LEADERSHIP STYLES OF TECHNOLOGY DIRECTORS AND READINESS FOR TECHNOLOGY IMPLEMENTATION

by

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ABSTRACT

Leadership style research spans many areas both inside and outside of education. This study sought to add to that research by looking at the leadership of technology directors in education. This population was targeted because gaps in student abilities versus performance needs have only expanded over the course of the COVID-19 pandemic and the number of teachers available to meet those needs has decreased in many areas. To address this need, technology has been increasingly the source that administrators are turning to in an attempt to do more with less. The question that arises from this is simple: how ready are teachers to use new technologies to meet those needs? There are many factors that may impact this, but a key one this study seeks to answer is how the interactions between a technology director and teachers impacts their readiness to do that. Leadership styles were collected using the Multifactor Leadership Questionnaire (MLQ) and teacher readiness was collected using a modified version of the Stages of Concern Questionnaire (SOCQ). Basic demographic data were also created to see if setting of a school or generational age of the participants impacted the results. SOCQ measures of central tendency were compared via MLQ scores and showed no results significant enough to support a connection between these measures. Small sample size was a major issue for this analysis and likely had a significant impact on these findings.

CHAPTER 1: INTRODUCTION

Leadership style is an area of study that has had an impact on organizational performance across almost all disciplines and areas (Anderson, 2017; Bass, 2008). The effects, both positive and negative, are undeniable in the research with the most effective leadership techniques by far belonging to a set of practices that are what are considered to be transformational for an organization (Bass, 2008). These techniques revolve around building relationships and consensus with individuals and groups while providing direction and voice to allow growth and improvement (Bass, 2008). Although these techniques are efficacious across almost all areas, the level to which this is the case does vary from one discipline to another (Anderson, 2017; Bass, 2008), so it is important to determine to what extent they matter in these particular contexts.

The discussion of leadership in public schools, and study thereof, often focuses on superintendents and principals, but they are not the only district and building level leadership that can shape the success of initiatives, especially in technology (Bass, 2008; Gunnell, 2013). The role of the technology director, and in many ways the entire technology department, has moved from one of supporting learning infrastructure indirectly or peripherally to providing materials directly integral to the lesson, and in some cases where 21st century skills are the focus, the lesson itself. Transformational leadership may have a positive impact on readiness for technology implementation as suggested by the literature (Bass, 2008; Smith, 2011), but it may also be more strongly impacted by some substyles of transformational leadership than others. It is also possible that there will be direct and indirect effects from those that are measurable directly for teachers, and indirectly for students as teachers take their craft in a different direction as new tools and training are provided (Fusco, 2019; Lin, 2016). The leadership styles identified here via the Multifactor Leadership Style (MLQ) self-report and the substyles within each leadership style are identified and summarized in Table 1.

Table 1. Leadership styles as measured by the MLQ

Style/Category	Description
Transformational	
Idealized influence	Ability to build trust and capitalize on it
Inspirational motivation	Inspires others to want to act; setting the example; encouraging others
Individual consideration	Takes the time to develop and help others, building capacity in others
Intellectual stimulation	Ability to present a vision that encourages others to innovative when considering issues
Transactional	
Management by Exception (Active)	Monitor subordinates for mistakes and issues, provides consequences as needed
Contingent reward	Monitor performance to determine if objectives and performance is adequate to reward
Passive/Avoidant	
Management by Exception (Passive)	Manages problems as they emerge, providing consequences as they do.
Laissez Faire	Lets everyone do as they will without real monitoring or support.

The role of technology directors has changed drastically over time, so it is important to closely discuss what the term technology director means in this research and the role that diffuse leadership has played in technology leadership research. In many cases, the changes seen in the role of the technology director have been due to shifts in definition and responsibilities for these positions. For instance, a 2018 Consortium for School Networking (COSN) report described technology leaders as CIOs, CTOs, IT directors, and educational technology directors, despite often serving similar functions in each role. One element that has remained present in many instances however is the role of a technology director in helping to ready staff in a variety of ways.

This study captures that level of readiness in teachers using the Stages of Concern Questionnaire (SOCQ). The stages and general overview of them can be seen in Table 2.

Table 2. Stages of concern questionnaire expressions and grouping

Stage of concern	Rating	Description
Impact	6	Ready to implement, has ideas on how to improve process or implementation for the district, classrooms, themselves, and students
	5	Ready to work with others for the best possible outcome for all. Focus is on district as well as classroom
	4	Primarily focused on how best to affect their own students, less concern on district or others
Task	3	This is a chore that is being done, but the level of urgency and initiative is low
Self	2	Interested in how it will work, focused on how it will affect themselves
	1	Interested in learning more, not considering advantages to themselves, class or school
Unconcerned	0	No real readiness or concern regarding implementation

In a larger sense, this study is seeking to provide additional frameworks to support the shift within public education that has occurred and is occurring in teaching methodology by helping to elucidate the leadership characteristics that are most relevant in technology directors. Previously, teachers were the people that were viewed as being the best source of information and learning and therefore many classrooms would have students listening to lectures from teachers about various topics, studying those notes, and moving on with a test or quiz. While this approach is necessary in most classrooms to some extent, much of education has transitioned from this to being more of a guide through the educational process using various activities that can support learning. In the earlier days of computer implementation, new technologies were often explored by teachers, but increasingly the saturation of the educational technology market has made it difficult to do this

on one's own, or the cost has been prohibitive, which is an area that many technology directors have developed the ability to assist. Technology implementation aims to give teachers another tool to utilize for any educational approach, but it takes proper training and support to make the most of those tools and to allow staff to be prepared to want to use them.

An interesting facet that this research examines as well in public school districts is the impact of leadership style on teachers when adjusted for the setting of schools and generation of teachers being studied. Public schools rely on an influx of new teachers each year and yet education is still a profession in which there is generally a need for more. This means that in a typical school district that there will be a stratification of teachers from every generation. The degree of this stratification can vary based on location, urban or rural, and the needs of students and teachers in those districts may vary as well (Hayes, 2018; Trinidad, 2020). It may be that a higher teacher turnover in urban settings leads to less of an observable impact on leadership styles as there is a lower average amount of time spent with those teachers as they leave more quickly, but it may also mean that teachers coming into a new district may appreciate feedback more and use that more readily to grow their classrooms in terms of technology. The generational stratification will be important because the impact of various leadership styles varies by generation, and the stated preference from members of generations for given styles (Anderson, 2017; McGaha, 2018). This will be of particular import given that technology directors must provide leadership to all populations in their district over time as educational technology changes.

Problem Statement

The impacts of building level leadership and individual teacher leadership have been the focus of many studies in terms of technology implementation and readiness for technology implementation (Balan, 2018; Bannon, 2012; Bray & Tangney, 2017; George & Hazell, 2018; Hunter, 2015; Karlin et al., 2018). When new technology is being considered for adoption and implementation, there is a great deal of focus on input from teachers and administrators, and technology directors are often only considered from the side of device and product selection, with little focus placed on how their leadership contributes to or detracts from the readiness of a district for technology implementation. As one article by Fusco (2019) puts it,

> Many studies have focused primarily on the leadership styles of district leaders or building principals and their ability to lead schools towards change, however there has not been a great deal of research focusing on the leadership styles of technology leaders. Although administrators are at the forefront of many academic changes, teachers who serve as leaders have proven to also be significant components of leadership in successful schools. (p. 3)

Technology implementation is not something that happens overnight. Technology is something that requires building relationships with staff to ensure that all teachers are in some way ready to move forward with technology implementation in their classroom (Bak, 2015; Del Campo et al., 2012; Fusco, 2019). How these relationships are built correlates directly with transformational leadership practices (Bass, 2008). Without positive relationship elements present a technology implementation will likely be haphazard as teachers are not ready to move forward with implementation, whether because they lack the training or understanding of why it needs to be done. Without seeing the need for a change, which correlates directly with individual consideration and inspirational motivation, many teachers will not be ready for a new technology to be implemented (Bass, 2008). This leads to outcomes for students that will be inconsistent and likely less than ideal; as with any initiative or approach that is done at different levels, it can be confusing and difficult for students to adapt (Hinckley, 2011; Schlechty, 2011).

This research is focused on investigating what facets of leadership styles are most strongly correlated with teacher readiness for technology implementations (Bak, 2015; Del Campo et al., 2012; Hilton, 2016). The research examines the impact of leadership styles at the district level of technology. This research synthesizes the best elements of leadership for recommendations on training and development for technology directors to implement, as well as for district and building level administrators to consider when making retention and hiring decisions for technology directors and staff.

Purpose of the Study

The purpose of this quantitative methods study is to explore the leadership characteristics that technology directors possess that correlate most strongly with a district's readiness for technology implementation. The research seeks to identify specific leadership styles and characteristics that enhance technology implementation readiness. Through this quantitative methods approach, the research hoped to achieve the following:

1. Determine a specific leadership style for technology directors, based on the transformational leadership model put forward by Bass (2008), best suited to implementing technology in public school districts by increasing readiness for said implementation.
2. Determine if a specific type of transformational leadership is more strongly correlated with readiness for technology implementation in public school districts than another.
3. Make recommendations for integration into training, hiring, and retention policies for technology directors in public schools.

Research Questions

To better understand how leadership style may impact technology implementation, the following research questions were utilized to guide this study:

1. Do public schools with technology directors exhibiting dominant transformational leadership styles have higher scores for readiness for technology implementation than those with non-transformational leadership styles?
2. Do public schools with technology directors exhibiting specific subtypes of leadership styles have higher scores for readiness for technology implementation?
3. Are there differences in the impact of leadership styles on readiness for technology implementation based on a teacher's generational classification (e.g. millennial, Gen X, Gen Z, etc.)?
4. Are there differences in impact of leadership styles on readiness for technology implementation based on the setting of a school (Urban v. Rural)?

Hypothesis

The researcher hypothesized that a significant difference would be found in the readiness for technology implementation based on leadership style. Further the researcher hypothesized that, individualized consideration would have the most prominent effect on readiness in a district because the diverse support needs of many public school districts for implementation will require additional support from the technology director. Directors that are approachable and show a genuine interest in those in need of help will have both more teachers seeking them out and a better

understanding of what will be needed for the district to have positive outcomes. Given that many of the data collected here were based on the observations and perspectives of others, this also, to some extent, examined the role of the perception of character traits of the technology director as transformational as opposed to transactional or laissez-faire. Generational classification was also collected as part of this study and the researcher hypothesizes that there would be differences seen in the readiness for implementation with Generations Y and Z having the strongest correlation with transformational leadership. Transformational impact requires interaction over time to have a positive impact on outcomes, and given the higher rate of teacher turnover in urban schools as well as the variation in needs, the researcher hypothesized that transformational leadership impacts will vary between urban and rural schools with rural schools having a higher degree of readiness for technology implementation.

Significance of the Problem

Public school districts spend a significant amount of resources, both financial and personnel, on technology implementation (Ramirez, 2014). Technology implementation has increased greatly in the last ten years, and there has been a significant push at the national and state level to increase the amount of technology implemented and taught in classrooms. School funding in many school districts remains below the level of funding received prior to the 2008 recession, which is an issue compounded by the additional expenses of technology expansion and inflation of more traditional expenses that has occurred since (Leachman & Figueroa, 2019)**.** While there are grants to help with implementation, the maintenance of technology that has been implemented and upkeep of the infrastructure that supports it is not something that grants can be relied on to provide as they can vary greatly or disappear from year to year (Kowalski, 2002). Putting this all together, this means that schools need to acquire and maintain more expensive tools than in years past with overall lower levels of funding. Therefore, it makes it more important than ever that schools are maximizing the impact of initiatives, and that means having the most effective possible leaders in place.

An important question to ask is: What leadership practices impact readiness for technology implementation? While it is uncommon, there are times when transactional leadership styles are as effective as transformational leadership styles (Anderson, 2017; Bass, 2008; Deichmann & Stam, 2015; Hinkin & Schriesheim, 2008). There are also other factors that can mitigate leadership

style's effect that may emerge as well, so studying transformational leadership in this specific domain is essential to identifying the role that those factors may serve (Bass, 2008). Leadership in schools is done in an increasingly collaborative way, which means that understanding the importance of each piece, such as in the case of the technology director, from the classroom teacher to the superintendent, is essential. Technology directors are the often-overlooked factor in this equation in the literature.

The technology environment in which education functions has changed significantly over time and will likely continue to do so rapidly. Retention decisions for older technology directors and staff, as well as hiring decisions for newer ones will require that district and building level administrators be aware of those traits that will make staff most effective. This will be a key piece of ensuring that student outcomes are maximized. Part of that maximization is being able to get one's staff ready and gauge their readiness for technology implementation and changes, which is something that will be examined here as well.

While leadership style is something that can be thought of as innate, knowing the importance of a facet of it can allow a person not only to change how they are managing their behavior, but also to seek ways to address their weaknesses. If a person is not used to seeking input from others, and therefore ranks lower on the individual consideration scores, they can explicitly design opportunities to gain feedback. This will allow both technology directors themselves and district level leadership to understand areas of focus and for professional development and support going forward, because the greater degree of fidelity in technology implementation, the greater student outcomes will be.

Definition of Terms

1. Technology director- Someone who fills the primary leadership purposes of technology in a district, regardless of actual title. May include CIO, CTO, technology director, or many other official labels. Explicitly excludes staff solely involved in technology coaching in the classroom.
2. Technology implementation- any technological change being implemented in a district. This could include anything from giving a device to every child, or adopting a policy that gives them one, to expanding a computer lab or adding new virtual technology tools.

CHAPTER 2: REVIEW OF THE LITERATURE

To examine the background of the impact of leadership on various initiatives and technology initiatives, as well as the outcomes associated with positive technology implementation, the literature review is divided into the following sections:

1. Leadership styles and subtypes
2. Transformational leadership and education
3. Technology: Implementation, evolving roles, and society
4. Technology and change
5. Stages of concern
6. Emergent vs. replacement uses of technology
7. Technology director training, ISTE, and COSN
8. Teachers and technology
9. Generations
10. Setting: Urban versus Rural

Leadership styles and subtypes

The least interactive leadership style is the passive-avoidant leadership style. The first area within this is laissez-faire leadership. Laissez-faire leadership focuses on giving supervisees as much freedom as possible (Bass, 2008; Yang, 2015). In the literature, this is viewed often in two very different ways. Some literature characterizes this as the leadership of non-leadership, an almost absence of direction or management that is inherently poor for subordinates if not actively destructive (Bass, 2008; Buch et al., 2015; Hinkin & Schriesheim, 2008). Others argue that it is a more empowered approach to leadership and is simply misunderstood (Yang, 2015). The prevailing opinion in the research is that this leadership style is focused on the idea that people thrive when given directives and left to accomplish them (Anderson, 2017; Bass, 2008; Hinkin & Schriesheim, 2008; Wong & Giessner, 2018; Yang, 2015). If one does not, then they are often assumed to be unsuited to the job as regulations and rules are often viewed as not being inhibitory. A key element that I. Yang (2015) argues is that there can be support in laissez-faire leadership; it simply needs to be with an emphasis on allowing maximal freedom. Bass (2008) and Anderson

(2017), however believe that true laissez-faire leadership by definition would exclude significant support.

Laissez-faire leadership approaches do have some benefits for some people that thrive on independence, but they tend to neglect providing supports that help a larger portion of people to thrive (Bass, 2008). These supports are not necessary for some people; however they are still helpful for almost all people. Even those that profess a desire for a boss that is more laissez-faire tend to perform better under a supervisor who is not (Bass, 2008). In many ways this is similar to the difference between equity and equality. Providing the same support for all provides equality, but, providing the needed and varying supports for individuals creates equity. Many people confuse the idea of empowering leadership, which is active and transformational in basis, with laissez-faire leadership, which is passive and not transformational (Wong & Giessner, 2018). What most people want when they describe what sounds like laissez-faire leadership is simply to work with fewer restrictions, more freedom, and supports provided only as needed (Wong & Giessner, 2018). This sounds like what laissez-faire leadership purports to be; however, it is in fact very active in the last piece: looking for opportunities to support subordinates in a way that provides equity for all (Bass, 2008; Wong & Giessner, 2018). The difficulty with this is that it cannot be a "one size fits all" approach to supports, which is what government and policies so often want to have. It requires finding the unique areas of struggle in each subordinate and developing a unique plan to address those shortfalls while enhancing their areas of strength, much like developing an individualized growth plan for every subordinate.

Interestingly, I. Yang (2015) argues that the issue with laissez-faire leadership, and the reason that so much literature show negative outcomes for subordinates is the definition used by much research is biased toward only looking at laissez-faire leadership at its worst form: a lack of leadership or response to one's subordinates. This can be seen in many articles and publications (Anderson, 2017; Bass, 2008; Hinkin & Schriesheim, 2008; Karlin et al., 2018; Kowalski, 1995; Wong & Giessner, 2018) In many ways, what is described by Wong & Geisser (2018) as empowering leadership is in fact what I. Yang would describe as laissez-faire leadership at its best, so part of the discrepancy may really be a lack of truly defined terms in the literature. When behavioral aspects are examined instead, there are more positive outcomes seen in much of the literature in regards to subordinate outcomes (Yang, 2015). At the heart of this issue is the answer to the question: where do laissez-faire ideas with some supports become transformational or

empowering? To illustrate this issue, any number of specific behaviors can be examined and the difference easily seen. In this case, one example would be workplace bullying. Transformational leadership has been shown to increase the resilience of subordinates undergoing stressful situations (Syaifuddin, 2016). Workplace bullying, on the other hand, which is in and of itself stressful, has been positively correlated with laissez-faire leadership as the bullying often persists without proper intervention (Glambek et al., 2018). A laissez-faire leader will allow workers to continue to deal with this stressor, while transformational leaders will deal with the issue because freedom in the workplace does not have to be associated with infringing on the freedom of others to pursue happiness. Looking at I. Yang's argument and the explanations provided for laissez-faire leadership, the truth likely lives somewhere in the middle of both literary trends. I. Yang wants to only look at the most positive definitions of laissez-faire leadership, and many of the other studies want to define it only as the most abject lack of leadership, but very rarely are either the case. Most managers are some blend of laissez-faire, transactional, and transformational leadership (Bass, 2008), so understanding the positive role that laissez-faire leadership can play for some subordinates and activities may be a much better approach to viewing laissez-faire leadership than viewing it as the epitome or antithesis of leadership styles.

The other passive avoidant leadership style is MBEP (Management by exception (passive)). This leadership style, interestingly, does not have as much support as laissez-faire styles, despite technically more involved (Bass, 2008). MBEP is focused on only dealing with problems as they emerge and often includes little monitoring or active planning for proactive approaches to current or future issues (Bass, 2008). The ideal version presented of MBEP is that of a leader that allows total freedom provided all goals are being met (Moore & Newsome, 2019; Moore et al., 2018; Taylor, 2017). Those who advocate for this style of management, such as Taylor (2017), make very similar arguments to I. Yang (2015) for laissez-faire leadership: it provides freedom to workers who are the experts in what they do. The key difference between the two in the literature is that MBEP has more limits and on freedom in meeting one's responsibilities and typically involves more specific goals and checkpoints than laissez-faire leadership. Advocates will go on to tout the superiority of the MBEP approach because it does not micromanage but does have safeguards for employers and employees by outlining specific expectations while allowing flexibility in how those are met (Taylor, 2017).

MBEP is most often cited and discussed in light of the rise in employment that in short term ventures and contracts with specific goals and ends in mind that may ebb and flow with time. This is often referred to as the gig economy. With the advent of technology, the gig economy has grown to include jobs within almost every occupation whether they involve high skill and training, such as a mental health counselor, or only basic requirements, like Uber. The reason that the gig economy features so prominently in discussion of MBEP leadership is because many of these services operate under the auspices of this type of leadership (Moore & Newsome, 2019; Taylor, 2017). For most of these, the "goal" is to meet the needs of a single client or entity and to be reimbursed for that. There is no guarantee or work going forward and there is no proscription on how the work must be done beyond a few safety guidelines (Moore & Newsome, 2019; Moore et al., 2018; Taylor, 2017). For a rideshare company for instance, the task is to transport someone from one place to another within a general timeline and distance. The exact route, amenities offered, speed of vehicle used can all vary, and as long as the passenger is happy, there is no comment from most rideshare companies. Outside of enforcing legal requirements to drive and practice, there is little communication that needs to be addressed unless there is an issue, which is a key part of the definition of MBEP leadership.

There are many criticisms in the literature regarding MBEP, but they widely fit into a two groups. The first major criticism is that it does not allow for support or collaboration to play a meaningful role in activity (Bass, 2008; Moore & Newsome, 2019). In the example of rideshare companies used previously, a driver has no input on how the job is done beyond the basics of how to go from one point to another. There is no opportunity to collaborate with other drivers on how to have more efficient outcomes while driving. There are no shared times available to coordinate with those higher in the company about how they can help make the job more efficient. There is no network for drivers having car issues, or other social safety nets, and there is no local society to help them better understand how they can increase productivity and satisfaction while minimizing support, the type of support that many employees need. This leads to an environment that is stagnant and leans toward being temporary for many people as it does not allow them to readily meet their needs in a way that is satisfying.

