approach to wellbeing: Life histories and self-determination theory in rural Zambia. *Social Science & Medicine*, 212, 153-160. https://doi.org/10.1016/j.socscimed.2018.07.026

Wilson, E. O. (1998). *Consilience: The unity of knowledge* (1st ed.). Random House, Inc.

Zhou, L-H., Ntoumanis, N., & Thogersen-Ntoumani, C. (2019). Effects of perceived autonomy support from social agents on motivation and engagement of Chinese primary school students: Psychological need satisfaction as mediator. *Contemporary Educational Psychology, 58*, 323-330. https://doi.org/10.1016/j.cedpsych.2019.05.001

Zhang, Y., Zhang, J., Forest, J., & Chen, C. (2018). The negative and positive effects of employees' innovative behaviors: Role of goals of employees and supervisors. *Frontiers in Psychology, 9*, 1871. https://doi.org/10.3389/fpsyg.2018.01871

Zuckerman, M., Porac, J., Lathin, D., Smith, R., & Deci, E. L. (1978). On the importance of self-determination for intrinsically motivated behaviour. *Personality and Social Psychology Bulletin, 4*(3), 443-446. https://doi.org/10.1177/014616727800400317

APPENDIX A

INTERVIEW QUESTIONS FOR UNFUNDED SMALL AND LARGE GRANT TEAMS

Interview Questions for Unfunded T3 and X Grant Teams

1. Tell us about your involvement in interdisciplinary research prior to applying for your T3 or X-Grant?
    a. How has your involvement in interdisciplinary research changed since applying for the T3 or X-Grant?
2. Let's go back to when you applied for this grant in Round 1. Tell us the story of your application - why did you decide to apply?
    a. Perceptions about the application process.
    b. Perceptions about the selection process.
3. Did anything result from the application?
    a. Continued collaboration with the team members
4. Despite not getting funded, what did you do with the idea you proposed for your T3 or X-Grant?
5. Did you apply for a T3 or X-Grant in a subsequent round?
    a. Were you funded in a subsequent round?
    b. If yes, how is it going?
    c. If no, what have you done with your idea?
6. In what ways have you involved yourself in interdisciplinary research outside of the T3 and X-Grant opportunities?
7. What should I be asking you that I have not?

IRB NUMBER: IRB2019-0021M
IRB APPROVAL DATE: 06/30/2020

APPENDIX B

CONSENT FORM

TEXAS A&M UNIVERSITY HUMAN RESEARCH PROTECTION PROGRAM
INFORMED CONSENT SCRIPT FOR INTERVIEWS

Title of Research Study: Comprehensive Evaluation of the T3 and X-Grants at Texas A&M University.

Investigator: Michael Beyerlein, Ph.D.

Funded/Supported By: This research is funded/supported by the TAMU Office of Research.

Why are you being invited to take part in a research study?

You are being asked to participate because of your experience with the T3 and/or X-Grant initiative.

What should you know about a research study?

- Someone will explain this research study to you.
- Whether or not you take part is up to you.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
- You can ask all the questions you want before you decide.

Who can I talk to?

If you have questions, concerns, or complaints, or think the research has hurt you, talk to the research team at:
Michael Beyerlein
EAHR Department, College of Education & Human Development
(979) 862- 2183
beyerlein@tamu.edu (email preferred)

This research has been reviewed and approved by the Texas A&M Institutional Review Board (IRB). You may talk to them at 1-979-458-4067, toll free at 1-855-795-8636, or by email at irb@tamu.edu if

- You cannot reach the research team.
- Your questions, concerns, or complaints are not being answered by the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.

IRB NUMBER: IRB2019-0021M
IRB APPROVAL DATE: 06/30/2020

- You want to get information or provide input about this research.

Why is this research being done?

To evaluate the effectiveness of the T3 and X-Grants Initiative on campus and to improve our understanding of interdisciplinary and transdisciplinary research and use of seed grants for supporting it.

How long will the research last?

We expect that the amount of time that you will be in this research study varies based on your involvement with the T3 and/or X-Grant programs. The entirety of the study will last three years

How many people will be studied?

All faculty at TAMU (about 4,000) that are eligible to apply for T3 and X-Grants will be invited to participate in surveys or interviews. This consent form focuses on faculty members who have been involved in that Initiative with plans to interview about 30 each year.