The other chief criticism of the MBEP is that it prevents true work and life balance, which is essential long term in preventing burnout and maintained performance (Bass, 2008; Moore & Newsome, 2019; Moore et al., 2018). MBEP leadership encourages meeting short term goals and

agreements to avoid negative consequences, but without support and efforts toward being proactive, it does not provide the most desirable long term outcomes in most cases (Bass, 2008; Moore et al., 2018). This presents many of the same issues as seen with laissez-faire leadership in that there tends to be more stress seen in employees, which means higher burnout, and often a greater prevalence of problem behaviors such as workplace bullying (Bass, 2008; Glambek et al., 2018; Moore et al., 2018).

Transactional leadership focuses on providing incentives and punishments based on performance goals being met or not. This type of leadership has been associated with some positive outcomes, especially when compared to classically defined laissez-faire leadership, and is what many subordinates profess a desire for. People, especially in education, talk frequently about the need for additional compensation and bonuses, and while those do have short term increases in outcomes, the long term and highest levels of benefit from effective leadership are not normally shown using these leadership styles, although improvement can still be present (Bass, 2008; Deichmann & Stam, 2015). It is important to note that transactional leadership does show increases in performance in most areas and can be used to setup successful and multigenerational organizations; however, the outcomes tend not to be as profound as in transformational leadership (Antonakis & House, 2014; Bass, 2008; Deichmann & Stam, 2015). The line between transactional and transformational does often get blurred in many real-world case studies and discussions, but the chief differences often come from motivation behind behaviors. Bonuses, for instance, may be a key part of the motivational characteristics of transformational leadership if they are offered with supports, encouragement, and scaffolding to make them accessible as part of helping ensure that the vision is achieved of whatever implementation is occurring (Anderson, 2017; Antonakis & House, 2014; Bass, 2008). They can also be part of a transactional leadership style when they are offered without these items or when vision is a secondary element (Anderson, 2017; Antonakis & House, 2014; Bass, 2008). In many environments it is likely that there is a combination of transactional and transformational motivations going into any project or initiative, but ultimately the expectation in most cases will be the more transformational approaches will be most successful in the long term.

Going further into transactional leadership, there are two facets. The first is MBEA (management by exception (active)). This is characterized by many of the similar ideas as MBEP in terms of focusing on whether or not goals are being met and providing maximal freedom to

meet them, but there is active monitoring to along the way to ensure that the goal is on the way to being met (Bass, 2008; Moore et al., 2018; Taylor, 2017). In the literature, there is often not a hard line between MBEP and MBEA because in many instances technology or business practices have built in automatic monitoring for optimization of businesses (Bass, 2008; Deichmann & Stam, 2015; Hinkin & Schriesheim, 2008; Moore & Newsome, 2019; Moore et al., 2018; Taylor, 2017). The key difference is the process. A leader using a MBEA approach might use a weekly submission of lesson plans as a way of monitoring who was planning in a way that would actively engage students in the classroom rather than waiting for the once a semester observation. They are still focused on the outcome, but taking active steps to make sure it is reached. This allows for some level of additional feedback to be given, therefore allowing a subordinate to self-correct. An important distinction is the role the monitoring plays. In transformational leadership, this monitoring would be coupled with some level of tiered support ideally. In transactional leadership it is more informational, given to the subordinate to allow them to correct their behaviors themselves, rather than creating a truly collaborative, supportive culture. This has more positive effects in the literature than MBEP, however it is not as impactful as contingent-reward or transformational leadership in most cases (Bass, 2008; Deichmann & Stam, 2015; Marques & Dhiman, 2017).

Contingent reward is the other transactional leadership subtype. This model provides incentives for subordinates for performance that goes beyond their primary roles. This method of leadership is very effective for shorter term projects provided the goals are reasonable to achieve (Antonakis & House, 2014; Bass, 2008; Deichmann & Stam, 2015; Hinkin & Schriesheim, 2008). These methods often include the use of bonuses for desired outcomes that go beyond what is expected in a day to day operation (Bass, 2008). This is, for many people, a stated desire in terms of leadership, especially when they feel they are confidant in their craft, however the outcomes in most settings tend to lag behind those of transformational leadership because they encourage more short term thinking and goal setting as opposed to true collaboration and longevity (Bass, 2008; Deichmann & Stam, 2015; Hinkin & Schriesheim, 2008; Marques & Dhiman, 2017).

A good framework for viewing transformational leaders is as one that, “augment[s] transactional leadership” and “unlocks” better outcomes through additional consideration (Thite, 2000). Transformational leadership focuses on the qualities that make individuals want to follow a leader, so in many ways it is similar to the idea of engagement with a leader and their mission or

vision (Anderson, 2017; Bass, 2008; Schlechty, 2011). This mean placing the focus on helping subordinates "buy-in" to the vision and make it part of their own, as opposed to convincing them to help with their superior's vision. Thite (2016) summed this up effectively in a different way by saying, "a project leader can make it a great success when it would otherwise be a moderate success and prevent it from being a complete disaster." The behaviors that leaders exhibit that are considered transformational fall into four categories (Anderson, 2017; Bass, 2008). The first is individualized consideration. People work better when they feel that their leaders have a genuine concern for them (Bass, 2008), and it helps them to deal with stress like new technology initiatives (Syaifuddin, 2016). Education is a field with many altruistic individuals. This altruism creates an interesting environment for leaders to navigate as it means that employees are looking for more than just a paycheck in many cases. They want to believe in what they are doing, that they are making a difference, and a key part of that is feeling that their leader is someone who cares about that in a way that allows them to care more effectively for others. This facet of transformational leadership should be observable throughout the process of technology implementation through continuous pursuit of feedback from all stakeholders and the use of that feedback (Anderson, 2017; Fowler, 2013; McChesney et al., 2012). This can also be seen through focused, ongoing, individualized professional development for employees as they struggle with new material and tools, as well as the structure of the progress meetings that should be held for buildings and grade levels to solicit feedback on educational matters (Anderson, 2017; Karlin et al., 2018; Martin et al., 2010).

The next category or substyle within transformational leadership is inspirational motivation, which is being able to inspire others to want to improve their daily practice (Bass, 2008). This is an area where providing a coherent and collaborative vision that teachers want to meet can be influential, along with the support to meet it (Bass, 2008; Karlin et al., 2018). In technology implementation, it is essential to help teachers and students to understand why change is happening, not just for the sake of change, but because it will be beneficial to them long term (Thite, 2000). Teachers often complain of implementation fatigue, and inspirational motivation helps to build consensus and combat (Fowler, 2013; Zabihi & Khodabakhsh, 2019). Collaborative planning helps to build this, as does working to hold oneself to standards that are as high as others if not higher (Fowler, 2013). For technology implementation specifically, this area is likely to be most influential as technology more than many other areas has often been the focus of new initiatives

from year to year. The literature in general agrees that this is highly effective in areas where critical thinking and collaboration in problem solving are necessary on a regular basis for ideal outcomes, such as in education and medicine (Fowler, 2013; Zabihi & Khodabakhsh, 2019).

Intellectual stimulation is another aspect of transformational leadership (Bass, 2008). In a similar fashion to individualized consideration, this is an area where consistently gathering and implementing feedback from teachers and other stakeholders will help with the outcomes. Having a vision that is built collaboratively allows others to more readily engage with it in a way that is almost infectious as they in turn spread it to others (Anderson, 2017; Fowler, 2013; McChesney et al., 2012). Making teachers understand why something needs to happen is the first step to getting them on board for planning (Fowler, 2013; McChesney et al., 2012). After that point, engaging them in the planning and presenting a vision for how this will be different than other initiatives or how it is unique and worthwhile is essential in any implementation, but especially in technology.

Intellectual stimulation involves bringing creativity, problem-solving, and critical thinking to issues that others may not (Bass, 2008). This is a key facet of designing professional development that will engage educators (Anderson, 2017; Bass, 2008). Teachers, as with students, have various strengths and weaknesses when learning new material, but almost universally teachers want to be engaged and treated as competent, intelligent, professionals. Professional development is as difficult to design as any part of education, and behaviors from a leader that can make professional development engaging and meaningful for all participants, young and old; amateur and veteran, go a long way toward motivating those that are under a leader to want to move forward. This is especially important for technology because of the breadth of technology options. There are many technology interventions and implementation strategies, so providing a coherent, well-thought out plan for doing so with professional development appropriate to all staff members is especially challenging, even more so than a standard professional development. It is also a key element missing in many implementations and a reason cited by both professions when surveyed by organizations such as CoSN (2018) and seen in literature as to why initiatives fail or have difficulty (Bak, 2015; Bray & Tangney, 2017; Fusco, 2019).

The last facet of transformational leadership is idealized influence, which is often described as leading by example, providing an appealing vision, and helping to move the goals of the membership of an organization forward (Bass, 2008). For technology implementation, this will be particularly important as not every person has the same vision for technology, or a vision that

includes it at all, so bringing all people together will be essential. All elements of transformational leadership will be present at some point in a new technology implementation, (and in most cases more than one element at a time), making a transformational leadership design is the most research-based approach to encouraging success in an initiative. Two key areas where initiatives fail is having diverse visions for technology and a perceived lack of true engagement by those higher up, according to both the realities survey by CoSN (2018) and literature analyzing more specific incidents (Bak, 2015; Bray & Tangney, 2017). Those that are truly transformational in their leadership will find ways to demonstrate their commitment to technology implementations and model it for other staff if they truly want a technology implementation to be as successful as possible (Anderson, 2017; Bass, 2008)

Through the majority of the literature cited, there has been one trend that has not been mentioned, and that is how leadership styles and facets are being determined. This determination in most cases uses the multifactor leadership questionnaire (MLQ). This assessment does not simply provide a single area of leadership, it presents a full picture of one's leadership style (Bass, 2008; Muenjohn, 2008). This means measuring each facet not only for presence and degree, but for balance between them as well (Bass, 2008; Muenjohn, 2008). This tool has been revised multiple times since its inception and is currently in the fifth iteration. The validity of it in a variety of testing methodologies and forms has been tested, and, in almost all cases, it has been shown to be both accurate and precise (Bass, 2008; Muenjohn, 2008). This is of particular importance because further research will build upon the use of this tool and correlations built from it, as much of the current research has done (Anderson, 2017, Bass, 2008; Muenjohn, 2008).

Transformational leadership in education and practice

In education, transformational leadership is a kind of buzz word, because it is something that every district, and the public they serve, desires. Teachers want to see a transformation of their school and district when student needs are not being met. Many good teachers will never feel that all of their students' needs are being met, which means that many teachers are always looking for a transformation, in ways both big and small. Frequently, schools are seen as not keeping up with modern times, fueling discontent among parents and students (Greene, 2012). This is a key reason that alternative education environments are being sought out by parents (Gleason & Silverberg, 2010; Greene, 2012). Transformational leaders should aim to bring sustained and manageable

change to an organization that makes it better able to manage in the educational marketplace going forward, especially in an environment increasingly featuring charter and private school options that are more readily available to students than in years past (Convertino, 2017; Gleason & Silverberg, 2010; Greene, 2012; Hill, 2006). This mindset and the increasing competition with school choice have spawned a great deal of research on transformational leaders in school settings.

Educational leaders in general agree with the need for transformational leadership practices to exist and be implemented (Alsaeedi & Male, 2013; Anderson, 2017; Bass, 2008; Yang, 2014). The difficulty that develops is often in how to implement it, which is frequently expressed by leaders when discussing transformational leadership training and initiatives (Alsaeedi & Male, 2013; Anderson, 2017). The outcomes within education, however, are profound in many ways (Anderson, 2017). Teacher satisfaction is one key area where transformational leadership impacts education (Rugg, 2005). Given the teachers shortages that are developing in education, and in some cases are present already, finding a way to increase teacher retention is essential to the continuation of the profession (George & Hazell, 2018). Going beyond teacher retention, school improvement initiatives have also been shown to be more effective when guided by transformational leaders (Anderson, 2017; Bass, 2008; Yang, 2014). In light of this, the importance of continuous improvement is paramount, regardless of the type of school system, and this type of training is essential for anyone in the educational realm. Students coming out of the current educational system are being asked to learn more and do more upon graduation than any generation in recent memory (Glatthorn et al., 2016). There is also a key emphasis on ensuring that students have the skills to apply that knowledge and use it going forward in life as well (Glatthorn et al., 2016). Compounding this issue is the feeling from many teachers that they are doing more with less already and that technology is a large investment for students, sometimes without a complete payoff for what it costs, which is also something cited in the data collected from technology directors through CoSN (2018) (Bak, 2015; Balan, 2018; Bannon, 2012; Bray & Tangney, 2017; Del Campo et al., 2012; I-Hua et al., 2008).

One interesting area that was seen in literature was the role of transformational leadership in education that is beyond secondary education, in many cases because of the efficacy seen in changing K-12 education. Nursing schools are exploring implementing curriculum regarding how to behave in a transformational fashion and, in some cases, have already implemented practices in the workplace to measure the effects on patient outcomes of implementing this curriculum (Fischer,

2017; Shaughnessy et al., 2018; Spano-Szekely et al., 2016; Vaismoradi et al., 2016). Some business schools have argued that there is a contrary nature to teaching transformational leadership as part of the curriculum because it will inherently go against modern business practices (Tourish et al., 2010). This was an interesting discussion to read and delve into because it speaks to important questions about the nature of leadership. Should leadership be focused on short- or long-term outcomes? What role does morality play in leadership, and can amorality be present in an individual that seeks to lead transformationally? The arguments for including transformational leadership in graduate curriculum centers on outcomes, which the nursing field is showing and embracing. As was stated before, the educational field shows positive outcomes as well (Anderson, 2017). Interestingly, businesses also see positive outcomes from using transformational leadership practices; however, their supposedly contrary nature to using them in all regards would seem to indicate that if a business is not focused on human service, there may be issues with it achieving the most from their employees (Mittal & Dhar, 2015; Syaifuddin, 2016; Tourish et al., 2010). In other words, not including these things in the curriculum because they are contrary may indicate a focus on short-term profits as opposed to long-term viability and sustainability for all parties, both employees and stakeholders. This should be the exact antithesis of the goal of any school.

Demographic factors have been shown to have an impact on leadership in a variety of ways (Bass, 2008). Part of individual consideration is often knowing what to look at to support one's subordinates. People, including teachers, identify with their leaders more if they feel like they have been, "in the trenches" and "know what education is really like." (Eddins, 2012; Hill, 2013; McGaha, 2018). This means that as results are analyzed it is important to analyze data for potential differences between generational groups. McGaha (2018) predicted that there may be a difference in transactional and transformational leadership efficacy in her study. The study by McGaha still supported transformational leadership as being the desired approach for the larger workforce, which holds with current trends and ideas on leadership, however the argue for a continued exploration in education and through different facets of leadership made there and by others is still persuasive and worth examining (Bass, 2008; Hill, 2013).

Technology: Implementation, evolving roles, and society

Technology plays an integral role in society. The part that it serves has done nothing but increase over the last several decades and is projected to continue to increase immensely going

forward as well. This is easily demonstrated by the ubiquity of technology discussion, from engineering to healthcare to library science (Andriole, 2018; King, 2018; Risling, 2017; Ryland, 2017). Some professions have already seen dramatic change in how daily tasks are completed and technology is used (King, 2018; Risling, 2017), but the adoption of technology has not be uniform in all fields by any means. This trend holds not only when applied to larger fields of employment such as manufacturing and education, but for smaller subsets within each category as well. Mathematics education, for instance, is an area in which there is support for the idea of technology-enhanced instruction, but the results have not been as consistently positive as hoped, which is a key argument that is made by those who do not wish to implement these tools (Bray & Tangney, 2017).

This trend is not isolated to mathematics education or any other single discipline or level of education; rather it is one that many educators will speak about anecdotally. Despite this, technology may be the only way to address some shortages that are projected in several teaching areas (George & Hazell, 2018). To illustrate this the United Kingdom can be analyzed as it has a projected forty-seven thousand teacher shortage in secondary education by 2024 which is not likely to be met using current initiatives and recruiting efforts (George & Hazell, 2018). Many solutions have been proposed and most come to the same conclusion: whatever the optimal solution to properly addressing this shortfall will likely have to involve technology (M. George & Hazell, 2018). This is an issue that is relatable to the United States with has shortages occurring in the science, technology, engineering, and math content areas in many regions that are analogous to those seen in the United Kingdom (George & Hazell, 2018; Šorgo et al., 2018).

As the gap of available teachers widens, and as the efficacy of technological tools increases, there will be a greater demand for technology implementation in many districts (George & Hazell, 2018; Šorgo et al., 2018), and given the cost of technology implementation, this is not something that many schools would want to enter into lightly. One school of 650 students was awarded a grant for technology implementation, and an article discussing the implementation efforts of this school mentions that hardware is not the only significant cost to be considered carefully (Ramirez, 2014). Staffing, in this case fifteen new staff members, and training can also be significant costs that are essential for the ongoing success of students and support of teachers (Karlin et al., 2018; Ramirez, 2014).

Technology implementation can take many forms. It can be of a specific type of program or service used in a particular classroom, such as guided practice problems in mathematics courses, or it can be more general, such as ensuring access to a personal device for all students, colloquially known as "going 1:1". Implementing a specific technology, such as the example of using a service for mathematics practice, is often lower impact overall but is also not as costly. Going 1:1, on the other hand, is a large investment not only in the hardware, but also in personnel and programing to support the devices (Ramirez, 2014), although it does have a larger impact. This study and the phrase "technology implementation" will refer to technology implementation in any of these facets. The reasons for this are twofold. Firstly, there is so much variation in any one approach to technology implementation, even if this was limited to going 1:1, that there is little benefit to limiting the scope of the study. Secondly, there may be issues obtaining large enough sample sizes if only districts implementing a specific program or 1:1 initiative are analyzed. It is also possible that certain types of implementation may have facets to them that lead to more pronounced effects to be seen between leadership style and technology implementation.

How teachers will use technology will also vary wildly regardless of approach to technology implementation that is taken. Some teachers will use it to give older resources a new life, and to some extent that can increase student engagement because of the interactive elements of technology (Hunter, 2015; Schlechty, 2011). Other teachers will use technology to do activities that could not be done otherwise, which is more effective for students' long-term achievement and attainment (Hunter, 2015; Schlechty, 2011). The ways in which technology can be implemented in the classroom are almost as limitless as a teacher's desire and creativity to employ them. Because of this there will be focus on discussing the school's technology environment holistically as opposed to a collective of individuals. This means technology implementation can refer to anything as extensive as total 1:1 implementation or something as infrequent as a visit to computer labs. The elements that make these technologies and lessons effective are similar across the board, although an area for further research may be to seek to separate these implementation levels in the literature. For example, in most current traditional educational environments an observer may find that one teacher will only use technology as a resource to give a multiple-choice quiz while in another room they may see another teacher using it to facilitate a 3-D walkthrough of the chambers of the heart as if they were inside of it. In both cases however, this observer may be able to isolate

overlapping elements that make each technology application efficacious for students in that moment.

One methodology that looks at how technology is implemented is the SAMR model (Substitution, Augmentation, Modification and Redefinition). Although the number of teachers implementing technology at higher SAMR levels, modification and redefinition, is less than that of replacement and augmentation in most schools, the percentages will skew toward higher SAMR levels more often in schools that have a more supportive and positive technology environment (Hunter, 2015). This is one of many elements that can be observed and measured to correlate with a positive environment for technology implementation. The presence of ongoing professional development that is focused and tailored to teacher needs is another of these elements and has been shown to increase student outcomes as well (Martin et al., 2010). This will be an interesting area to examine as the needs seen by administration and teachers do not always align, however they approach a great parity when transformational leadership approaches are taken. For another example, while individuals and groups within a school using 1:1 technology are associated with positive outcomes for students, there is also an element of importance that the lens of the focus of the institution itself plays as well (Lamb & Weiner, 2018). If an institution places high value on implementation with fidelity, then more teachers and students will be impacted by positive technology practices. If this positive impact is being felt, it should be something that will be noted in this research and seen in not only teacher perceptions but also student outcomes. This is at the heart of this research and is used as a principle for modifying an existing survey to determine the health and readiness of a school's technology implementation and environment for both individual adopters and the school. If teachers are scoring high on this survey regarding positive perceptions of technology and the student outcomes have been positive since implementation, it can be reasonably inferred that implementation is being done with at least a base level of fidelity. It has been well established in literature that principal leadership styles and the attitude they have toward technology has an effect on technology implementation, as does that of individual teachers, which has led to a trend of examining the efficacy of ways for leaders to enhance their technology leadership skills (Gerard et al., 2008; Hadjithoma-Garstka, 2011; I-Hua et al., 2008). What has not been examined as fully is the impact that a technology director's leadership style has on implementation outcomes, outside of impacts on self-efficacy (Fusco, 2019), which is very recent, although outcome measurement has been attempted unsuccessfully for a larger scale examination

of outcomes for technology implementation (Smith, 2011). It is also worth noting that while this research is close to what is done in this study, there were serious limitations on the applicability of the findings. In the case of Smith (2011) the sample size was so small because of response rate that there were no significant findings. In the case of Fusco (2019) the methodology allowed for a much higher completion rate; however, the use of convenience sampling raises some issues with the generalizability of the results.