What happens if I say "Yes, I want to be in this research"?

You will be interviewed either virtually such as a phone call or Zoom link for approximately 30 to 60 minutes. With specific permission to do so, the interview(s) will be audio recorded.

What happens if I do not want to be in this research?

You can leave the research at any time and it will not be held against you.

What happens if I say "Yes", but I change my mind later?

You can leave the research at any time and it will not be held against you.

Is there any way being in this study could be bad for me?

Risks incurred in this study are not greater than routine daily risks academics face, related to their work. It may be possible to identify some interview respondents whose information is included in either reports or publications. However, to both protect respondents and to assure the accuracy of interview data you will have the opportunity to review your transcribed interview.

Will being in this study help me in any way?

There are no immediate benefits to the individual participant.

What happens to the information collected for the research?

Efforts will be made to limit the use and disclosure of your personal information, including research study and other records, to people who have a need to review this

information. We cannot promise complete privacy. Organizations that may inspect and copy your information include the TAMU HRPP/IRB and other representatives of this institution.

Can I be removed from the research without giving my OK?

The person in charge of the research study or the sponsor can remove you from the research study without your approval. Possible reasons for removal include your termination of employment with the College Station TAMU campus.

We will tell you about any new information that may affect your health, welfare, or choice to stay in the research.

What else do I need to know?

The interim and final results of this research will be provided to the Texas A&M Office of Research at least annually and at the conclusion of the three year study.

Optional Elements:

The following research activities are optional, meaning that you do not have to agree to them in order to participate in the research study. Please indicate your willingness to participate in these optional activities by placing your initials next to each activity.

I agree	I disagree	
_____	_____	The researcher may audio record me to aid with data analysis. The researcher will not share these recordings with anyone outside of the immediate study team.
_____	_____	The researcher may audio record me for use in scholarly presentations or publications. My identity may be shared as part of this activity, although the researcher will attempt to limit such identification. I understand the risks associated with such identification.
_____	_____	The researcher may use portions of this interview as direct quotations in scholarly presentations or publications anonymously.

If you agree, please respond to this email by writing the statement "I agree to be interviewed", and then your full name and UIN.

APPENDIX C

CODE BOOK

CODE	DEFINITION	CODE FAMILY
APPLIED ELSEWHERE: Funded	Participant mentions that the unfunded idea was proposed to another funding source and was funded.	OUTCOMES
APPLIED ELSEWHERE: Not funded	Participant mentions that the unfunded idea was proposed to another funding source, but was still not funded.	OUTCOMES
ATTITUDE: Resilience	Participant mentions that they will continue to apply/ work until their idea gets funded; mentions not giving up.	PERCEPTIONS
CATALYST: For ID Research	Participant mentions a specific event that spurred an interest in or increase in interest for ID research.	ORIGINS OF ID
Certain Disciplines More Equipped for ID Research	Participant mentions that a particular discipline is more or less inclined to do ID research than another discipline.	PERCEPTIONS
COLLABORATION: Desired disciplines	Participant mentions disciplines they would like to work with in the future.	COLLABORATION
COLLABORATION: Outside of The University	Participant mentions that they have collaborated on ID projects with people outside of The University.	COLLABORATION
COLLABORATION: With other disciplines	Participant mentions collaborating with other disciplines.	COLLABORATION
COST OF ID RESEARCH	Participant mentions the financial requirements of doing ID research.	MISCELLANEOUS
COVID AFFECTED ID	Participant mentions that the occurrence of COVID-19 has altered their ID research agenda or plans.	MISCELLANEOUS
CULTURE	Participant mentions culture (at The University or elsewhere), particularly it's conduciveness to ID work.	PERCEPTIONS
ENTHUSIASM: To conduct ID research	Participant mentions that they have strong emotions towards conducting ID research.	MOTIVATION
EXPERIENCE: Previous ID	Participant discusses their previous experience regarding ID research.	ORIGINS OF ID