Technology implementation can necessitate change in many school policies and procedures, which may need to be carefully evaluated and revised in light of large increases in availability or changes in current utilization (Karlin et al., 2018; Ramirez, 2014). These policies often create more and different discipline issues and work for administrators, without necessarily relieving many previous aspects. This shift can result in qualified technology directors helping to deal with discipline issues in a way that would not have been common in previous decades. It can also force technology directors to shift from working primarily with teachers and smaller groups of students to working with entire student bodies, which requires a different skill set and more time. This shift in job description and responsibilities requires a different set of skills and training as the shift from hardware and software support to instructional technology leader is made in districts increasing technology resources. Some districts choose to address this by hiring additional staff or training existing staff to fulfill this role in addition to other duties (Ramirez, 2014). Other districts increase student workers and training to reduce the burden of previous roles on the technology director so that he or she can focus on the newer roles they may need to serve. Regardless of which approach is taken this requires technology directors to step into a much broader leadership role than they likely did previously, one that requires interaction and management of a much more diverse staff (Smith, 2011). Two major organizations for supporting technology implementation in K12 schools, the Consortium for School Networking (COSN) and the International Society for Technology in Education (ISTE), refer to this fairly regularly in their different publications. For instance, the standards that are provided by ISTE (2020) refer to a technology leader that is able to "advocate," "plan," and "empower" all students to do better than the current status quo. If one were to look at the original functions and definitions of technology directors as their job descriptions emerged, the tech director's role would have been limited to only one of the five standards from ISTE, number four which describes a technology leader's role as one of a system designer, because the old expectation of being a system designer has not been supplanted; rather, it has been expanded.

These ideas are supported by much COSN (2014; 2018) documentation as well, such as how to be an empowered superintendent, as superintendents should be bringing technology to their districts as well for a modern school district, and in their survey looking at the roles and responsibilities of a technology director in modern education. The 2018 COSN report in particular is interesting as it looks at multiple years, and there is a visible shift in many aspects of a technology director's life, from credentials to salary to roles and responsibilities.

Technology and change

The definition of technology in the American classroom has evolved a great deal over time and is primarily used currently to refer to computers and electronic approaches to education. However, the history of technology, especially in terms of the stages leading up to full implementation, is better viewed by looking at it as any other new instructional tool (Wilson et al., 2010). For instance, white boards were considered controversial at one point, an unnecessary expense when chalk was so much cheaper and more prevalent in many classrooms already. In any new instructional approach or adoption, there is an element of change in the organization and staff must address this change and overcome it to have a successful implementation (George et al., 2013). This is true whether one is discussing a new computer program or wooden panels with letters on it (George et al., 2013). One element that is unique to computer technologies is the level of change, and this is probably part of the reason for how long it has taken for technology to be embedded fully in classrooms. In the case of other technological tools, a single function was being replaced or enhanced. In the case of computer technology, a teacher can replace almost any function of the traditional classroom, and, ideally, they will be enhancing it to a level that would have been impossible without the technology (Hilton, 2016; Hunter, 2015). This makes the adjustments needed for these changes, and the training to make them, significantly more complex as well.

Technology trends have always had positive and negative factors that advocates on either side use to argue, even when it is something that has become ubiquitous in education today, like a chalk board or white board (Del Campo et al., 2012; Jr, 1995; Vázquez-Bernal et al., 2012). This lends credence to the idea that determining the readiness of an educational environment for change will likely have predictable factors to look for because of the history of stress being placed on the environment to make change and reforms. Teachers and education are simultaneously pushing for

change and reform while pushing to maintain the pedagogy that was used previously (Bray & Tangney, 2017; Del Campo et al., 2012; Jr, 1995; King, 2018). A key part of this often has to do with training. Many teachers want to use the approaches that they were trained on, which means that if a teacher was taught using tools that were cutting edge at the time but has been practicing as a teacher for several years, they may not be embracing technological advancements that have developed since. This is another reason why ongoing, personalized, professional development is so important, because teachers have to be taught in a way that allows them to embrace using technology that they did not have direct experience with learning for use in their own classrooms (Gerard et al., 2008; I-Hua et al., 2008; Lin, 2016; Marques & Dhiman, 2017; Vázquez-Bernal et al., 2012). This is on the surface an amusing idea to consider when the definition of technology includes items such as white boards and chalk boards as they would seemingly require little additional training, which is often cited as a barrier in technology integration. Diving further down into the idea though, there was probably a time when some teachers used them for all direct instructions at all times, much like some early computer implementors did with various facets of education. This is not the right approach for technology integration. Each new piece of technology is a part of the solution to the problem of finding ways to meet the needs of every student. There are some things that are done better with one piece of technology, like a white board for demonstrating how to solve a new math problem, but there are other things that are done better using another, like a computer for giving a quick multiple choice assessment as it can provide instantaneous feedback. This is an area of significant research that will be discussed later.

A key area of the literature is forecasting the future of computer integration technologies and education, and a significant subset of this focuses on moving districts and teachers to higher levels of technology integration, but part of what the history of technology seems to be telling us is that as new technologies emerge, they will be integrated over time based on other factors that make teachers ready for it within a district (Del Campo et al., 2012; Karlin et al., 2018; Vázquez-Bernal et al., 2012). Much of the focus of the research seems to be on knowing the trends, both in education and in other areas, so that leaders can keep up with them, as opposed to finding ways to help leaders to be part of finding and piloting the new trends (Andriole, 2018; Bray & Tangney, 2017; Damle et al., 2017; Del Campo et al., 2012; Nature, 2015). This is problematic as it means that education is chronically behind what is available and that some districts will not push for reforms and changes until they are pulled or pushed into doing so. This is part of why it is essential

that a technology leader be able to effectively communicate vision and raise the level of readiness for technology change to happen if it is to be successful. It also means having the ability to effectively communicate and support one's non-negotiable elements for a technology implementation in a way that is helping to lead schools into a larger technological frontier than teachers and administrators may have predicted. With this said, if there is no underlying readiness for change, or if environmental changes have not occurred as part of initiatives that allow for sustainability, the longer term success of a new type of technology that is being implemented is not likely (Vázquez-Bernal et al., 2012).

Stages of Concern

Determining the level of readiness for an implementation is the entire premise of the stages of concern questionnaire (SOCQ). This questionnaire can be used with any technology and has been adapted to several studies over the years. The SOCQ, in a similar fashion as the MLQ has gone through several revisions. The original scale contained seven stages, and while it produced the desired results, a five-stage model was shown to be more effective (Bailey & Palsha, 1992). Since the inception of the SOCQ, other models have been developed and used alongside it, but none have proven as reliable and accurate as the SOCQ in side-by-side testing (Cheung et al., 2001; George et al., 2013). Transformational leaders should be exhibiting qualities and leading others to a state that they are more receptive to potential technology implementation. The SOCQ is a useful tool for measuring this and determining whether the atmosphere of a building will be supportive of change and technology going forward. It is also interesting to note that there are times in history where large scale events have pushed teachers and administrators toward additional technologies that had not been previously employed (Del Campo et al., 2012), and at the time of this writing, there is a viral outbreak that has caused large scale quarantine and travel restrictions, including long-term school closures that will likely have interesting implications for technology implementation trends.

The first SOCQ stage is the unconcerned stage (George et al., 2013). In this stage a person is not open to change, or only open in a very limited way, because they have not yet seen any need for the status quo to be disrupted (A. George et al., 2013). Technology implementation is almost always a disruption of the norm, so that is why measuring someone's level of concern regarding the need for change is an effective measure of their readiness (A. George et al., 2013). Someone

who is in the unconcerned stage may be unaware of a need or they may feel that new technology is not the appropriate method for handling it (A. George et al., 2013). Someone who is unaware of a need or does not believe it exists is unlikely to be willing and able to make the accommodations needed to make any technological change in their classroom or the district (A. George et al., 2013). Going beyond a lack of awareness, the next stage of concern is being concerned with one's self. This is where technology change can begin to be considered (A. George et al., 2013). This stage is characterized by people wondering how technology, whether they are implementing or it is being implemented by others around them, will impact them and may have a desire to know more. In the educational world this would be the equivalent of a student realizing they might need to go into office hours (A. George et al., 2013). They may not see it as their problem yet, but might see that something additional or different needs to happen. The next stage is the task stage, which is when someone views a new technique as a task to be completed, rather than something to be embraced (A. George et al., 2013). There is something to be said for compliance and getting things done, but this is compliance to the letter of the law as opposed to trying to do it with fidelity (A. George et al., 2013). The last stage is the impact stage, because this is where technology implementations begin to have true, meaningful, and lasting impacts because people are on board with more than just token compliance (A. George et al., 2013).

Emergent vs. replacement uses of technology

One key level to examine when discussing technology integration is the extent to which technology is being used to the fullest. If technology is being used simply to do the same things as were done in the class before, it is not. This is not to say that tasks done with technology are inherently more effective than those done without, however using technology in this way makes it more likely to be the case. For example, using a learning management system (LMS) such as Canvas or Blackboard for test administration is a replacement of existing technology. There are advantages to the teacher and student in terms of the speed of grading and rapidity of feedback to the student, at least in terms of the overall score, but that is something that has been done on paper or using a scantron in a similar way for several decades. Examples of emergent use of technology that cannot be matched in traditional ways include using these platforms to pull unique questions for each student, allowing for tests being read aloud by the web browser, and setting up each answer of a question to provide unique corrective feedback based on the answer chosen. Adaptive

testing, in which a test adjusts difficulty for a student based on their answers to questions, would be another example of emergent technology use at the state and national level for some testing companies.

In general, there are two prevailing educational technology frameworks that are used in the literature to discuss technology integration. The first is the SAMR model. This refers to the ways in which assignments and technology can be used: substitution, augmentation, modification, and redefinition (Bak, 2015; Bray & Tangney, 2017; Hartman, 2016; Hilton, 2016; Van Thiel, 2018). The literature for this defines substitution and augmentation as being enhancements to existing technology (Bak, 2015; Bray & Tangney, 2017; Hartman, 2016; Hilton, 2016; Howlett et al., 2019; Van Thiel, 2018), and something that should be encouraged as a starting point but not an ending point. These are activities that were already done in the classroom which, while they may be more effective with technology tools, are not something that is essential to the success of the endeavor. This is in line with much of the discussion around project-based learning (PBL), which often leans heavily on technology for fulfillment, in terms of how implementing some parts of PBL will lead to increased results for students, even if implementing all parts of PBL would lead to even higher achievement (Schlechty, 2011). Modification and redefinition, on the other hand, are considered transformational applications of technology (Bak, 2015; Bray & Tangney, 2017; Hartman, 2016; Hilton, 2016; Howlett et al., 2019; Van Thiel, 2018). This means that the tasks given are substantially altered by technology, to an extent that they would not be the same if given differently, or would be impossible to do without technology (Bak, 2015; Bray & Tangney, 2017; Hartman, 2016; Hilton, 2016; Howlett et al., 2019; Van Thiel, 2018). With the testing examples above, the use of an LMS to administer a test would be considered enhancement, whereas the use of adaptive testing for switching the questions and questions order would be considered transformative. For a school to truly be successful in technology implementation, the SAMR model states that technology use should be pushed toward being transformative as much as possible (Bak, 2015; Bray & Tangney, 2017; Hartman, 2016; Hilton, 2016; Van Thiel, 2018).

The other major model is the technological pedagogical content knowledge (TPACK) model. This model focuses on the knowledge employed by teachers when designing technological tasks, and how to apply that knowledge, more than it focuses on the specific way that the technology is being used. It is worth noting that because of the differing approaches to discussing technology that the TPACK and SAMR models have, they can be used together as a common

language and vocabulary about the goals. Different parts of the literature focus on each solely as well as in conjunction because while SAMR is about how technology is being used, in many ways TPACK is about a teacher's ability to use it for transformative tasks (Bray & Tangney, 2017; Hilton, 2016; Van Thiel, 2018). The TPACK model views designing any task in school as having three parts of content required: technology knowledge, content knowledge, and pedagogical knowledge (Bak, 2015; Drennan & Moll, 2018; Hilton, 2016; Hunter, 2015). Technology knowledge is the knowledge of the tool itself, as well as how it works, that is necessary for a lesson or task to be performed (Hilton, 2016). For example, using a chemistry assignment to model a molecule requires knowledge of the program to complete the task. Content knowledge is the knowledge of the content that is necessary for the successful completion of a learning task (Hilton, 2016). For the previous example in chemistry, this would include the idea that a molecule is made of two or more atoms; therefore, to make a computer model of one, two or more atoms would need to be shown with a bond. Pedagogical knowledge is knowledge necessary to teach the task with proper support and scaffolding to a student or class (Hilton, 2016). For this lesson, that might mean knowing that pre-teaching of the content, or demonstrations of the technology before asking students to create a molecule on their own, may be necessary. Using the model, teachers are able to evaluate and plan what the goal of the lesson is, and how these different areas overlap to get to that goal. On the leadership side, this is useful knowledge for evaluating capacity and areas for professional development before beginning a technology implementation. It also allows for discussion of where the strengths and weaknesses of a building or district might be. In an ideal lesson, a teacher would be able to demonstrate all of these types of knowledge. There would also be an overlap of all of these types of knowledges for students as well that leads them to develop skills not only in the content area the task is designed for, but also in how to use technology in novel ways to approach problems and seek out information that may be necessary to them in the future. This is a good goal to have as it helps to address many of the 21st Century skills and other reforms that have focused on non-academic goals for students (Glatthorn et al., 2016)

The primary difference between these two models is the focus of how technology needs to be used to be successful. SAMR focuses on how the technology is used, whereas TPACK focuses on the knowledge used by teachers and required for a task. Because neither model is directly contradictory, much of the literature focuses on using both in combination or relation to one another (Bak, 2015; Hilton, 2016; Hunter, 2015). Both of these are important considerations when

designing lessons and leading change, because both have longer term implications on planning. In the case of SAMR, to get the most effect from technology implementation, it is important to be using technology in novel techniques that allow students to explore content in ways they have never done before, which helps with both engagement and retention (Bak, 2015; Bray & Tangney, 2017; Schlechty, 2011). In the same way, not recognizing the requirements of the hidden curriculum and the soft skills that are being expected of students will lead students to be less successful with technology and therefore less likely to engage with it (Bak, 2015; Drennan & Moll, 2018; Glatthorn et al., 2016; Hilton, 2016). In general, the ideal outcomes for each of these scales can be combined. Those uses of technology that are primarily serving the same function, in terms of content teaching, approaches to assessment, and lessons that do not require heavy technological knowledge, can be viewed as being replacement uses of technology much of the time. Assessments using an LMS would often fall into this category, as they require little technological knowledge to create and are generally very similar to the paper and pencil assessments given previously. Transformative lessons that are balanced in terms of required knowledge from the teacher and learned knowledge for the students can be viewed as the ideal outcome and often take a form that is difficult to define because it may not have been done previously. These can be viewed as emergent and transformative uses of technology as they are still not completely developed and are likely to change as they are honed and emerge into the educational zeitgeist, but they are items that unquestionably are not possible without the current education level.

Meeting special needs is an area in many schools that has been done to varying degrees of success. There are many issues that can contribute to this, from adequate preparation of teachers and administrators to approaches for difficult to meet needs at a cost the school district can afford (Gunnell, 2013; Imazeki & Reschovsky, 2003; Wilcox, 2011). Technology can provide novel means for helping to meet these programming deficits in ways that as are efficient if not more so than traditional approaches (Hartman, 2016). It can also serve a supplemental function to traditional approaches to enhance their efficacy. This issue is further complicated by the increasing lack of qualified special education personnel needed to design and meet the accommodations in a student's individualized education plan, so technology can help fill this gap at least somewhat (Del Campo et al., 2012; George & Hazell, 2018; Smith, 2011). Testing accommodations, assignment accommodations, presentations, and testing itself, as well as almost any other facet of education can be better adapted to meet the requirements of students with special needs. This is a key area

that when combined with staffing will have to change going forward as it lets both classroom and special education teachers more easily and effectively ensure that all provisions of a student's individualized educational plan are being met not just to the letter but to the spirt as well.

Observing unique ways in which technology can be implemented in the classroom leads other teachers to want to do the same and creates a sort of feedback loop of innovation. Pushing teachers toward the higher ends of SAMR and TPACK integrations is an important facet of helping to fuel technology transformations (Hartman, 2016; Hilton, 2016; Hunter, 2015). One key ingredient to starting this is having a technology leader that can catalyze this sort of chain reaction in innovation. A sign of robust technological systems within a school is the level of implementation at which most teachers are operating. Essential to facilitating this is comprehensive professional development that is aligned with the needs of teachers. There are many forms that this can take, from peer-to-peer mentoring, observations, breakout professional development sessions, or check-ins with the technology director. Regardless of what methodology is used, there should be some level of professional development present in any school where technology has been implemented or is being implemented well.

Technology director training, ISTE, and COSN

The world of technology directors and their training is not one that is blind to the differing needs of schools in their technology directors, and the training for these individuals has changed over time. One organization that has pushed heavily for teachers and educational leaders to keep up with changing time in technology education is ISTE. While there is no full uniformity in technology director training any more than in most other educational training, the ISTE standards that have been developed go a long way toward codifying what should be looked for when evaluating the technological health of a school at any stage of technology implementation. They are also standards that most teachers and administrators would agree would be desirable in a technology director. The very first standard and substandard state that all students have access to "skilled teachers who actively use technology to meet the learning needs of students" (ISTE, 2020). This fits with the research regarding the importance of professional development for technology implementation endeavors (Gerard et al., 2008; ISTE, 2020; Karlin et al., 2018; Martin et al., 2010). These standards also mirror many of the ideas that are reflected in transformational leadership. For instance, one of the ISTE standards is that a technology leader is a "visionary planner" that solicits

feedback in the development and adoption of technology policy (ISTE, 2020). This is very much the same idea of being a transformational leader that has idealized influence, and one of the ways to demonstrate and gather that influence is to be cognizant of the importance of seeking stakeholder feedback (Anderson, 2017; Bass, 2008). Table 3 lists all of these standards and demonstrates the aspects of transformational leadership from which they would stem.

Table 3. ISTE Standards correlated with transformational leadership domain

ISTE Standard	Explanation	Transformational domain
Equity and citizenship advocate	Aims to increase equity and inclusion for all	Individualized consideration
Visionary Planner	Develops a vision for implementation and evaluation of technology	Intellectual stimulation Inspirational motivation
Empowering leader	Brings all stakeholders into the fold to increase learning for all	Idealized influence Inspirational motivation
Systems designer	Designs policies, procedures, and systems to increase the consistently be improving technology	Intellectual stimulation Inspirational motivation
Connected learner	Model continued professional growth for staff to continue to bring the best possible outcomes to all stakeholders	Individualized consideration Idealized influence

Because of the similarities of these standards to existing research, and the fact that according to ISTE they are based on research, it would make sense that these standards could be used as the basis for a questionnaire that could help to evaluate the current technology education environment of a district. This will be an interesting factor to measure in relation to student outcomes and teachers' overall perceptions. It was also be a key factor in designing the SOCQ as that is a measure that is general to any technology application so it needed some level of rewording on specific measures (Cheung et al., 2001).

COSN is another interesting source for information on technology directors, both in terms of current trends in the workplace as well as in looking at the evolution of the current roles. It is

not focused on training and standards in the same way that ISTE is; rather, COSN is focused on making sure that professional development is provided for those in need and analyzing the realities as they currently exist. In many ways it can be viewed as a resource that a connected learner (standard 5 from ISTE) would employ to meet this standard. This makes it an interesting source to look at during the SOCQ revision process as it allows for an encapsulation of the current concerns in the field that may inhibit technology implementation. It also raises the issue when looking at the demographics of technology directors, of whether there will be any difference based on school district size, gender of the technology director, or ethnicity of the technology director.

Teachers and technology

One key factor in technology implementation is teacher engagement in the process (Bak, 2015; Gerard et al., 2008; Karlin et al., 2018; Lamb & Weiner, 2018; Rugg, 2005; Smith, 2011; Vázquez-Bernal et al., 2012). This is a key element in the research and is a primary reason that this researcher hypothesizes that transformational leadership practices will be significantly impactful on technology outcomes. In most districts, especially those that are attempting to attract high quality teachers, there is a focus on allowing teachers freedom in not only what they teach, in terms of meeting the standards, but how they do so as well (Glatthorn et al., 2016). This means that if a technology leader wants to ensure the success of the implementation of a new technology or tool, they must find a way to engage teachers in a way that encourages them to change to use these tools. Historically, as discussed in the technology and change section, this change is slow to happen as many teachers believe firmly in how they are teaching currently, and in many cases they are not wrong that it is effective (Anderson, 2017; Del Campo et al., 2012; Glatthorn et al., 2016). In many cases, education is a matter of choosing between two good options, or combining them to make a better one, rather than choosing between a right or wrong option. This means that a strong case has to be made for why something new is better before it can be brought in, which all starts with persuading the teacher. Of interesting note, during the initial composition of this dissertation, the COVID-19 (corona) virus outbreak was occurring. This is just the type of historical impetus that may serve to shift many teachers who utilized techniques outside of technology tools previously to more toward utilizing technology with greater regularity. It will also be an interesting challenge for technology leaders and instructional coaches to face as teachers that were simply dabbling with technology are now thrown into it full force.

Part of what the literature shows is that in the school setting, change begins with finding ways to influence teachers to do something different, and, just like students that starts with engagement (Schlechty, 2011). This is done in how initiatives are developed and revised (Fowler, 2013), presented and implemented (Hinckley, 2011), and supported (Karlin et al., 2018; Marques & Dhiman, 2017; Martin et al., 2010; Rizzo, 2010). Teachers that are engaged in the planning process are more likely to become advocates of the plan that is developed as there is a sense of ownership (Fowler, 2013). This is a similar idea in much of the leadership research, as empowerment of individuals, when done with proper supports, is an important way to improve outcomes (Wong & Giessner, 2018). Engagement means not just gathering ideas, but also actively bringing teachers into the planning process and giving them a voice that has weight in decision making (Fowler, 2013; Bass, 2008). This can take many forms, but it has to involve respect for what is being said by all of those involved in the planning process, which is a key facet of transformational leadership (Bass, 2008). This is why transformational leadership is so powerful in education. It utilizes many of the "non-negotiables" that are intangible in consensus building as part of the model. In other words, the things that a transformational leader is doing are already present in many of the interactions and exchanges that are necessary to do well.

Another key part in the literature of getting teachers on board with technology is ensuring they are being supported in that endeavor through daily supports and ongoing professional development. Sometimes that support takes the form of the individualized consideration of a transformational leader (Anderson, 2017; Bass, 2008; Deichmann & Stam, 2015), but at other times it takes a highly focused monitoring approach that may on the surface seem more transactional (Hinckley, 2011). This is where the idea of transformational leadership being enhanced transactional leadership is a useful analogy, as it includes all the expectations and rewards of transactional leadership, but with the added supports of a transformational leader that truly cares about the success of not only their students and initiative but also of their teachers and subordinates as well (Thite, 2000). From a strategic planning standpoint, transformational leaders are looking for a "win-win" solution for all those involved and are invested in the success of the other part as well (McChesney et al., 2012).

Generations

One seemingly universal axiom is that experience matters. Our experiences shape who we are and create a shared generational view for many in the same age group. This is not to say that everyone in the same age group thinks or acts the same, but common experience leads to threads that are important to be considered by researchers. Over the years when looking at research regarding generational differences it is interesting to note that every generation since the veteran's returning from World War II has had to face the question: How does this generation fit with existing businesses and norms in those businesses (McGaha, 2018)? The answer to the question has differed from generation to generation and there are differences to the answers and preferences that emerge from employees in those generations (McGaha, 2018; Strauss & Howe, 1991). Table 4 is adapted from McGaha (2018) and gives the approximate birth years for those generations and the common names for them.

Table 4. Generational groupings commonly seen in literature

Generation name	Years	Also known as
Veterans	1925-1942	Lost Generation Greatest generation
Baby Boomers	1943-1960	Boomers War Babies
Generation X	1960-1980	Gen X MTV Generation
Generation Y	1980-2000	Millennials Dot-Com Generation Gen Next
Generation Z	2000-?	Gen Z iGeneration

Source: (McGaha, 2018)

When reviewing the research, the idea of not fitting in with current culture and norms or being overlooked is one that comes up in a variety of sources (Luttrell, 2017; McGaha, 2018; Parment, 2012; Watson, 2014). Although much of the literature explores this feeling in different generations, it almost appears to be a universal inevitability. No generation likes to be viewed as ubiquitous in any regard and there are key differences. When literature then tries to lump people together despite people wanting to be viewed as individuals, they immediately look for areas in which there is not similarity. But despite this, grouping is important for research and there are trends that emerge. For instance, Generation X was one of the first to be considered the generation that is, "proficient with technology,"(Watson, 2014). When one examines those tech skills compared to the older generations this is on average true. It is possible to find members that are not particularly tech savvy, but in general their average level of technology usage and understanding will be higher because they grew up using and being told about it, it was incorporated into education and was part of the importance of technology was in the cultural zeitgeist (Watson, 2014). Because these differences do emerge *en masse* it is important to look for them, especially when those differences will have a direct impact not only on feelings and perception, but the actual results. In the educational field, this could mean an administrator may take an entirely different approach to professional development for his or her staff based on their generational makeup to meet their leadership needs and get greater efficacy from initiatives.

Another key element in generational research that emerges is the importance of perception (Luttrell, 2017; McGaha, 2018; Parment, 2012; Watson, 2014). Watson (2014) brings this to light through a collection of essays by academics discussing their experiences in academia. These often include anecdotes about being judged for being young and in some cases outright dismissed because of their age (Watson, 2014). While there is likely some level of hyperbole, the general perception of these academics is that they are being dismissed and trivialized when compared to their older peers despite having similar merits. What a millennial is and the media and culture's perception of them is another example of this. Luttrell (2017) found so many items, often of conflicting information, that the time was taken to write a book to separate what had a research base and what did not. The fact this book was needed drives even more heavily toward the importance of having good research analyzing these trends and differences that may emerge from generation to generation.

When analyzing these age groups, it comes as no surprise that there are differences in many facets, including leadership styles employed most often and most efficacious leadership styles for typical members of a generation. For instance, Generation X is more likely to employ transactional leadership styles as opposed to transformational ones, and Generation Y, and likely Z, are more likely to prefer those that are transformational (McGaha, 2018). In a typical workplace then, this would mean that many of the most experienced individuals serving in leadership and managerial roles are more likely to natively employ leadership practices that are not as well received by their subordinates (McGaha, 2018). This mismatch has important implications for leaders and their development as such as a shift in the workforce occurs in their facility. Education is a field in which the attrition rate is traditionally high, necessitating always having younger generations filling gaps in the K-12 educational process. This means that compared to many other fields with lower attrition or longer training there is a higher likelihood of lost efficacy in the workplace as leaders are not providing leadership that meets the needs of all employees (McGaha, 2018).

Setting: Urban versus Rural

The idea of differences existing in the educational environment based on an urban or rural setting is one that has existed in literature for generations and seems to be global in reach (Han et al., 2015; Hayes, 2018; Imazeki & Reschovsky, 2003; Lindsjö, 2018; Lowan-Trudeau, 2017; Silva-Peña et al., 2020; Trinidad, 2020; United States. Office of, 1928; Zhang et al., 2021). The idea that that differences must exist because of educational setting are pervasive in the literature for everything from the best pedagogical approaches to topics to differences inherent in students in those settings to challenges only unique to one setting or another (Han et al., 2015; Lindsjö, 2018; Lowan-Trudeau, 2017; Trinidad, 2020). This idea intuitively makes sense and therefore is generally accepted in literature as a factor to include in analysis until proven otherwise (Han et al., 2015; Rugg, 2005). The differences abound. Urban settings often have charter schools whereas rural districts are less likely to be able to support them (Betts & Tang, 2011). This means there is more competition for students and while the impact of charter schools in terms of a average performance versus community schools, the impact of having choices definitively impacts how community schools operate in ways that rural schools simply do not have to deal with (Betts & Atkinson, 2012; Betts & Tang, 2011; Camera, 2017; Convertino, 2017).

This examination can continue into nearly any facet. Rural schools for instance often have high rates of poverty they have to deal with, but without as robust of a local government support network to help to mitigate issues (Gurley, 2016). The broader trend that emerges is that whenever possible, because of the numerous differences between urban and rural settings, researchers should examine these as a potential confounding variable. Leadership research is not exception to this and significant differences are found in the literature regarding leadership style impacts and urban v. rural settings (Eckert, 2019; Fellows, 2009; Rugg, 2005). Fellows (2009) examined the leadership practices implemented by superintendents in urban, suburban, and rural settings. He found that there were significant differences on the leadership inventory he used specifically in terms of how superintendent approach existing systems when faced with problems that have thus far been intractable (Fellows, 2009).

For good or for ill, in the literature, technology is often seen in the literature as a silver bullet for mitigating the urban versus rural divide that is present in many areas (Khan et al., 2019; Oppenheimer, 2003). Proper implementation increases student access to important materials and resources while allowing them to engage with material in new ways (Bak, 2015; Lamb & Weiner, 2018). Improper implementation is sometimes given as a reason for teacher and student burnout with technology (Zabihi & Khodabakhsh, 2019). It stands to reason given the focus on increasing rural access to technology, existing gaps in rural technology infrastructure, and the different populations present in these environments that technology will have impacts that differ from one setting to the next.

CHAPTER 3: RESEARCH METHODS

Statement of research problem

The impacts of building level leadership and individual teacher leadership have been the focus of many studies in terms of technology implementation and readiness for technology implementation (Balan, 2018; Bannon, 2012; Bray & Tangney, 2017; George & Hazell, 2018; Hunter, 2015; Karlin et al., 2018). When new technology is being considered for adoption and implementation, there is a great deal of focus on input from those peoples, and technology directors are often only considered from the side of device and product selection, with little focus placed on how their leadership contributes to or detracts from the readiness of a district for technology implementation. As one article by Fusco (2019) puts it,

> Many studies have focused primarily on the leadership styles of district leaders or building principals and their ability to lead schools towards change, however there has not been a great deal of research focusing on the leadership styles of technology leaders. Although administrators are at the forefront of many academic changes, teachers who serve as leaders have proven to also be significant components of leadership in successful schools. (p. 3)

Technology implementation is not something that happens overnight. Technology is something that requires building relationships with staff to ensure that all teachers are in some way ready to move forward with technology implementation in their classroom (Bak, 2015; Del Campo et al., 2012; Fusco, 2019). How these relationships are built correlates directly with transformational leadership practices and those relationships may be built differently depending on the generation someone is from (Bass, 2008; Deichmann & Stam, 2015). The teaching environment in which a school is located may also play a role in how these relationships are built and the impact that they have (Eckert, 2019). Without positive relationship elements present a technology implementation will likely be haphazard as teachers will not be ready to move forward with implementation, whether because they lack the training or understanding of why it needs to be done. Without seeing the need for a change, which stems from individual consideration and motivation, many teachers may only do as much as is mandated instead of truly buying in and doing as much as possible, and that may be done without fidelity (Bass, 2008; Fusco, 2019; Hadjithoma-Garstka, 2011).

This research is focused on investigating what leadership styles and substyles are most strongly correlated with teacher readiness for technology implementations that enhance the

learning of students (Bak, 2015; Del Campo et al., 2012; Hilton, 2016). The research examines the impact of leadership styles at the district level of technology and if that relationship varies according to generation and school setting. This research synthesizes the best elements of leadership for recommendations on training and development of technology directors, as well as for district and building level administrators to consider when making retention and hiring decisions for technology directors and staff.

Research Questions

To better understand how leadership style may impact technology implementation, the following research questions were utilized to guide this study:

1. Do public schools with technology directors exhibiting dominant transformational leadership styles have higher scores for readiness for technology implementation than those with non-transformational leadership styles?
2. Do public schools with technology directors exhibiting specific subtypes of leadership styles have higher scores for readiness for technology implementation?
3. Are there differences in the impact of leadership styles on readiness for technology implementation based on a teacher's generational classification (e.g. millennial, Gen X, Gen Z, etc.)?
4. Are there differences in impact of leadership styles on readiness for technology implementation based on the setting of a school (Urban v. Rural)?

Hypotheses

As a result of the questions given above, the following hypotheses were tested:

H_1= Having a dominant transformational leadership style, as measured by the MLQ, will be significantly associated with greater levels of readiness for implementation as measured by the SOCQ.

H_2= Some subtypes of transformational leadership will be more highly correlated with readiness for technology implementation as measured by the SOCQ than leadership subtypes that are not transformational.

H_3= There will be a significant positive variation in readiness for implementation, as measured by the SOCQ, based on the generation of the teacher, with younger generations showing greater effects with higher levels of transformational leadership.

H_4= There will be a significant variation in the readiness for implementation, as measured by the SOCQ, based on the setting of a school (Urban v. Rural).

Methodology

Population

Technology directors and teachers in public schools that were members of the Indiana Urban School Association (IUSA) or Indiana Small and Rural School Association (ISRSA) were invited to participate in these surveys. Combined theses associations make up roughly half of the public school districts in Indiana, with 109 schools being members of the ISRSA and 37 being part of the IUSA. The schools in these associations often have similar needs and there is value in learning how one school deals with a given need as opposed to trying something brand new that may or may not be effective. Students in schools in the IUSA for instance often have a variety of characteristics that make it difficult to participate in education fully without support, from increased student enrollment of ELL students to significant populations of high poverty students, which is a common characteristic of many urban schools (Fellows, 2009). District technology directors and teachers of kindergarten through 12th grade were able to participate in this study.

Sample

For this study, a convenience sampling procedure was used for this quantitative study. Convenience sampling is indicated when a population is easy to access and there are no criteria for selection beyond desire to participate (Johnson & Christensen, 2020). In the case of this study, the associations used for sampling, the ISRSA and IUSA, also provide grouping variables for analysis as well (rural v. urban). The population targeted from these samples were district level technology directors and teachers in their districts. The IUSA and ISRSA both allowed for easy access to volunteers as well as direct contact with district superintendents to obtain permission to conduct research in their public school district. For the purposes of this study, membership in these

organizations is assumed to be an appropriate grouping as the school is unlikely to maintain membership in an inappropriate organization and geographical classification is not always completely accurate in some public school districts anymore as school choice is increasingly blurring district classifications (Gleason & Silverberg, 2010; Shuls, 2017).

Data Collection

Prior to administering any surveys, permission to conduct this study was obtained from the Purdue University Institutional Review Board (Appendix A). Permission to survey technology directors and teachers was then solicited from IUSA and ISRSA member district superintendents (Appendix B). Superintendents were notified that the researcher desired to conduct research in their district via email and later a follow-up email was sent in an attempt to increase participation (Appendix C). Superintendents that were willing to participate were asked to reply to the email with at least the word "Yes" to signify permission and to copy their technology director on the email. The letter explained the reason for the study and potential impact in the educational realm, as well as why both technology directors and teachers needed to participate from a district to create a useable data point. When a participation request was approved then a letter soliciting the participation of the technology director was sent to them (Appendix D). In the letter to technology directors there was a link to Qualtrics, where they could review their consent to participate and complete the MLQ (Appendix E). After completion of the MLQ, the "thank you" page of the survey included the text of an email to be sent to teachers in the district which included a link to Qualtrics for the consent to participate and SOCQ (Appendix F). This was also included after the technology director's participation email so that the technology director had access to send it on to teachers in multiple venues. The initial page of both the SOCQ and the MLQ was a consent form to be signed that explained the confidentiality procedures being followed for this research, namely each district being assigned a random code upon participation and identifying information being deleted after respondents were paired. Please see Appendix G for the available items and permissions for the MLQ. Appendix H includes a copy of the questions used for the Qualtrics survey of the SOCQ.

Instrumentation and Measures

Multifactor Leadership Questionnaire (MLQ)

The MLQ self-report version was used to collect data from technology directors to determine their leadership style similar to Fusco (2019) and as supported by the administration manual (Avolio & Bass, 2004). The MLQ (Form 5X) consists of forty-five questions that are used to determine a leadership profile for someone regarding their different levels of leadership (Muenjohn, 2008). This scale has gone through several revisions and was developed by Bass & Avolio (Bass, 2008; Muenjohn, 2008). Measurements on the questionnaire divide behaviors into three different leadership styles: transformational, transactional, and passive/avoidant, with multiple subtypes within each (Bass, 2008). Each question uses a five-point scale as to how often individuals feel they exhibit a behavior and is tied to a specific style and subtype (Bass, 2008). The ranking of how often a behavior occurs is summed with each other similar question to give a scaled ranking of that behavior type (Avolio & Bass, 2004). It is possible for someone to score high on many scales or low on many scales, so the ratings are compared relative to each other to determine the dominant leadership styles (Avolio & Bass, 2004).

Stages of Concern Questionnaire

To determine the level of readiness for technology implementation within a district, the SOCQ was administered to teachers. It is worth noting that the SOCQ is a somewhat unique instrument in that it is designed to be modified by the researcher based on the exact type of implementation being studied in a school district (Bailey & Palsha, 1992; Cheung et al., 2001; George et al., 2013). This questionnaire was originally developed in the 1970s, and uses the idea that education is continuously evolving, but does so in a consistent progression, to determine where in the adoption of a new instructional technique or approach a person or school is (Bailey & Palsha, 1992; George et al., 2013). The modifications used here are geared toward making the questions toward technology implementation in general as opposed to any specific type of technology. For the SOCQ, statements are ranked as being irrelevant to very true of an individual or organization (George et al., 2013). The higher the overall score between all of these statements, the more likely a school is to be ready for a new technology implementation (George et al., 2013). For this version of the SOCQ, there are thirty-five statements for both the individual and learning environment that

were addressed by teachers within a district for which a technology director has submitted the MLQ (George et al., 2013). The aggregate raw scores were used as a basis to develop a graph of concern for both individuals and districts via their corresponding percentile rankings per the SOCQ administration manual (George et al., 2013). These were then analyzed both via the peak method and first and second highest stage score interpretation method to as points of data analysis (George et al., 2013).

Instrument Reliability and validity

The MLQ has been established as a valid and reliable survey instrument (Avolio & Bass, 2004; Bass, 2008; Muenjohn, 2008). Structurally the originators have published a wealth of information detailing reliability both structurally and internally (Avolio & Bass, 2004; Bass, 2008), but it has been verified by outside analyses and meta-analyses as well (Hemsworth et al., 2013; Muenjohn, 2008; Ridder, 2016). For instance, Muenjohn (2008) performed a confirmatory factor analysis to determine how well the data from the MLQ supports the structural validity of it and found a Cronbach alpha=.87, which exceeds the .7 required for use in statistical testing. Avolio and Bass (2004) reported Cronbach alpha scores for each category ranging from .63 to .92, with only MBEA being scored below the .7 threshold.

Avolio and Bass (2004) do a particularly thorough analysis of the MLQ (5X) and go through almost any facet that could be analyzed. They determined significance levels for each question based on who was doing the rating: self, peer, someone above at the organization, or someone below at the organization and while some items individually fail to find significance, goodness of fit scores were greater than .7 for the majority of individual items and all categories (Avolio & Bass, 2004).

One issue with the MLQ as given here was how information is obtained regarding the MLQ. The version used here is a self-report version of the MLQ, which is not quite as accurate as the full MLQ battery which includes subordinate reports (Avolio & Bass, 2004). Despite this small limitation, most people do identify their leadership style accurately using the self-rater version of the MLQ, and sufficient sample size should limit any potential issues with this as seen in other studies (Avolio & Bass, 2004; Fusco, 2019; Ridder, 2016). More generally, the MLQ has been used in a variety of settings and applications and has been shown to be a reliable measure for leadership styles through these revisions (Bass, 2008; Muenjohn, 2008). An earlier study by Smith

(2011) had issues with sample size when using the traditional MLQ questionnaire and procedure. Fusco (2019) was able to produce some significant results despite sampling concerns using a similar non-triangulated MLQ, so provided sampling is not an issue the data should be reliable for some level of generalization here as well.

The other questionnaire used, the SOCQ, is designed to be slightly modified using the suggestions in the testing manual to replace certain phrases that do not alter the structure of the question (George et al., 2013). There are two scoring methods for the SOCQ, the peak scoring method and the first and second highest scores method (George et al., 2013). The peak method analyzes the data as a whole to produce a "peak" denoting the top rating within a stage of concern and looks at those around it to infer where potential issues in readiness for an implementation may occur (George et al., 2013). The first and second highest score methods look at the two highest ratings as opposed to just the highest single rating as it is possible to have the highest ratings come from different stages of concern (George et al., 2013). When examining this instrument, the initial developers used a $p<.05$ as a threshold for significance because modification of the survey can lead to issues with precision, especially when used researchers inexperienced in using the tool (Cheung et al., 2001). Overall it has been found that all ratings within each stage of concern, except 5 and 6, for the instrument produced a Cronbach alphas=.5 or greater when finding specific stages but the tool was overall a better fit than other similar options or modifications on the current SOCQ (Bailey & Palsha, 1992; Cade, 2013; Cheung et al., 2001; George et al., 2013). While precision was noted as a potential concern in the research, it is less of an issue when using the first and second highest score method than the peak method of scoring as the first and second highest score method provides an additional point of comparison that may be almost as strong as the peak score and therefore impact an individual's readiness for technology implementation (George et al., 2013).