ID ORIGINS: Individual level	Participant mentions how their involvement in ID began.	ORIGINS OF ID
ID ORIGINS: Systemic level	Participant mentions how general ID involvement began or is embedded in a larger system.	ORIGINS OF ID
ID PARTICIPATION: Consistent	Participant mentions that their ID participation has remained the same since participating in the initiative or was not affected by participating in the initiative.	ID PARTICIPATION
ID PARTICIPATION: Decrease	Participant mentions that their ID participation has decreased since participating in the initiative.	ID PARTICIPATION
ID PARTICIPATION: Increase	Participant mentions that their ID participation has increased since participating in the initiative.	ID PARTICIPATION
ID TEAM FACTORS: General	Participant describes the attributes of team members.	ID TEAM LEVEL
ID TEAM FACTORS: Trust	Participant mentions trust in regard to their ID team.	ID TEAM LEVEL
ID TEAM FORMATION	Participant mentions the roots of how their ID team came to collaborate.	ID TEAM LEVEL
KNOWLEDGE: Acceptance of lacking	Participant mentions that they lack knowledge and have accepted it.	MISCELLANEOUS
LEARNING EXPERIENCE: From Unfunded Grant	Participant mentions that they learned from the grant that was not funded and used that information in the future.	MISCELLANEOUS
LEVERAGING RESOURCES	Participant mentions combining resources from multiple ID projects in order to support ID research.	MISCELLANEOUS
MISCELLANEOUS		MISCELLANEOUS
MOTIVATION: Curiosity	Participant mentions that they are motivated to do ID research by curiosity.	MOTIVATION
MOTIVATION: Discovery	Participant mentions that they do ID research for the purpose of discovering new knowledge/information.	MOTIVATION
MOTIVATION: Exploration	Participant mentions that ID research or the initiative is an opportunity to explore	MOTIVATION

MOTIVATION: Extrinsic	Participant mentions being motivated to do ID research for an extrinsic reason.	MOTIVATION
MOTIVATION: Intrinsic	Participant mentions being motivated by an intrinsic factor.	MOTIVATION
MOTIVATION: Pressure	Participant mentions that they conduct ID research because they are being influenced to do so by others.	MOTIVATION
MOTIVATION: Problem focused	Participant mentions that they do ID research because they need to solve a problem that their discipline is unable to solve alone.	MOTIVATION
MULTIPLE GRANTS	Participant mentions that they applied for multiple internal The University ID grants in one or multiple rounds.	ID PARTICIPATION
OUTCOME: Applied elsewhere	Participant mentions that the unfunded idea was proposed to another funding source.	OUTCOMES
OUTCOME: Reapplied	Participant mentions that they have reapplied for an internal The University grant.	OUTCOMES
OUTCOME: Will not reapply	Participant mentions they will not reapply for the internal The University grants.	OUTCOMES
OUTCOME: Will reapply	Participant mentioned that they will reapply in an upcoming round of The University ID initiative grants.	OUTCOMES
OUTCOME: Collaboration ceased after proposal	Participant mentions that they no longer collaborate with the members they submitted their original proposal with.	OUTCOMES
OUTCOME: Collaboration continued after proposal	Participant mentions that they continued to collaborate with the members they submitted their original proposal with.	OUTCOMES
PERCEPTION: Initiative	Participant mentions their views on a particular grant or the initiative as a whole.	PERCEPTIONS
PERCEPTION: Minimal effort	Participant mentions that applying for the Small Grant was not a strenuous or difficult process.	PERCEPTIONS
PERCEPTION: Of ID	Participant mentions a view regarding the conducting of ID research.	PERCEPTIONS