Methods for data analyses

MLQ was administered to technology directors and survey results were used to determine their overall leadership profile, including their subtype scores and total transformational score, non-transformational score, and the ratio of the sums of those scores. The combined total scores and ratio were compared versus SOCQ measures as were each of the leadership substyles separately, similar to the approach taken by (Fusco, 2019). This analysis and usage of the MLQ results is in line with other research and the intended usage of the MLQ by design (Muenjohn,

2008; Ridder, 2016). The SOCQ results were used to determine three measures as recommended (George et al., 2013). The first was the most common "peak" or the mode of the data. The second was the second most common "peak" which is referred to going forward as mode 2. The last was the mean value given on the SOCQ. The SOCQ data were all aggregated from the total respondents to create an average mode 1, average mode 2, and average of the mean of respondents.

The IBM statistical package for the social sciences (SPSS) software suite was used to analyze all data. First, the overall descriptive data were compared for each category. The means, medians, standard deviations, and data distribution were all examined. Of particular interest were the skewness and kurtosis data, as those are indicative of the overall normality of the distribution. The original intent of the researcher was to construct a correlational matrix the various MLQ and SCOQ measures, however due to the low overall response rate (n=6), this was not possible. This matrix was going to be used as a guide for continued analysis with one-way ANCOVA for both the overall leadership category as well as the impact of the subsections. This was done to prevent excessive analysis given the number of factors involved and ANCOVA was chosen over ANOVA specifically because there are likely to be many covariates in this particular study not being analyzed directly which ANCOVA handles better in the statistical analysis than ANOVA. Unfortunately, the number of respondents was much lower than anticipated, likely due to COVID-19 stresses as that was stated by some superintendents during the permission solicitation. In lieu of this, a series of t-tests was performed to address the survey questions. These fall generally into three broad categories. The first relate the full MLQ measures to the SOCQ measures. The second compares the urban and rural settings and the impact leadership styles have on the SOCQ measures in those settings. Lastly, generational classifications were examined for both technology directors and the most common generational classification among teacher respondents.

Limitations

The sample for this study is taken solely from Indiana, so there may be issues generalizing the results outside of the Midwest. Many factors affecting education, such as funding and licensing requirements, vary a great deal from state to state and region to region as well, so it is entirely possible that any findings from this study, regardless of response rate and sample size, may not be fully generalizable to areas with more or less stringent licensing requirements and this is especially true of technology directors (COSN, 2018). Another limitation is that these survey are not capable

of measuring the emotions of the respondents and that could be especially true given the continuing COVID-19 pandemic (Macur, 2013). With that said, they should be a good starting point for additional research or expansion of the research. This study is taking a single point in time to gather data instead of taking a longitudinal approach, so it is entirely possible that factors regarding the timing of giving the survey may limit the results as well (Macur, 2013). There are other measures for leadership style and technology integration that may provide different results than these, so an area of expansion would be to see if any correlations hold true with different types of technology implementation measures and leadership assessment tools.

CHAPTER 4: RESULTS AND FINDINGS

The purpose of this quantitative study was to determine the impact of transformational leadership styles, measured via the MLQ, on the readiness of teachers for potential new technology implementation, measured via the SOCQ. This was further analyzed through the lens of the setting of those teachers, urban or rural, and the generation of the teachers. As a proxy for teacher engagement with the survey, the district's SOCQ teacher completion percentage was also explored compared to leadership style and scores. Initial solicitation for participation in this study was done with assistance from the ISRSA and IUSA. The following research questions and hypotheses were explored.

1. Do public schools with technology directors exhibiting dominant transformational leadership styles have higher scores for readiness for technology implementation than those with non-transformational leadership styles?

   H_1= Having a dominant transformational leadership style, as measured by the MLQ, will be significantly associated with greater levels of readiness for implementation as measured by the SOCQ.
2. Do public schools with technology directors exhibiting specific subtypes of leadership styles have higher scores for readiness for technology implementation?

   H_2= Some subtypes of transformational leadership will be more highly correlated with readiness for technology implementation as measured by the SOCQ than leadership subtypes that are not transformational.
3. Are there differences in the impact of leadership styles on readiness for technology implementation based on a teacher's generational classification (e.g. millennial, Gen X, Gen Z, etc.)?

   H_3= There will be a significant positive variation in readiness for implementation, as measured by the SOCQ, based on the generation of the teacher, with younger generations showing greater effects with higher levels of transformational leadership.
4. Are there differences in impact of leadership styles on readiness for technology implementation based on the setting of a school (Urban v. Rural)?

   H_4= There will be a significant variation in the readiness for implementation, as measured by the SOCQ, based on the setting of a school (Urban v. Rural).

This chapter is split into four sections. The first section is the descriptive analysis of the data from each instrument. The next section is the correlational analysis between the overall transformational and non-transformational scores and their substyles relative to the first and second research questions. The third section addresses research questions three and four by looking at generational and setting analyses of the data. The last section is a summary of the chapter.

Before presenting this analysis, there is a note of caution from the researcher. The response rate for this study was incredibly low (8.90%), with the completion rate for the total participant pool (4.11%) being even lower. This is attributed to the effects of the COVID-19 pandemic, which was explicitly stated in two rejections from superintendents of potential research districts. In an attempt to completely and accurately address the research questions in this examination, the researcher has chosen to use more liberal guidelines for some of the analyses than would be standard, which is not out of line with data gathered in real world settings (Blanca et al., 2013). These deviations are noted throughout the analysis as needed.

Descriptive data

The invitation to participate in this study was sent to the 109 superintendents that are members of the ISRSA and 37 that are members of the IUSA by the executive directors of their corresponding associations. A follow-up email was sent by the researcher in an attempt to solicit additional participation. At the end of the collection window, 13 school district superintendents had agreed to participate, three of these with stipulations, with two additional superintendents refusing explicitly and citing the COVID-19 pandemic as creating too much additional pressure on the average teacher for them to allow further obligations to be placed on teachers in their districts. From the 13 that agreed to participate, there were six schools that had an appropriate response from technology directors and from teachers to allow for inclusion in this analysis. Due to the small sample size, demographic data not needed for analysis is omitted from this report to ensure anonymity of participants.

First, the MLQ data from technology directors were analyzed holistically starting with the descriptive data. The range of total transformational scores from the MLQ was 54 to 70 (M=62.17; SD=5.95) and non-transformational range of 11 to 28 (M=20.83; SD=6.62). For transformational leadership scores there is a theoretical range of 0 to 80 and for non-transformational scores there is a theoretical range of 0 to 64. The averages therefore represent a bias toward higher

transformational leadership scores and lower non-transformational leadership scores than would be expected of a random distribution. These data can be seen in Table 5.

Table 5. Descriptive data for the sum of transformational and non-transformational substyles

	N	Range	Min	Max	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
								Stat	Std. Error	Stat	Std. Error
Total Transformational Score	6	16.00	54.00	70.00	62.1667	5.94699	35.367	-0.039	0.845	-1.161	1.741
Total Non-transformational Score	6	17.00	11.00	28.00	20.8333	6.61564	43.767	-0.410	0.845	-1.202	1.741
Ratio Transformational vs Non-transformational	6	3.34	1.93	5.27	3.3050	1.23529	1.526	0.668	0.845	-0.380	1.741
Valid N (listwise)	6										

The ratio of transformational to non-transformational leadership scores was also examined. People are a mixture of leadership styles and do not act simply with a single leadership style at all times. Because of this, the ratio is used as numerical proxy measurement for a total leadership profile. The range of these ratios was from 1.93-5.27 (*M*=3.31; *SD*=1.24). These data can also be seen in Table 5.

To guide further correlational testing, examination of the normality of the various measures being compared, skewness and kurtosis data specifically, were also assessed and are presented in Table 5. The general skewness for each measure is all within normal limits (-1 to 1); however, the kurtosis of the individual scores indicates the results may not meet the standard assumptions of normality (Blanca et al., 2013). Since the values are only slightly lower than -1, which is the ideal lower end, but at a kurtosis of -1.161 and -1.202 for the transformational sum and non-transformational sum respectively, further exploration of these data for correlation via correlational testing was appropriate given that real world data often do not meet the strictest conditions of normality and can still be analyzed effectively for significance (Blanca et al., 2013). The ratio of the sums does not have the kurtosis issue the other data do.

Next, the descriptive data for the transformational leadership subtypes was analyzed. Idealized influence is measured both via attributes (IIA) in this version of the MLQ and by behaviors (IIB). IIA has a range of 11 to 15 (*M*=13.17; SD1.72) and IIB has a range of 9 to 14 (*M*=11.83; *SD*=2.14). IM, IS and IC have ranges of 10 to 15 (*M*=12.67; SD=2.07), 10 to 13 (*M*=11.50; SD=1.38), and 11 to 15 (*M*=13; SD=1.41), in that order. These data are depicted in Table 6.

Table 6. Descriptive data for transformational leadership substyles

	N	Range	Mini	Max	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
								Stat	Std. Error	Stat	Std. Error
Idealized Influence (Attributes)	6	4.00	11.00	15.00	13.1667	1.72240	2.967	-0.026	0.845	-2.367	1.741
Idealized Influence (Behaviors)	6	5.00	9.00	14.00	11.8333	2.13698	4.567	-0.232	0.845	-2.150	1.741
Inspirational Motivation	6	5.00	10.00	15.00	12.6667	2.06559	4.267	0.053	0.845	-1.721	1.741
Intellectual Stimulation	6	3.00	10.00	13.00	11.5000	1.37840	1.900	0.000	0.845	-2.299	1.741
Individual Consideration	6	4.00	11.00	15.00	13.0000	1.41421	2.000	0.000	0.845	-0.300	1.741
Valid N (listwise)	6										

While the skewness data for the subtypes are within normal ranges (0-.232), the platykurtic distribution continues for these subtypes. The range of the kurtosis for these is from -2.367 to -.300. Although this means that some of the subtypes have data that do not meet the traditional assumptions of normality, the analysis continued with all transformational subtypes with further consideration given as significance is approached for these data. This is supported in others analyses as platykurtic distributions are not abnormal data collected in real world settings (Blanca et al., 2013). These data can also be seen in Table 6.

The non-transformational leadership styles were examined in a similar fashion. MBEA showed the largest overall range of 2 to 11 (*M*=6.83; *SD*=3.92). Laissez faire and contingent reward had the lowest ranges, 0 to 2 (*M*=.50; *SD*=.84) and 8 to 14 (*M*=10.50; *SD*=2.43) respectively. MBEP was the only other substyle except laissez-faire to have an actual minimum of 0, with a maximum of 7 (*M*=3.00; *SD*=2.76). Table 7 depicts these results.

Table 7. Descriptive data for non-transformational leadership substyles

								Skewness		Kurtosis	
	N	Range	Min	Max	Mean	Std. Deviation	Variance	Stat	Std. Error	Stat	Std. Error
Contingent Reward	6	6.00	8.00	14.00	10.5000	2.42899	5.900	0.754	0.845	-1.456	1.741
MBEA	6	9.00	2.00	11.00	6.8333	3.92003	15.367	-0.112	0.845	-2.760	1.741
MBEP	6	7.00	0.00	7.00	3.0000	2.75681	7.600	0.430	0.845	-1.572	1.741
Laissez Faire	6	2.00	0.00	2.00	0.5000	0.83666	0.700	1.537	0.845	1.429	1.741
Valid N (listwise)	6										

Normality was examined for the non-transformational styles as well. The skewness values here did have a violation of skewness for the first time in the laissez-faire category and an overall range of -.112 to 1.537 for that measure. The kurtosis examination revealed a continuation of the platykurtic distribution here as well, with the exception of the laissez-faire subtype. Interestingly, this is the same leadership subtype that presents the first issue with skewness. Given the overall range of skewness and kurtosis and a mean value in each sample of .5 for the laissez faire subtype, which indicates a low representation in the overall leadership picture of technology directors, further analysis of this subtype was not continued.

The same descriptive analysis was done for the SOCQ data from teachers as well. There were three key measures looked at for the analysis of the SOCQ. The first is the mean of the average values reported by teachers on the SOCQ from a given district. A measure of central tendency was used to report this as the number of respondents from each district varied, with an average of 10 teachers responding per district. This is reported on all tables as the "SOCQ Average" and has a range from 3.00 to 4.70 (*M*=4.25; *SD*=.63).The next is the mean value of the mode of the SOCQ respondents in a district, which corresponds to the first "peak" suggested for analysis in the SOCQ manual (George et al., 2013), and is referenced in all tables as "SOCQ Average Mode 1." The range for mode 1 was 3.38 to 6.00 (*M*=4.91; *SD*=1.05). A second "peak" was also recorded as suggested by George et al. (2013) and is referenced in all Tables as "SOCQ Average Mode 2." Mode 2 had a range of 3.30 to 5.50 (*M*=4.61; *SD*=.74). These data are presented in Table 8.

Table 8. Descriptive data for SOCQ outcomes and measures

								Skewness		Kurtosis	
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Stat	Std. Error	Stat	Std. Error
SOCQ Average Mode 1	6	2.62	3.38	6.00	4.9067	1.05242	1.108	-0.543	0.845	-1.555	1.741
SOCQ Average Mode 2	6	2.20	3.30	5.50	4.6117	0.73576	0.541	-1.129	0.845	2.365	1.741
SOCQ Average	6	1.70	3.00	4.70	4.2500	0.63113	0.398	-2.134	0.845	4.812	1.741
Valid N (listwise)	6										

As discussed for the MLQ measures, there are potential violations of normality seen in the SOCQ data as well. Kurtosis ranges are from -1.555 to 4.812 and skewness from -2.134 to -.543. These are somewhat to be expected for the reasons stated in the discussion of the MLQ results; however, there is also the aspect of teacher self-selection for the SOCQ that may further complicate this. As further analysis is continued, these potential violations are considered by the researcher when discussing significant findings, or those approaching significance. The data for this are also seen in Table 8.

Holistic Correlational Analysis

Because of the low sample size, higher power predictive correlations for these data would be inappropriate. The original design of this study intended to use a correlational matrix and ANCOVA to analyze data for more meaningful explorations. An example of how this fails to produce meaningful results can be seen in Figure 1 below, which was the best fitting correlational regression that could be created from the data and is still only able to produce a coefficient of determination of .1255, which is considered to be a poor fit for the data.

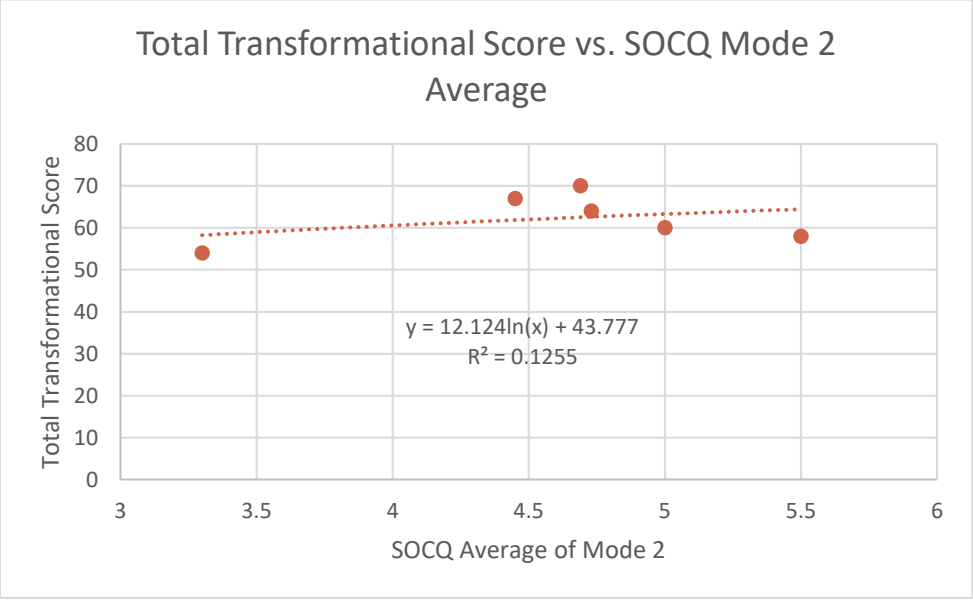

Figure 1. Sample of regression

Because of the above issues, the research chose to use a lower power correlational comparison of means via t-tests. This section presents the results of independent sample t-tests for transformational and non-transformational leadership measures and the SOCQ measures detailed in the previous section. For the grouping variables in these tests, the mean value was used to separate technology directors into two groups, those that had lower overall scores in an area from those that had a higher overall score. This was favored over the percentile measure available in the MLQ score guide, as the values in the scoring guide created groupings with all respondents being in the "high" category or "low" category, meaning no analysis could be done. Because there is no reason to expect variation could not happen in either direction, and because Levene's test for equality of variances (maintained in each t-test Table) is passed in most t-tests performed, equal variances are assumed for these analyses, and two-sided significance values are stated unless otherwise noted.

The first parameter analyzed was the overall sum of transformational leadership subtypes versus the SOCQ measures. This analysis produced no significant results, with p values ranging from .557 to .975, with equal variances not being assumed for mode 2. The full details of this can be seen in Table 9.

Table 9. T-test of the transformational leadership subtype sum versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode1	0.003	0.961	-0.641	4	0.556	-0.58667	0.91485	-3.12669	1.95335
SOCQ Average Mode2	8.207	0.046	0.035	4	0.974	0.02333	0.67155	-1.84119	1.88785
SOCQ Average	9.643	0.036	0.631	4	0.562	0.34667	0.54944	-1.17883	1.87217

The same analysis was done for the non-transformational leadership score sum as well. These values also did not yield results demonstrating any significant difference between those high in non-transformational leadership versus those low in expression of these leadership subtypes, although the values in this range (p=.270 to .687) do come closer to significance in some areas. Table 10 presents these data.

Table 10. T-test of the non-transformational leadership subtype sum versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	1.232	0.329	1.154	4	0.313	0.32667	0.28300	-0.45907	1.11240
SOCQ Average Mode 1	0.092	0.776	0.433	4	0.687	0.40667	0.93896	-2.20030	3.01364
SOCQ Average Mode 2	7.608	0.051	-0.916	4	0.411	-0.48000	0.52377	-1.93421	0.97421

The last measure of the MLQ analyzed against the SOCQ measures was the ratio between transformational scores and non-transformational scores but this analysis also did not produce results that showed significant differences in the mean values reported. Those data are presented in Table 11.

Table 11. T-test of the ratio of the transformational leadership versus non-transformational leadership subtype sum versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	1.232	0.329	-1.154	4	0.313	-0.32667	0.28300	-1.11240	0.45907
SOCQ Average Mode 1	0.092	0.776	-0.433	4	0.687	-0.40667	0.93896	-3.01364	2.20030
SOCQ Average Mode2	7.608	0.051	0.916	4	0.411	0.48000	0.52377	-0.97421	1.93421

Tables 12 through 19 show these various leadership subtypes and the t-test results performed for them. None of these showed any significant differences between those that were high in a given group versus those that were low against any of the SOCQ measures, although both IIB (p=.249 versus SOCQ Mode 1) and intellectual stimulation (p=.270 versus SOCQ Mode 2) were the closest to producing significant results. While Levene's test for equality of variances is not passed in several of these cases, given the results are not significant already, this has little bearing on the discussion of these results as the lack of equality makes the threshold for significance more difficult to achieve rather than less.

Table 12. Idealized influence (attributes) measures versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	0.913	0.394	-0.619	4	0.569	-0.19333	0.31213	-1.05993	0.67327
SOCQ Average Mode 1	0.003	0.961	-0.641	4	0.556	-0.58667	0.91485	-3.12669	1.95335
SOCQ Average Mode 2	9.643	0.036	0.631	4	0.562	0.34667	0.54944	-1.17883	1.87217

Table 13. Idealized Influence (behaviors) versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	0.309	0.608	-1.154	4	0.313	-0.32667	0.28300	-1.11240	0.45907
SOCQ Average Mode 1	1.676	0.265	-1.347	4	0.249	-1.07333	0.79685	-3.28576	1.13909
SOCQ Average Mode 2	7.364	0.053	-1.044	4	0.355	-0.53333	0.51071	-1.95128	0.88462

Table 14. Idealized motivation versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	1.232	0.329	-1.154	4	0.313	-0.32667	0.28300	-1.11240	0.45907
SOCQ Average Mode 1	0.092	0.776	-0.433	4	0.687	-0.40667	0.93896	-3.01364	2.20030
SOCQ Average Mode 2	7.608	0.051	0.916	4	0.411	0.48000	0.52377	-0.97421	1.93421

Table 15. Intellectual stimulation versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	1.232	0.329	-1.154	4	0.313	-0.32667	0.28300	-1.11240	0.45907
SOCQ Average Mode 1	0.092	0.776	-0.433	4	0.687	-0.40667	0.93896	-3.01364	2.20030
SOCQ Average Mode 2	7.608	0.051	0.916	4	0.411	0.48000	0.52377	-0.97421	1.93421

Table 16. Individual consideration versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	6.358	0.065	0.240	4	0.822	0.08250	0.34411	-0.87290	1.03790
SOCQ Average Mode 1	3.303	0.143	-0.717	4	0.513	-0.68750	0.95927	-3.35086	1.97586
SOCQ Average Mode 2	2.299	0.204	-0.440	4	0.683	-0.26250	0.59682	-1.91955	1.39455

Table 17. Contingent reward versus SOCQ measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	0.839	0.412	0.196	4	0.854	0.06750	0.34493	-0.89017	1.02517
SOCQ Average Mode 1	6.035	0.070	0.490	4	0.650	0.48500	0.98973	-2.26292	3.23292
SOCQ Average Mode 2	3.821	0.122	0.185	4	0.862	0.11250	0.60849	-1.57694	1.80194

Table 18. MBEA versus SOCQ Measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average	1.232	0.329	1.154	4	0.313	0.32667	0.28300	-0.45907	1.11240
SOCQ Average Mode 1	0.092	0.776	0.433	4	0.687	0.40667	0.93896	-2.20030	3.01364
SOCQ Average Mode 2	7.608	0.051	-0.916	4	0.411	-0.48000	0.52377	-1.93421	0.97421

Table 19. MBEP versus SOCQ Measures

	Levene's Test for Equality of Variances		t-test for Equality of Means						
					Significance	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
	F	Sig.	t	df	Two-Sided p			Lower	Upper
SOCQ Average	7.420	0.053	-0.164	4	0.878	-0.05333	0.32566	-0.95752	0.85085
SOCQ Average Mode 1	1.198	0.335	-1.515	4	0.204	-1.16000	0.76589	-3.28645	0.96645
SOCQ Average Mode 2	11.921	0.026	-0.514	4	0.635	-0.28667	0.55802	-1.83598	1.26265

Analysis of measures by demographic groups

For this section, data are grouped for analysis based on some of the demographic data collected about the school district and participants. Specifically, the setting of the school, the generation of the technology director as well as the mode of the generation of the SOCQ teacher respondents, and overall completion rate for the SOCQ are explored. Originally, whether or not the district used contracted IT services was also going to be analyzed; however, none of the districts that participated used contracted services. Given the small sample size, this may be coincidental, however it may also have helped to fuel the small sample size.

The first facet analyzed was the setting of a district. This analysis was somewhat limited as only four urban schools and two rural school chose to participate in this study. The range of transformational leadership scores for urban schools was higher, 58 to 70 (M=.64.75; SD=5.12), than the rural range of 54-60 (M=57.00; SD=4.23). The non-transformational ranges show a similar trend in the ranges with urban having a range of 11 to 27 (M=18.25; SD=6.60) and rural having a range of 24 to 28 (M=26.00; SD=2.83). These differences lead to a ratio range of 2.48 to 5.27 (M=3.85; SD=1.14) for urban schools and 1.93 to 2.5 (M=2.22; SD=.40) for rural schools. Kurtosis and skewness were omitted given the previous discussion of them. These data can be seen in Tables 20 and 21.

Table 20. Urban MLQ descriptive data

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Total Transformational Score	4	12.00	58.00	70.00	64.7500	5.12348
Total Non-transformational Score	4	16.00	11.00	27.00	18.2500	6.60177
Ratio Transformational vs Non-transformational	4	2.79	2.48	5.27	3.8500	1.14061
Valid N (listwise)	4					

Table 21. Rural MLQ descriptive data

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Total Transformational Score	2	6.00	54.00	60.00	57.0000	4.24264
Total Nontransformational Score	2	4.00	24.00	28.00	26.0000	2.82843
Ratio Transformational vs Nontransformational	2	0.57	1.93	2.50	2.2150	0.40305
Valid N (listwise)	2					

Descriptive data for the SOCQ is presented as well before comparison between the instruments. The SOCQ measures also have quite a range difference. The mode 1 scores for an urban setting are 3.38 to 6.00 (*M*=4.96; *SD*=1.18) versus 4.00 to 5.60 (*M*=4.8; *SD*=1.13) for rural. Mode 2 has ranges of 4.45 to 5.50 (*M*=4.84; *SD*=.46) and 3.3 to 5.00 (*M*=4.15; *SD*=1.20) for urban and rural respectively. Lastly, the range for the mean of the SOCQ average scores was 4.32 to 4.62 (*M*=4.45; *SD*=.15) for urban schools and 3.00 to 4.7 (*M*=3.85; *SD*=1.20) for rural ones. These data are presented in Tables 22 and 23.

Table 22. Urban SOCQ descriptive data

	N	Range	Minimum	Maximum	Mean	Std. Deviation
SOCQ Average Mode 1	4	2.62	3.38	6.00	4.9600	1.18656
SOCQ Average Mode 2	4	1.05	4.45	5.50	4.8425	0.45544
SOCQ Average	4	0.30	4.32	4.62	4.4500	0.14900
Valid N (listwise)	4					

Table 23. Rural SOCQ descriptive data

	N	Range	Minimum	Maximum	Mean	Std. Deviation
SOCQ Average Mode 1	2	1.60	4.00	5.60	4.8000	1.13137
SOCQ Average Mode 2	2	1.70	3.30	5.00	4.1500	1.20208
SOCQ Average	2	1.70	3.00	4.70	3.8500	1.20208
Valid N (listwise)	2					

A t-test was performed for urban participants between the transformational leadership sums and the SOCQ measures. Due to a low data score, Levene's test for equality of variances was not performed via SPSS; therefore, the values reported are assuming the variance are not equal as that is the higher statistical significance measure. Even were this not the case however, no significant values would have been found in this analysis (p=.378-.808). These results can be seen in Table 24.

Table 24. Urban transformational scores versus SOCQ measures

			Significance			95% Confidence Interval of the Difference	
	t	df	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	0.311	0.621	0.621	-.81000	1.33561	-8.57221	6.95221
SOCQ Average Mode 2	0.189	0.378	0.378	-.54500	0.40327	-4.07427	2.98427
SOCQ Average	0.404	0.808	0.808	.05000	0.17903	-0.79680	0.89680

The same analysis was done for urban schools for both non-transformational leadership scores and for the ratio of those scores. Neither the non-transformational scores (p=.378-.621) nor the ratio scores (p=.110-.754) were significantly different, although it is worth noting that a larger sample that allowed for an assumption of equality of variances may have yielded results that were significant as the value for equal variances was significant (p=.031). These results can be seen in Tables 25 and 26.

Table 25 . Urban non-transformational scores versus SOCQ measures

	t	df	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
SOCQ Average Mode 1	-0.606	1.538	0.621	-0.81000	1.33561	-8.57221	6.95221
SOCQ Average Mode 2	-1.351	1.192	0.378	-0.54500	0.40327	-4.07427	2.98427
SOCQ Average	0.279	1.823	0.808	0.05000	0.17903	-0.79680	0.89680

Table 26. Urban transformational versus non-transformational scores versus SOCQ measures

	t	df	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
SOCQ Average Mode 1	-0.385	1.285	0.754	-0.54000	1.40218	-11.26249	10.18249
SOCQ Average Mode 2	1.178	1.236	0.418	0.50500	0.42851	-3.00709	4.01709
SOCQ Average	5.522	1.025	0.110	0.25000	0.04528	-0.29356	0.79356

Unfortunately, as there were only two rural respondents it is not possible to perform these comparisons for rural schools. Looking at the measures in general there is no discernable trend between the scores on the instruments, with the lower total transformational score having the higher SOCQ peak 1 and average SOCQ score, but lower peak 2 score. A similar trend can be seen with the non-transformational leadership scores in terms of varying SOCQ measures, with the higher non-transformational score being the same as the lower transformational score in terms of SOCQ trends. As the ratio of leadership scores is a derived measure and the lowest transformational score is paired with the highest non-transformational score, the trend of not demonstrating significant differences continues for that measure as well.

The next set of demographic analyses examined the generational components of a technology director or teacher's generational classification with MLQ scores and compared them to the SOCQ measures. An even split of respondents are in generation X versus generation Y for technology directors, with no other generational classifications being represented. Generation x had transformational scores ranging from 58 to 67 (M=63; SD=4.58), non-transformational scores ranging from 11 to 27 (M=18.33; SD=8.08), and ratio scores ranging from 2.48 to 5.27 (M=3.84; SD=1.40). These data are depicted in Table 27.

Table 27. Generation X technology director MLQ descriptive statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Total Transformational Score	3	9.00	58.00	67.00	63.0000	4.58258
Total Non-transformational Score	3	16.00	11.00	27.00	18.3333	8.08290
Ratio Transformational vs Non-transformational	3	2.79	2.48	5.27	3.8367	1.39658
Valid N (listwise)	3					

In terms of SOCQ measures for technology directors in generation X, the average of SOCQ mode 1 range was 4.73 to 6 (*M*=5.49; *SD*=.67), SOCQ mode 2 was 4.45 to 5.50 (*M*=4.89; *SD*=.54) and the range of the mean of the average SOCQ scores was 4.32 to 4.53 (*M*=4.39; *SD*=.12). These data can be seen in Table 28.

Table 28. Generation X technology director SOCQ descriptive statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
SOCQ Average Mode 1	3	1.27	4.73	6.00	5.4867	0.66905
SOCQ Average Mode 2	3	1.05	4.45	5.50	4.8933	0.54372
SOCQ Average	3	0.21	4.32	4.53	4.3933	0.11846
Valid N (listwise)	3					

The MLQ measures for generation Y technology directors ranged from 54 to 70 (*M*=61.33; *SD*=8.08) for transformational scores, 18 to 28 (*M*=23.33; *SD*=5.03) for non-transformational scores, and 1.93-3.89 (*M*=2.77; *SD*=1.01) for the ratio of these scores. The presentation of this data can be seen in Table 29.

Table 29. Generation Y technology director MLQ descriptive statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Total Transformational Score	3	16.00	54.00	70.00	61.3333	8.08290
Total Nontransformational Score	3	10.00	18.00	28.00	23.3333	5.03322
Ratio Transformational vs Nontransformational	3	1.96	1.93	3.89	2.7733	1.00818
Valid N (listwise)	3					

The SOCQ descriptive data for generation Y technology directors shows an SOCQ average mode 1 range of 3.38-5.60 (*M*=4.33; *SD*=1.15), SOCQ average mode 2 range of 3.30 to 5.00 (*M*=4.33; *SD*=.91) and average SOCQ mean range of 3.00 to 4.70 (*M*=4.11; *SD*=.96). These data are presented in Table 30.

Table 30. Generation Y technology director SOCQ descriptive statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
SOCQ Average Mode 1	3	2.22	3.38	5.60	4.3267	1.14548
SOCQ Average Mode 2	3	1.70	3.30	5.00	4.3300	0.90537
SOCQ Average	3	1.70	3.00	4.70	4.1067	0.95924
Valid N (listwise)	3					

Since the generation of the technology director is only one part of understanding the role of leadership on the outcomes of subordinates, the descriptive data for the SOCQ measures of the school districts was also analyzed based on the mode generation of the school districts. The split for this analysis had four school districts with a teacher generation mode of generation x and two with generation y. School districts where the most common teacher respondent generation in generation x showed a range in the average mean score of 4.33 to 4.70 (*M*=5.18; *SD*=1.21) which can be contrasted with the range of 3.00 to 4.32 (*M*=3.66; *SD*=.93) for school districts with a teacher generation mode of generation y. A note of interest in the descriptive data is that despite generation y having a lower mean of the average value on the SOCQ, the range is narrower for each of the average modes, with mode 1 for generation y having a range of 4.00 to 4.73 (*M*=4.37; *SD*=.52) versus 3.38 to 6 (*M*=5.18; *SD*=1.21) and mode 2 being 4.73 to 5.00 (*M*=4.87; *SD*=.19) for generation y and 3.30 to 5.50 (*M*=4.49; *SD*= .91). The data for each mode generation of teachers can be seen in Tables 31 and 32.

Table 31. Descriptive data for school districts with a most common teacher generation of generation X

	N	Range	Minimum	Maximum	Mean	Std. Deviation
SOCQ Average Mode 1	4	2.62	3.38	6.00	5.1775	1.20986
SOCQ Average Mode 2	4	2.20	3.30	5.50	4.4850	0.90879
SOCQ Average	4	0.37	4.33	4.70	4.5450	0.15927
Valid N (listwise)	4					

Table 32. Descriptive data for school districts with a most common teacher generation of generation y

	N	Range	Minimum	Maximum	Mean	Std. Deviation
SOCQ Average Mode 1	2	0.73	4.00	4.73	4.3650	0.51619
SOCQ Average Mode 2	2	0.27	4.73	5.00	4.8650	0.19092
SOCQ Average	2	1.32	3.00	4.32	3.6600	0.93338
Valid N (listwise)	2					

To determine if these generational distinctions caused a significant difference in the means a series of independent sample t-tests were performed. These fall into three main categories: t-tests comparing outcomes based on the technology director's generational classification, t-tests comparing the mode of the teacher's generational classification, and a t-test comparing school districts where the mode of teacher's generational classifications matched that of the technology director. Due to a small sample size it was not possible to properly use SPSS to conduct Levene's test for equality of variances, therefore the assumption of equal variances is not kept and equal variances are not assumed for any significance values reported.

Because there was an equal split of technology director generational classifications between generation x and generation y it was possible for a t-test to be conducted that for each both generation x and y. There was a significant result found between the average SOCQ mean reported and those technology directors showing higher transformational leadership scores (p=.027), but significance was not shown for either peak. These data can be seen in Table 33.

Table 33. T-test for the transformational score sum versus SOCQ measures for technology directors from generation x

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	-0.889	1	0.269	0.537	-0.77000	0.86603	-11.77390	10.23390
SOCQ Average Mode 2	-3.753	1	0.083	0.166	-0.91000	0.24249	-3.99109	2.17109
SOCQ Average	-23.671	1	0.013	0.027	-0.20500	0.00866	-0.31504	-0.09496

Another t-test was performed for non-transformational sums versus the SOCQ measures. None of these measures were found to be significant and in fact had some of the most consistently not significant values in all of the t-tests conducted (p=.501-.796). These data are presented in Table 34.

Table 34. T-test for the non-transformational score sum versus SOCQ measures for technology directors from generation x

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
SOCQ Average Mode 1	0.332	1	0.398	0.796	0.36500	1.09985	-13.60995	14.33995
SOCQ Average Mode 2	-0.997	1	0.250	0.501	-0.66500	0.66684	-9.13800	7.80800
SOCQ Average	-0.522	1	0.347	0.694	-0.09500	0.18187	-2.40582	2.21582

The ratio of transformational to non-transformational sums was examined as well. No significant results were found in the t-test performed, however the values of significance spanned a large range (p=.166-.863). These data are detailed in Table 35.

Table 35. T-test for the ratio of the transformational score sum versus non-transformational score sum versus SOCQ measures for technology directors from generation x

	t-test for Equality of Means							
			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	0.889	1	0.269	0.537	0.77000	0.86603	-10.23390	11.77390
SOCQ Average Mode 2	3.753	1	0.083	0.166	0.91000	0.24249	-2.17109	3.99109
SOCQ Average	-0.219	1	0.431	0.863	-0.05500	0.25115	-3.24613	3.13613

The same t-tests were done for technology director's whose generational classification was in generation y. These t-tests did not yield significant results, with transformational score sums showing a range of values from close to significant to quite far from it (p=.110-.640) and both non-transformational score sums (p=.492-.776) and the ratio of transformational score sums to non-transformational score sum (p=.492-.776) being firmly in the range of not significant. These data are presented in Tables 36 through 38.

Table 36. T-test for the non-transformational score sum versus SOCQ measures for technology directors from generation y

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	-3.557	1	0.087	0.174	-1.91000	0.53694	-8.73242	4.91242
SOCQ Average Mode 2	5.755	1	0.055	0.110	1.54500	0.26847	-1.86621	4.95621
SOCQ Average	-0.634	1	0.320	0.640	-0.89000	1.40296	-18.71631	16.93631

Table 37. T-test for the non-transformational score sum versus SOCQ measures for technology directors from generation y

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
SOCQ Average Mode 1	1.025	1	0.246	0.492	1.42000	1.38564	-16.18623	19.02623
SOCQ Average Mode 2	-0.367	1	0.388	0.776	-0.54000	1.47224	-19.24662	18.16662
SOCQ Average	-0.523	1	0.347	0.693	-0.77000	1.47224	-19.47662	17.93662

Table 38. T-test for the ratio of the transformational score sum versus non-transformational score sum versus SOCQ measures for technology directors from generation y

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
SOCQ Average Mode 1	-1.025	1	0.246	0.492	-1.42000	1.38564	-19.02623	16.18623
SOCQ Average Mode 2	0.367	1	0.388	0.776	0.54000	1.47224	-18.16662	19.24662
SOCQ Average	0.523	1	0.347	0.693	0.77000	1.47224	-17.93662	19.47662

The next set of analyses was involving the most prevalent teacher generation for a school district based on SOCQ completion. The first of these compared schools with a most common classification of generation x. No significant relationships were found in these t-tests when

comparing transformational score sums (p=.406-.892), non-transformational score sums (p=.225-.783), or the ratio of these sums (p=.225-.783). These data can be seen in Tables 39-41. It is worth noting that due to a small sample size, some of the statistical output for these t-tests is very similar as the same school districts are being compared based on the score groupings. This can be seen previously in Tables 37 and 38 and is seen in Tables 40 and 41 in this analysis.

Table 39. T-test for the transformational score sum versus SOCQ measures for school districts with a majority of teacher respondents from generation x

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	-1.045	2	0.203	0.406	-1.24500	1.19190	-6.37333	3.88333
SOCQ Average Mode 2	0.154	2	0.446	0.892	0.17000	1.10653	-4.59100	4.93100
SOCQ Average	-0.833	2	0.246	0.493	-0.14000	0.16808	-0.86318	0.58318

Table 40. T-test for the non-transformational score sum versus SOCQ measures for school districts with a majority of teacher respondents from generation x

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	0.743	2	0.267	0.535	0.97500	1.31161	-4.66841	6.61841
SOCQ Average Mode 2	-1.735	2	0.112	0.225	-1.22000	0.70331	-4.24611	1.80611
SOCQ Average	-0.315	2	0.391	0.783	-0.06000	0.19039	-0.87920	0.75920

Table 41. T-test for the ratio of the transformational score sum versus non-transformational score sum versus SOCQ measures for school districts with a majority of teacher respondents from generation x

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	-0.743	2	0.267	0.535	-0.97500	1.31161	-6.61841	4.66841
SOCQ Average Mode2	1.735	2	0.112	0.225	1.22000	0.70331	-1.80611	4.24611
SOCQ Peak Average	0.315	2	0.391	0.783	0.06000	0.19039	-0.75920	0.87920

The same set of t-tests was not able to be performed for school districts whose respondents for the SOCQ had a generational mode of generation y, the only other reported generational mode from these SOCQ surveys, because there were only 2 respondents.

The last set of generational analyses looked at the SOCQ outcomes that occurred when the technology director's generation did not match that of a district's primary respondents. The MLQ scores for these districts ranged from 54 to 70 (*M*=62.67; *SD*=8.08), meaning the respondents in this category were both the lowest and highest transformational scores received in this study. The non-transformational scores had a range from 17 to 28 (*M*=21.00; *SD*=6.08), meaning this sampling also had the highest non-transformational score sum as well. The ratio ranged from 1.93 to 3.89 (*M*=3.19; *SD*=1.10). These data are recorded in Table 42.

Table 42. MLQ descriptive data for school districts where the technology director's generational classification differs from that of the most common generational classification of SOCQ teacher respondents

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Total Transformational Score	3	16.00	54.00	70.00	62.6667	8.08290
Total Non-transformational Score	3	11.00	17.00	28.00	21.0000	6.08276
Ratio Transformational vs Non-transformational	3	1.96	1.93	3.89	3.1933	1.09601
Valid N (listwise)	3					

The same descriptive data is presented for SOCQ data as well. The range of average SOCQ scores is 4.32 to 4.70 (*M*=4.55; *SD*=.20), 3.38 to 5.6 (*M*=4.57; *SD*=1.12) for the average of mode 1, and 3.3 to 4.73 (*M*=4.24; *SD*=.81) for mode 2. These data are presented in Table 43.