PERCEPTIONS: Of specific disciplines	Participant mentions a stereotype of a particular discipline or the people in it.	PERCEPTIONS
PERSPECTIVE: Offered by particular discipline	Participant mentions that each a discipline will see/approach a problem differently.	PERCEPTIONS
PRACTICAL APPLICATION	Participant mentions that their research has practical/ real world applications.	MISCELLANEOUS
PRIORITIZATION OF ID	Participant mentions that they have to share focus between their primary discipline and ID research.	ID PARTICIPATION
PROMOTION AND TENURE	Participant mentions that being involved in ID research in relation to the promotion and tenure process.	MOTIVATION
PUBLICATIONS	Participant mentions where to publish or the writing of publications.	MOTIVATION
RESEARCH AGENDA	Participant mentions how ID research fits into their research agenda.	ID PARTICIPATION
RESEARCH OVERLAP	Participant mentions how their discipline's research is similar to, or overlaps with, another discipline's research.	PERCEPTIONS
ROI	Participant mentions a return on investment from the initiative.	MISCELLANEOUS
TEAM DYNAMICS: Feedback	Participant mentions feedback and/or critique on an ID team.	ID TEAM LEVEL
TEAM DYNAMICS: General	Participant discusses the dynamics of the ID teams they have been a part of.	ID TEAM LEVEL
TEAM DYNAMICS: Leadership	Participant mentions the functioning of the ID team, specifically the team's leadership.	ID TEAM LEVEL
TEAM FORMATION: Cold calling	Participant mentions cold calling others in order to form an ID team.	ID TEAM LEVEL
TEAM FORMATION: No prior collaboration	Participant mentions that they did not know their ID teammates prior to applying for a The University grant.	ID TEAM LEVEL
TEAM FORMATION: Relationship prior to grant	Participant mentions that they knew their ID teammates prior to applying for a The University grant.	ID TEAM LEVEL

TEAM FORMATION: Seeking expertise	Participant mentions that they added a member to their project (or were added to a project) because they sought expertise/knowledge they lacked from a particular discipline.	ID TEAM LEVEL

APPENDIX D

IRB OUTCOME LETTER

DIVISION OF RESEARCH

TEXAS A&M UNIVERSITY

EXEMPTION DETERMINATION
(Common Rule –Effective January, 2018)

December 14, 2020

Type of Review:	IRB Amendment
Title:	Comprehensive Evaluation of the T3 and X-Grants at Texas A&M University.
Investigator:	Michael Beyerlein
IRB ID:	IRB2019-0021M
Reference Number:	118815
Funding:	TAMU - VPR
Documents Reviewed:	Amanda Garr Final Proposal 1.0
Review Category	Category 2: Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: i. The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects; ii. Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation; or iii. The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by .111(a)(7).

Dear Michael Beyerlein:

The HRPP determined on December 14, 2020 that this research meets the criteria for Exemption in accordance with 45 CFR 46.104.

This determination applies only to the activities described in this IRB submission and does not apply should any changes be made. Please use the reviewed, stamped study documents (available in iRIS) for applicable study procedures (e.g. recruitment, consent, data collection,

750 Agronomy Road, Suite 2701
1186 TAMU
College Station, TX 77843-1186

Tel. 979.458.1467 Fax. 979.862.3176
http://rcb.tamu.edu

etc...). If changes are needed to stamped study documents or study procedures, you must immediately contact the IRB. You may be required to submit a new request to the IRB.

Your exemption is good for three (3) years from the Approval Start Date (03/11/2019). Thirty days prior to that time, you will be sent an Administrative Check-In Notice to provide an update on the status of your study.

If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855-795-8636.

Sincerely,
IRB Administration

APPENDIX E

UNFUNDED PARTICIPANT RECRUITMENT EMAIL

SUBJECT LINE: Interview with you regarding your experience with (T3 Grant *or* X-Grant) initiative

Good morning/ afternoon, Dr. XXX (Name of applicant)

Our team had been funded by the Office of the Vice President for Research at TAMU to study the T3 and X-Grant initiative. As part of our research, we are conducting **interviews with those who applied for the initiative**, such as yourself, to capture your valuable experiences.

Since you participated in the Initiative, we would like to schedule an interview with you in the next few weeks for approximately 30-45 minutes to learn about your experience and your subsequent research.

Our team plans to conduct your interview using the method you most prefer: Google Meet/Skype/ Zoom/ phone. If you are willing to participate in an interview, please fill out this **doodle poll** to indicate what time works best for you. I look forward to hearing from you about your decision to participate (or not) in this interview opportunity. A summary of interview results is presented to the VPR each year to aid in guiding the design and implementation of the Initiative.

If you have questions about the evaluation, please contact our Principal Investigator, Dr. Michael Beyerlein, by email at beyerlein@tamu.edu or by phone at (979) 845-2716.

Sincerely,
Name and title of team member sending the email

TAMU IRB#2019-0021M
Approved on 08/11/2019

IRB NUMBER: IRB2019-0021M
IRB APPROVAL DATE: 07/07/2020