Table 43. SOCQ descriptive data for school districts where the technology director's generational classification differs from that of the most common generational classification of SOCQ teacher respondents

	N	Range	Minimum	Maximum	Mean	Std. Deviation
SOCQ Average Mode 1	3	2.22	3.38	5.60	4.5700	1.11862
SOCQ Average Mode 2	3	1.43	3.30	4.73	4.2400	0.81431
SOCQ Peak Average	3	0.38	4.32	4.70	4.5467	0.20033
Valid N (listwise)	3					

T-tests of MLQ scores (transformational, non-transformational, and the ratio thereof) were performed for these mismatched school districts versus the SOCQ measures. In terms of the significant differences, no significant differences were found in the transformational (p=.254-.795) or ratio (p=.254-.795) comparisons, however there was a significant (p=.016) difference found between non-transformational scores and the second mode. These data are reported in Tables 44 through 46.

Table 44. Comparison of transformational score sums versus SOCQ measures for school districts with different generational classifications between technology directors and the most common classification of SOCQ respondents

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	-2.369	1	0.127	0.254	-1.78500	0.75344	-11.35839	7.78839
SOCQ Average Mode 2	0.545	1	0.341	0.682	0.67500	1.23842	-15.06057	16.41057
SOCQ Average	0.334	1	0.397	0.795	0.11000	0.32909	-4.07148	4.29148

Table 45. Comparison of non-transformational score sums versus SOCQ measures for school districts with different generational classifications between technology directors and the most common classification of SOCQ respondents

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	1.321	1	0.206	0.412	1.54500	1.16913	-13.31026	16.40026
SOCQ Average Mode 2	-40.703	1	0.008	0.016	-1.41000	0.03464	-1.85016	-0.96984
SOCQ Average	0.885	1	0.269	0.539	0.23000	0.25981	-3.07117	3.53117

Table 46. Comparison of the ratio of transformational score sums to non-transformational score sums versus SOCQ measures for school districts with different generational classifications between technology directors and the most common classification of SOCQ respondents

t			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Average Mode 1	-2.369	1	0.127	0.254	-1.78500	0.75344	-11.35839	7.78839
SOCQ Average Mode 2	0.545	1	0.341	0.682	0.67500	1.23842	-15.06057	16.41057
SOCQ Average	0.334	1	0.397	0.795	0.11000	0.32909	-4.07148	4.29148

Since one thing that can drive survey completion and participation is strong feelings, for or against, something or someone, the percentage of teachers willing to complete a survey during a stressful year of the COVID-19 pandemic was used as a final metric to explore a further potential impact of transformational leadership. The completion rates were overall very low, with a range

only from .26 to 3.66% (*M*=2.20%; *SD*=1.20%), but deemed worth exploring as the lowest completion rate was roughly 14 times less than the highest. These descriptive data are presented in Table 47.

Table 47. Descriptive data for SOCQ teacher completion rates

	N	Range	Minimum	Maximum	Mean		Std. Deviation
					Statistic	Std. Error	
SOCQ Teacher Completion Percentage	6	3.40	0.26	3.66	2.1967	0.49141	1.20371
Valid N (listwise)	6						

A t-test was performed comparing those technology directors with transformational scores above the mean compared with those below versus teacher completion rate for the SOCQ. The results of that test, while not fully significant (*p*=.054), were extremely close and so therefore worth note as the values obtained for non-transformational leadership scores (*p*=.665) and for the ratio of the transformational scores to non-transformational (*p*=.665) were not near significance. These results can be seen in Tables 48 through 50.

Table 48. T-test of transformational score sum versus school district teacher completion percentages

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Teacher Completion Percentage	-2.703	4	0.027	0.054	-1.76667	0.65356	-3.58125	0.04791

Table 49. T-test of non-transformational score sum versus school district teacher completion percentages

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Teacher Completion Percentage	-0.467	4	0.332	0.665	-0.50000	1.07001	-3.47083	2.47083

Table 50. T-test of the transformational score sum to the non-transformational score sum versus school district teacher completion percentages

			Significance				95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SOCQ Teacher Completion Percentage	0.467	4	0.332	0.665	0.50000	1.07001	-2.47083	3.47083

Summary

Below are the research questions and corresponding hypotheses these data sought to address, as well as rationale for their rejection or maintenance. The broadest summary is that while various measures had low levels of significance and there was small support in some measures for the impact of transformational leadership, overall, there was not enough evidence to support retaining the alternative hypotheses for any of the research questions posed. A more detailed summary is below.

1. Do public schools with technology directors exhibiting dominant transformational leadership styles have higher scores for readiness for technology implementation than those with non-transformational leadership styles?

H_1= Having a dominant transformational leadership style, as measured by the MLQ, will be significantly associated with greater levels of readiness for implementation as measured by the SOCQ.

The transformational leadership sum produced no results that are viewed as significant. One issue that can occur in the MLQ when no raters are used to verify results is that there can be an inflation of transformational results (Bass, 2008). It is also possible that the ubiquity of transformational leadership emphasis in management, teacher, and leadership training currently has led to this number being higher for most people and therefore harder to detect the impacts of with a sample this small. The ratio of leadership style scores came closer to producing significant differences, but ultimately failed to support the hypothesis given and thus the alternative hypothesis given should be rejected and the null hypothesis maintained.

The approach of significance of the non-transformational result may indicate that the non-transformational subtypes have a larger impact than expected because the more authentic nature of reporting on those characteristics. There may also be a demotivational effect to some of the non-transformational leadership elements that relates to this as well and could lead to a statistically significant difference in the means. The ratio of transformational to non-transformational scores also does not support the alternative hypothesis and therefore, all measures support that the null hypothesis should be maintained.

2. Do public schools with technology directors exhibiting specific subtypes of leadership styles have higher scores for readiness for technology implementation?

H_2= Some subtypes of transformational leadership will be more highly correlated with readiness for technology implementation as measured by the SOCQ than leadership subtypes that are not transformational.

While the various leadership subtypes, especially those within transformational leadership, approached some level of significance, none produced an actual statistically significant result, meaning the alternative hypothesis should be rejected and the null hypothesis maintained.

3. Are there differences in the impact of leadership styles on readiness for technology implementation based on a teacher's generational classification (e.g. millennial, Gen X, Gen Z, etc.)?

   H_3= There will be a significant positive variation in readiness for implementation, as measured by the SOCQ, based on the generation of the teacher, with younger generations showing greater effects with higher levels of transformational leadership.

Similar to the commentary on research question two, there were some t-tests that showed some levels approaching significance; however, none of the actual values showed true significance in any more than one measure and the small sample size left some facets unable to be completely explored. Especially when considering the potential violations of normality assumed for this testing given earlier on. With a larger sample that could assure these assumptions could be met, or allow for tests such as Levene's to adjust for them, this would likely approach or meet significance, however that is not the case for this study. Therefore, the alternative hypothesis proposed should be rejected and the null hypothesis should be maintained.

4. Are there differences in impact of leadership styles on readiness for technology implementation based on the setting of a school (Urban v. Rural)?

   H_4= There will be a significant variation in the readiness for implementation, as measured by the SOCQ, based on the setting of a school (Urban v. Rural).

The analyses of the urban setting did not produce results that were significant, and the rural setting could not be explored due to sample size, though it is worth noting that transformational leadership approached significance when compared to the mean of the SOCQ average score. Despite this, there is insufficient evidence to support the alternative hypothesis given and the null hypothesis should be maintained.

CHAPTER 5: DISCUSSION OF FINDINGS AND RECOMMENDATIONS

Introduction

The purpose of this quantitative study was to determine the impact of leadership styles on classroom teacher's readiness for implementing new technology. This was explored via two instruments, the MLQ for leadership styles, and the SOCQ to measure teacher readiness. The study was distributed via the executive directors of the IUSA and ISRSA which serve 37 and 109 schools respectively and these two organizations together represent more than half of all public school students in the state of Indiana.

Technology implementation has increased greatly in the last ten years, and there has been a significant push at the national and state level to increase the amount of technology implemented and taught in classrooms. Funding in many school districts remains below the level of funding received prior to the 2008 recession, which is an issue compounded by the additional expenses of technology expansion and inflation of more traditional expenses that has occurred since (Leachman & Figueroa, 2019)**.** While there are grants to help with implementation, the maintenance of technology that has been implemented and upkeep of the infrastructure that supports it is not something that grants can be relied on to provide as they can vary greatly or disappear from year to year (Kowalski, 2002). Putting this all together, this means that schools need to acquire and maintain more expensive tools than in years past with overall lower levels of funding. Therefore, it makes it more important than ever that schools are maximizing the impact of initiatives, and that means having the most effective possible leaders in place.

This chapter highlights the research questions explored in this study and provide a more in-depth discussion of the research findings as well as note some of the complications of the research, study limitations, and recommendations for further research.

Research questions and hypotheses

This quantitative study sought to answer the following research questions.

1. Do public schools with technology directors exhibiting dominant transformational leadership styles have higher scores for readiness for technology implementation than those with non-transformational leadership styles?

H_1= Having a dominant transformational leadership style, as measured by the MLQ, will be significantly associated with greater levels of readiness for implementation as measured by the SOCQ.

2. Do public schools with technology directors exhibiting specific subtypes of leadership styles have higher scores for readiness for technology implementation?

   H_2= Some subtypes of transformational leadership will be more highly correlated with readiness for technology implementation as measured by the SOCQ than leadership subtypes that are not transformational.

3. Are there differences in the impact of leadership styles on readiness for technology implementation based on a teacher's generational classification (e.g. millennial, Gen X, Gen Z, etc.)?

   H_3= There will be a significant positive variation in readiness for implementation, as measured by the SOCQ, based on the generation of the teacher, with younger generations showing greater effects with higher levels of transformational leadership.

4. Are there differences in impact of leadership styles on readiness for technology implementation based on the setting of a school (Urban v. Rural)?

   H_4= There will be a significant variation in the readiness for implementation, as measured by the SOCQ, based on the setting of a school (Urban v. Rural).

Summary and interpretation of findings

The researcher's findings for this study were on the surface all the same: There were no significant relationships in any of the research questions. These were tested through an assortment of t-tests grouping data together in a variety of ways and using both direct and derived measures. Below is a more detailed discussion of each research question and the analyses done, but the largest issue applies to all of the questions: The sample simply was not large enough to provide the degrees of freedom necessary to demonstrated significance. Several analyses came close, or were able to demonstrate weak significance in an aspect of the comparing the means for equality, but ultimately, having two data points for some analyses simply was not enough to begin to extract meaningful conclusions from the data.

1. Do public schools with technology directors exhibiting dominant transformational leadership styles have higher scores for readiness for technology implementation than those with non-transformational leadership styles?

   H_1= Having a dominant transformational leadership style, as measured by the MLQ, will be significantly associated with greater levels of readiness for implementation as measured by the SOCQ.

This hypothesis was rejected because there was simply no evidence to support it, and in the case of a lack of evidence, the null hypothesis is maintained. The MLQ measures used were a sum of the transformation traits, sum of the non-transformational traits, and the ratio of these two sums. Some of the results approached significance, but none met it, and with the level of skewness and kurtosis of some of the data, even getting to the p=.5 threshold necessary to support the alternative hypothesis, let alone the desired p<.001, would not have meant that the data were accurate in their support of the hypothesis. With enough additional districts participating, the researcher believes that a relationship would have been seen sand would seek to explore this further if more data points could be obtained in the future; however, at this point it must be rejected completely and the null hypothesis upheld.

2. Do public schools with technology directors exhibiting specific subtypes of leadership styles have higher scores for readiness for technology implementation?

   H_2= Some subtypes of transformational leadership will be more highly correlated with readiness for technology implementation as measured by the SOCQ than leadership subtypes that are not transformational.

Hypothesis two was also rejected, although the researcher would posit many of the same assertions above regarding potential significance for this as well. IIA and intellectual stimulation both approached the point of significance and are supported as substyles in the research that make sense for significance to be found here (Bass, 2008). The approach of significance of these two subtypes makes sense when considered in light of driving readiness for implementation. A technology director that is not influential and not intellectually stimulating is unlikely to be

appealing to educators, especially in the long term (Anderson, 2017; Bass, 2008; Rugg, 2005). Despite the support in the literature, ultimately the data simply do not support the alternative hypothesis and the null hypothesis must be maintained.

3. Are there differences in the impact of leadership styles on readiness for technology implementation based on a teacher's generational classification (e.g. millennial, Gen X, Gen Z, etc.)?

H_3= There will be a significant positive variation in readiness for implementation, as measured by the SOCQ, based on the generation of the teacher, with younger generations showing greater effects with higher levels of transformational leadership.

Generational research in this study had an issue with sample size that went beyond what has been mentioned thus far; there were too few respondents for any comparison of means beyond discussion of measure of central tendency. Technology directors were all either part of generation x or generation y and the mode for the teachers responding was in the same categories. Analyses were done using the technology director's generation, the mode of teachers generational status, and cases where there was a mismatch between the two, and none of the t-test analyses were statistically significantly different than the expected mean of any of the SOCQ measures. With a larger sample the researcher believes there may still be a relationship between these variables that is statistically significant; however, it is not seen in these data or analyses, so the alternative hypothesis must be rejected and null hypothesis maintained.

1. Are there differences in impact of leadership styles on readiness for technology implementation based on the setting of a school (Urban v. Rural)?

H_4= There will be a significant variation in the readiness for implementation, as measured by the SOCQ, based on the setting of a school (Urban v. Rural).

The analysis of setting has a similar limitation to that of the generational research for the rural setting; there were not enough responses to analyze the differences. The t-test that compared urban transformational scores to the SOCQ measures did approach significance and would have met it if equal variances could have been assumed, however that was not the case as the sample

was too small. Between the inability to analyze the rural setting at all and the lack of significant results in any other t-tests, the alternative hypothesis must be rejected and the null hypothesis retained.

There were other ideas explored not directly related to the research questions that are worth noting as well. The first was whether a district is using a contracted service to fulfill the majority of their IT needs would have an impact on the MLQ or SOCQ measures. This was unable to be explored as there were no districts that participated in the study that used contracted IT services, but that may partially have been caused by an unwillingness of teachers to complete the SOCQ for a contracted servicer. The other was whether or not transformational leaders would have higher response rates on the SOCQ. This was measured as a percentage and while the metric is not directly measured against a research question, the researcher will note that the t-test analyzing this facet did reach the threshold of significance (p=.504), and as such the researcher feels a larger sample would have confirmed this finding more concretely.

Limitations to and complications of the study

The primary reason for the low response rate is on the surface easy to identify to most people in academia at the moment and was explicitly stated by some of the superintendents that were asked for permission to do research: teachers are incredibly stretched due to the COVID-19 pandemic. This has led school districts to try and protect them from unnecessary stress whenever possible and caused some districts to institute a policy of suspending approval of all requests for research until further notice (Olenchak, 2022). This can also be seen even in the response rate from urban schools when viewing a study with a similar survey distribution method (Rinehart, 2021). Rinehart (2021) also distributed her study through the IUSA and had twelve participants just from that solicitation whereas the final number here from the same pool was four. The prospective participant pool for the ISRSA was significantly larger than the IUSA, and while there is no research to support this, the researcher posits that having an organization of similar function roughly three times the size of the IUSA respond at half of the rate is alarming.

Setting aside the COVID-19 pandemic, there are several other complications of note. First was the design of the study itself. There are two primary issues with the study design. Context is always an issue with any quantitative research study. Without a qualitative component to provide a lens through which the data points can be viewed, there are potential issues with understanding

the reasoning for them to exist in that way (Creswell, 2009). It could be that teachers truly did believe that their technology director's leadership was phenomenal, but they have implemented so many new things of late because of the necessity of meeting student deficits that there is simply no significant will to do so, and without a qualitative component, there is no way to know those types of confounding factors

The other significant issue with the design was the distribution of the instruments. Many superintendents likely never read or opened the emails requesting permission to do research in their districts. Especially in some of the larger school urban school districts a superintendent may receive hundreds of emails in a day and with something as significant as a global pandemic happening, it is incredibly easy to imagine this being overlooked even if someone they knew personally had sent it. Even after permission was obtained from the superintendent of a district, it was entirely possible that they email sent to the technology director would be missed or forgotten after receipt or initial reading. Based on some of the incomplete responses received, the researcher believes this was an issue for several districts. Lastly, relying on the technology director to distribute the SOCQ to teachers, even with reminders and multiple copies of the informed consent built in from the initial email to the final MLQ page, seemed to be an issue in some districts who had no teacher respondents.

The MLQ and SOCQ themselves were another potential limitation to this study. Both instruments are on the longer side and require a participant to think through facets of their lives that they may be tempted to be less than fully honest with themselves about, which is not uncommon in quantitative research (Creswell, 2009). The MLQ adjusts for this by having people use raters in combination with their self-evaluation (Bass, 2008), but that would further complicate the overall design of the study and potentially impact response rates further. In the case of the SOCQ, it is an instrument designed to be adapted to many situations; however, that adaptability can also impact the validity (Cheung et al., 2001; George et al., 2013).

Recommendations for future study

Based on the limitations outlined above, the researcher would propose some areas for further research. Although the data do not support the assertion directly, the researcher believes the largest reason for lack of significant findings in this study has to do with sample size and not premise. Any future research that can expand the sample to even 20 or more schools in each

category may yield more significant results. This would also greatly increase the generalizability of this study as it is currently limited to traditional public schools in Indiana. Another area for potential research would be including private schools or charter schools. This would not only increase the potential sample size, but also give greater power of generalizability. It will further complicate the analysis of the results, but with sufficient districts participating that should be able to be overcome.

One of the ancillary questions explored in this study was whether or not contracting out IT services has an impact on readiness for technology implementation. This would be an area that the MLQ may or may not have be used as a survey instrument and may allow for greater response rates and lead to new research questions. The same may be said of the near significance seen between teacher completion of the SOCQ based on transformational leadership score. Further analysis of that relationship using other instruments may be a fruitful endeavor.

Lastly, researchers may consider expanding this study into a mixed methods approach. The self-selection of schools into these surveys is effectively random. Compiling a list of locations that are representative and obtaining permission directly via a different solicitation method to do a deeper dive in each may yield more powerful results, both in terms of quantitative analysis and in the context provided by adding a qualitative component.

Conclusion

While this study was not able to support any of the alternative hypotheses posited, it did reveal an interesting research complication present in academia at the moment: the COVID-19 pandemic is impacting an educational system that was so ill-prepared for it that as a society we still see students, teachers, parents, and administrators struggling to cope even more than two full years since the beginning of it. The research conducted here had a strong theoretical backing and yet when there are not enough respondents to provide high quality data for analysis, it is difficult to draw any meaningful conclusions or to truly reject the null hypothesis. If the data are viewed holistically and through a more forgiving lens than the traditional 95% certainty of science, there are several transformational leadership subtypes that seem to be quite effective in helping to motivate teachers to want to implement new technologies. While this is not something that can be known for sure from this, or from any, data, it is worth closing with the idea that the core ideas of transformational leadership ultimately boil down to the golden rule: treat others how you want to

be treated. Try and engage them intellectually, motivate them positively, influence them to be both better versions of themselves and employees, and lastly, have true consideration for them. If you do, not only will you be happier with the response, but life will be easier for all people involved, with better outcomes for staff and students.

REFERENCES

Alsaeedi, F., & Male, T. (2013). Transformational leadership and globalization: Attitudes of school principals in Kuwait. *Educational Management Administration & Leadership*, *41*(5), 640-657. https://doi.org/10.1177/1741143213488588

Anderson, M. (2017). Transformational leadership in education: A review of existing literature. *International Social Science Review (Online)*, *93*(1), 1-13.

Andriole, S. J. (2018). What executives should know about technology trends. *IT Professional*, *20*(2), 80-82. https://doi.org/10.1109/MITP.2018.021921654

Antonakis, J., & House, R. J. (2014). Instrumental leadership: Measurement and extension of transformational–transactional leadership theory. *The Leadership Quarterly*, *25*(4), 746-771. https://doi.org/10.1016/j.leaqua.2014.04.005

Avolio, B., & Bass, B. (2004). *Multifactorial leadership questionnaire: Third edition manual and sample set*. Mind Garden, Inc.

Bailey, D. B., & Palsha, S. A. (1992). Qualities of the stages of concern questionnaire and implications for educational innovations. *The Journal of Educational Research*, *85*(4), 226-232. https://doi.org/10.1080/00220671.1992.9941120

Bak, C. Y. (2015). Transforming teaching and learning with technology: A case study of a California public school. University of Southern California Digital Library (USC.DL).

Balan, H. R. (2018). Use of study guide as intervention tool in enhancing students' motivation in grade 8 genetics concepts. *Malaysian Online Journal of Educational Technology*, *6*(2), 75-85.

Bannon, B. W. (2012). Creating/developing/using a wiki study guide: Effects on student achievement. *Journal of Research on Technology in Education*, *44*(4), 293-313.

Bass, B. (2008). *Transformational leadership*. Taylor & Francis.

Betts, J., & Atkinson, R. (2012). Education. Better research needed on the impact of charter schools. *Science 335*(6065), 171.

Betts, J., & Tang, Y. (2011). The effect of charter schools on student achievement: A meta-analysis of the literature. *National Charter School Research ProjectCenter on Reinventing Public Education*.

Blanca, M. J., Arnau, J., López-Montiel, D., Bono, R., & Bendayan, R. (2013). Skewness and kurtosis in real data samples. *Methodology*, *9*(2), 78-84. https://doi.org/10.1027/1614-2241/a000057

Bray, A., & Tangney, B. (2017). Technology usage in mathematics education research – A systematic review of recent trends. *Computers & Education*, *114*, 255-273. https://doi.org/10.1016/j.compedu.2017.07.004

Buch, R., Martinsen, Ø. L., & Kuvaas, B. (2015). The destructiveness of laissez-faire leadership behavior: The mediating role of economic leader–member exchange relationships. *Journal of Leadership & Organizational Studies*, *22*(1), 115-124. https://doi.org/10.1177/1548051813515302

Cade, C. (2013). Stages of concern questionnaire: Understanding the implementation of positive behavioral intervention and supports in Texas juvenile justice facilities. *ProQuest Dissertations and Theses*, *2013*.

Camera, L. (2017). DeVos delivers tough love to charter school advocates. *U.S. News and World Report*. https://www.usnews.com/news/education-news/articles/2017-06-13/devos-delivers-tough-love-to-charter-school-advocates

Cheung, D., Hattie, J., & Ng, D. (2001). Reexamining the stages of concern questionnaire: A test of alternative models. *The Journal of Educational Research*, *94*(4), 226-236. https://doi.org/10.1080/00220670109598756

Consortium for School Network (COSN). (2014). Five imperatives for technology leadership *The empowered superintendent*, April, 2014.

(COSN). (2018). *K-12 IT leadership survey report*. https://cosn.users.membersuite.com/shop/store/59ce3069-00ce-c8fb-d948-6736b971bc1f/detail

Convertino, C. (2017). What's a charter school? How the charter school debate and misinformation mediate the local production of school choice. *Policy Futures in Education*, *15*(2), 157-169. https://doi.org/10.1177/1478210316637970

Creswell, J. (2009). *Research-design: Qualitative, quantitative, and mixed-methods approaches* (3rd ed.). Sage.

Damle, A., Damle, R. N., Flahive, J. M., Schlussel, A. T., Davids, J. S., Sturrock, P. R., Alavi, K. (2017). Diffusion of technology: Trends in robotic-assisted colorectal surgery. *The American Journal of Surgery*, *214*(5), 820-824. https://doi.org/10.1016/j.amjsurg.2017.03.020

Deichmann, D., & Stam, D. (2015). Leveraging transformational and transactional leadership to cultivate the generation of organization-focused ideas. *The Leadership Quarterly*, *26*(2), 204-219. https://doi.org/10.1016/j.leaqua.2014.10.004

Del Campo, J. M., Negro, V., & Núñez, M. (2012). The history of technology in education. A comparative study and forecast. *Procedia - Social and Behavioral Sciences*, *69*(C), 1086-1092. https://doi.org/10.1016/j.sbspro.2012.12.036

Drennan, G., & Moll, I. (2018). A conceptual understanding of how educational technology coaches help teachers integrate iPad affordances into their teaching. *Electronic Journal of E-Learning*, *16*(2), 122-133.

Eckert, J. (2019). Collective leadership development: Emerging themes from urban, suburban, and rural high schools. *Educational administration quarterly*, *55*(3), 477-509. https://doi.org/10.1177/0013161X18799435

Eddins, G. (2012). The influence of principal gender, teachers' years of experience, and retention on teacher perceptions of principal leadership style, qualities, and job satisfaction. *ProQuest Dissertations and Theses*, *Jan. 2012*.

Fellows, B. P. (2009). Virginia public school superintendents' perceptions of the leadership practices utilized to lead urban, rural, and suburban school divisions. In: ProQuest Dissertations Publishing.

Fischer, S. A. (2017). Transformational leadership in nursing education: Making the case. *Nursing Science Quarterly*, *30*(2), 124-128. https://doi.org/10.1177/0894318417693309

Fowler, F. (2013). *Policy studies for educational leaders: an introduction*. Merrill.

Fusco, K. (2019). Technology leaders' impact on teachers' self-efficacy and integration of instructional technology in secondary schools. *Proquest dissertations and theses*, *2019*.

George, A., Gene, H., & Steigelbauer, S. (2013). *Measuring implementation in schools: The stages of concern questionnaire*. U.S. Department of Education.

George, M., & Hazell, W. (2018). Are we ready for teaching minus the teachers?(Insight: Staffing Crisis). *Times Educational Supplement*(5294), 15-18.

Gerard, L., Bowyer, J., & Linn, M. (2008). Principal leadership for technology-enhanced learning in science. *Journal of Science Education and Technology*, *17*(1), 1-18. https://doi.org/10.1007/s10956-007-9070-6

Glambek, M., Skogstad, A., & Einarsen, S. (2018). Workplace bullying, the development of job insecurity and the role of laissez-faire leadership: A two-wave moderated mediation study. *Work & Stress*, *32*(3), 297-312. https://doi.org/10.1080/02678373.2018.1427815

Glatthorn, A., Boschee, F., Whitehead, B., & Boschee, B. (2016). *Curriculum Leadership*. Sage Publications, Inc.

Gleason, P., & Silverberg, M. (2010). *The evaluation of charter school impacts : final report*. *United States Department of Education, National Center for Education Evaluation and Regional Assistance*, Institute of Education Sciences: Washington, DC.

Greene, D. Y. (2012). Factors that influence parents to choose charter schools.

Gunnell, J. W. (2013). Illinois directors' of special education Perceptions of their leadership styles and importance of the Illinois Standards for director of special education. *ProQuest Dissertations and Theses, Jan 2013.*

Gurley, L. (2016). Who's afraid of rural poverty? The story behind America's invisible poor: Who's afraid of rural poverty? *The American journal of economics and sociology*, *75*(3), 589-604. https://doi.org/10.1111/ajes.12149

Hadjithoma-Garstka, C. (2011). The role of the principal's leadership style in the implementation of ICT policy. *British Journal of Educational Technology*, *42*(2), 311-326. https://doi.org/10.1111/j.1467-8535.2009.01014.x

Han, K. T., Madhuri, M., & Scull, W. R. (2015). Two sides of the same coin: Preservice teachers' dispositions towards critical pedagogy and social justice concerns in rural and urban teacher education contexts. *The Urban review*, *47*(4), 626-656. https://doi.org/10.1007/s11256-015-0327-8

Hartman, E. (2016). Technology implementation and curriculum engagement for children and youth who are deafblind. *American Annals of the Deaf*, *161*(4), 462-473.

Hayes, J. L., III. (2018). Realizing the edeal school district size: How district size affects achievement and expenditure. *ProQuest LLC*.

Hemsworth, D., Muterera, J., & Baregheh, A. (2013). Examining Bass's transformational leadership in public sector executives: A psychometric properties review. *Journal of applied business research*, *29*(3), 853-862. https://doi.org/10.19030/jabr.v29i3.7785

Hill, P. T. (2006). *Charter Schools against the Odds An Assessment of the Koret Task Force on K-12 Education*. Chicago : Hoover Institution Press.

Hill, V. (2013). Principal leadership behaviors which teachers at different career stages perceive as affecting job satisfaction. *Proquest dissertations and theses*, *Jan. 2013*.

Hilton, J. T. (2016). A case study of the application of SAMR and TPACK for reflection on technology integration into two social studies classrooms. *The Social Studies*, *107*(2), 68-73. https://doi.org/10.1080/00377996.2015.1124376

Hinckley, P. (2011). *Monitoring: Keeping your finger on the pulse of school improvement*. Indianapolis Business Journal Book Publishing.

Hinkin, T. R., & Schriesheim, C. A. (2008). An examination of "nonleadership": From laissez-faire leadership to leader reward omission and punishment omission. *Journal of Applied Psychology*, *93*(6), 1234-1248. https://doi.org/10.1037/a0012875

Howlett, K. M., Allred, J., Beck, D., & Mysore, A. R. (2019). An english learner service-learning project: Preparing education majors using technology and the SAMR model. *CALL-EJ*, *20*(2), 128-149.

Hunter, J. (2015). *Technology integration and high possibility classrooms : building from TPACK*. New York, New York ; London, England : Routledge.

I-Hua, C., Chin, J., & Cheng-Mei, H. (2008). Teachers' perceptions of the dimensions and implementation of technology leadership of principals in Taiwanese elementary schools. *Journal of Educational Technology & Society*, *11*(4), 229-245.

Imazeki, J., & Reschovsky, A. (2003). Financing adequate education in rural settings.(Special Issue: Rural Education Finance). *Journal of Education Finance*, *29*(2), 156.

ISTE. (2020). *ISTE Standards for Education Leaders*. Retrieved March 2 from https://www.iste.org/standards/for-education-leaders

Johnson, B., & Christensen, L. B. (2020). *Educational research : quantitative, qualitative, and mixed approaches* (Seventh Edition. ed.). SAGE.

Jr, P. (1995). For a history of technology education: Contexts, systems, and narratives. *Journal of technology education.*, *7*(1), 43-56.

Karlin, M., Ottenbreit-Leftwich, A., Ozogul, G., & Liao, Y.-C. (2018). K-12 technology leaders: reported practices of technology professional development planning, implementation, and evaluation. *Contemporary Issues in Technology and Teacher Education (CITE Journal)*, *18*(4).

Khan, S., Hwang, G. J., Azeem Abbas, M., & Rehman, A. (2019). Mitigating the urban–rural educational gap in developing countries through mobile technology-supported learning. *British journal of educational technology*, *50*(2), 735-749. https://doi.org/10.1111/bjet.12692

King, D. (2018). Current technology trends. *Library Technology Reports*, *54*(2), 30-32.

Kowalski, T. (1995). Case studies on educational administration. *Educational Leadership Faculty Publications*, *Paper 54*. https://doi.org/http://ecommons.udayton.edu/eda_fac_pub/54

Kowalski, T. (2002). *Planning and managing school facilities*. Bergin & Garvey.

Lamb, A. J., & Weiner, J. M. (2018). Extending the research on 1:1 technology integration in middle schools: A call for using institutional theory in educational technology research. *Middle Grades Review*, *4*(1).

Leachman, M., & Figueroa, E. (2019). K-12 school funding up in most 2018 teacher-protest states, but still well below decade ago. *Center on Budget and Policy Priorities*.

Lin, S. (2016). The use of technology in K-12 schools: Demystifying the relationship between technology leadership and technology use. *The Ohio State University dissertations and theses*, *2016*.

Lindsjö, K. (2018). Contextualizing the quality of primary education in urban and rural settings: The case of Iringa Region, Tanzania. *Norsk geografisk tidsskrift*, *72*(4), 234-247. https://doi.org/10.1080/00291951.2018.1492962

Lowan-Trudeau, G. (2017). Gateway to understanding: Indigenous ecological activism and education in urban, rural, and remote contexts. *Cultural studies of science education*, *12*(1), 119-128. https://doi.org/10.1007/s11422-016-9746-4

Luttrell, R. (2017). *The millennial mindset : unraveling fact from fiction* (First paperback edition. ed.). Lanham, Maryland : Rowman & Littlefield.

Macur, M. (2013). Quality in health care: Possibilities and limitations of quantitative research instruments among health care users. *Quality and Quantity*, *47*, 1703-1716.

Marques, J., & Dhiman, S. (2017). *Leadership Today Practices for Personal and Professional Performance* (1st ed. 2017.. ed.). Cham : Springer International Publishing : Imprint: Springer.

Martin, W., Strother, S., Beglau, M., Bates, L., Reitzes, T., & McMillan Culp, K. (2010). Connecting instructional technology professional development to teacher and student outcomes. *Journal of Research on Technology in Education*, *43*(1), 53-74. https://doi.org/10.1080/15391523.2010.10782561

McChesney, C., Covey, S., & Huling, J. (2012). *The four disciplines of execution: Achieving your wildly important goals*. Simon & Schuster.

McGaha, K. (2018). An interpretive phenomological study of America's emerging workforce: Exploring generation z's leadership preferences. *ProQuest Dissertations and Theses, Jan, 2018*.

Mittal, S., & Dhar, R. L. (2015). Transformational leadership and employee creativity. *Management Decision*, *53*(5), 894-910. https://doi.org/10.1108/MD-07-2014-0464

Moore, S., & Newsome, K. (2019). Management by exception? The Taylor Review and workforce management: Good Work: The Taylor Review of Modern Working Practices, reviewed by Sian Moore and Kirsty Newsome. *New technology, work, and employment*, *34*(2), 95-99. https://doi.org/10.1111/ntwe.12128

Moore, S., Tailby, S., Antunes, B., & Newsome, K. (2018). 'Fits and fancies': the Taylor Review, the construction of preference and labour market segmentation. *Industrial relations journal*, *49*(5-6), 403-419. https://doi.org/10.1111/irj.12229

Muenjohn, N. (2008). Structural validity of the Multifactorial Leadership Questionnaire (MLQ), capturing the leadership factors of transformational-transactional leadership. *Contemporary Management Research*, *4*(March 2008), 3-14.

Nature. (2015). The scientist of the future. *Nature*, *523*(7560), 271. https://doi.org/10.1038/523271a

Olenchak, R. (2022). *Discussion of quantitative research methodology* [Interview].

Oppenheimer, T. (2003). *The flickering mind : the false promise of technology in the classroom, and how learning can be saved* (1st ed.). Random House.

Parment, A. (2012). *Generation Y in consumer and labour markets*. New York : Routledge.

Ramirez. (2014). Inside a school trying to bridge the digital divide. *Time*, *2014*.

Ridder, S. (2016). A meta-analysis on the Multifactor Leadership Questionnaire (MLQ). In: ProQuest Dissertations Publishing.

Rinehart, L. (2021). Urban teacher job retention: What makes them stay? In. Lafayette, IN: Purdue University.

Risling, T. (2017). Educating the nurses of 2025: Technology trends of the next decade. *Nurse Education in Practice*, *22*(C), 89-92. https://doi.org/10.1016/j.nepr.2016.12.007

Rizzo, R. (2010). Ready or not?: A portrait of the professional development of Michigan charter school principals and its affect on student academic performance. In C. Kozoll, E. Wellington, & M. Winborne (Eds.): ProQuest Dissertations Publishing.

Rugg, L. J. M. (2005). *Teacher satisfaction with principal transformational leader behavior* Thesis (Ph.D.)--Purdue University, 2005.

Ryland, A. (2017). Engineering technology trends. *ASEE Prism*, *26*(6), 16-17.

Schlechty, P. (2011). *Engaging Students: the next level of working on the work*. Jossey-Bass.

Shaughnessy, M., Quinn Griffin, M., Bhattacharya, A., & Fitzpatrick, J. (2018). Transformational leadership practices and work engagement among nurse leaders. *Journal of Nursing Administration*, *48*(11), 574. https://doi.org/10.1097/NNA.0000000000000682

Shuls, J. V. (2017). School choice: The personal and the political. *Journal of School Choice*, 1-18. https://doi.org/10.1080/15582159.2017.1374151

Silva-Peña, I., Precht, A., O'Brien, T. V., & Jara, C. (2020). Far away, but yet so close. Urban teacher education and rural schools: directors' point of view. *International journal of inclusive education*, 1-15. https://doi.org/10.1080/13603116.2020.1772892

Smith, M. S. (2011). The impact a technology leader and their leadership style makes in K-12 classroom teacher's implementation of technology. In: ProQuest LLC.

Spano-Szekely, L., Griffin, M., Clavelle, J., & Fitzpatrick, J. (2016). Emotional intelligence and transformational leadership in nurse managers. *Journal of Nursing Administration*, *46*(2), 101. https://doi.org/10.1097/NNA.0000000000000303

Strauss, W., & Howe, N. (1991). Generations: The history of America's Future, 1584 to 2069. In. New York: Harper.

Syaifuddin. (2016). The influence of work stress and transformational leadership on work-place motivation and implication of employee performance (CASE STUDY). *Academy of Strategic Management Journal*, *15*, 42-48.

Taylor, M. (2017). *Good Work: The Taylor Review of Modern Working Practices*. London, United Kingdom

Thite, M. (2000). Leadership styles in information technology projects. *International Journal of Project Management*, *18*(4), 235-241. https://doi.org/10.1016/S0263-7863(99)00021-6

Tourish, D., Craig, R., & Amernic, J. (2010). Transformational leadership education and agency perspectives in business school pedagogy: A marriage of inconvenience? *British Journal of Management*, S40.

Trinidad, J. E. (2020). Will it matter who I'm in school with? Differential influence of collective expectations on urban and rural US schools. *International studies in sociology of education*, *29*(4), 344-365. https://doi.org/10.1080/09620214.2019.1673791

United States. Office of, E. (1928). *Comparative status of secondary education in rural and urban communities*. [s.n.].

Vaismoradi, M., Griffiths, P., Turunen, H., & Jordan, S. (2016). Transformational leadership in nursing and medication safety education: a discussion paper. *Journal of Nursing Management*, *24*(7), 970-980. https://doi.org/10.1111/jonm.12387

Van Thiel, L. (2018). Professional learning design framework: Supporting technology integration in Alberta. *Research in Learning Technology*, *26*(0), 1-24. https://doi.org/10.25304/rlt.v26.1989

Vázquez-Bernal, B., Mellado, V., Jiménez-Pérez, R., & Leñero, M. C. T. (2012). The process of change in a science teacher's professional development: A case study based on the types of problems in the classroom. *Science Education*, *96*(2), 337-363. https://doi.org/10.1002/sce.20474

Watson, E. (2014). *Overcoming adversity in academia : stories from generation x faculty*. Lanham, Maryland : University Press of America.

Wilcox, J. E. (2011). Special or not so special: Special education background experiences of principals and adequate yearly progress. *ProQuest Dissertations and Theses, Jan, 2011.*

Wilson, C., Orellana, M., & Meek, M. (2010). The evolution of classroom technology - https://archive.nytimes.com/www.nytimes.com/interactive/2010/09/19/magazine/classroom-technology.html?_r=0

Wong, S. I., & Giessner, S. R. (2018). The thin line between empowering and laissez-faire leadership: An expectancy-match perspective. *Journal of Management*, *44*(2), 757-783. https://doi.org/10.1177/0149206315574597

Yang, I. (2015). Positive effects of laissez-faire leadership: conceptual exploration. *Journal of Management Development*, *34*(10), 1246-1261. https://doi.org/10.1108/JMD-02-2015-0016

Yang, Y. (2014). Principals' transformational leadership in school improvement. *International Journal of Educational Management*, *28*(3), 279-288. https://doi.org/10.1108/IJEM-04-2013-0063

Zabihi, R., & Khodabakhsh, M. (2019). L2 teachers' traditional versus constructivist teaching/learning conceptions and teacher burnout. *Current Psychology*, *38*(2), 347-353. https://doi.org/10.1007/s12144-017-9610-z

Zhang, D., Li, X., & Xue, J. (2021). Education inequality between rural and urban areas of the People's Republic of China, migrants' children education, and some implications. *Asian development review*, *32*(1), 196-224. https://doi.org/10.1162/ADEV_a_00042

Šorgo, A., Dojer, B., Golob, N., Repnik, R., Repolusk, S., Pesek, I., Špur, N. (2018). Opinions about STEM content and classroom experiences as predictors of upper secondary school students' career aspirations to become researchers or teachers. *Journal of Research in Science Teaching*, *55*(10), 1448-1468. https://doi.org/10.1002/tea.21462

APPENDIX A. IRB EXEMPTION MEMO

Date: January 25, 2022
PI: MARILYN HIRTH
Re: Initial - IRB-2021-1911
Leadership Styles of Technology Directors and Readiness of Technology Implementation

The Purdue University Human Research Protection Program (HRPP) has determined that the research project identified above qualifies as exempt from IRB review, under federal human subjects research regulations 45 CFR 46.104. The Category for this Exemption is listed below . Protocols exempted by the Purdue HRPP do not require regular renewal. However, the administrative check-in date is January 24, 2025. The IRB must be notified when this study is closed. If a study closure request has not been initiated by this date, the HRPP will request study status update for the record.

Specific notes related to your study are found below.
Decision: Exempt
Category:
Category 2.(i). 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).
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.
Category 2.(ii). 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).
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.

Research Notes:

Any modifications to the approved study must be submitted for review through Cayuse IRB. All approval letters and study documents are located within the Study Details in Cayuse IRB.

What are your responsibilities now, as you move forward with your research?

Document Retention: The PI is responsible for keeping all regulated documents, including IRB correspondence such as this letter, approved study documents, and signed consent forms for at least three (3) years following protocol closure for audit purposes. Documents regulated by HIPAA, such as Release Authorizations, must be maintained for six (6) years.

Site Permission: If your research is conducted at locations outside of Purdue University (such as schools, hospitals, or businesses), you must obtain written permission from all sites to recruit, consent, study, or observe participants. Generally, such permission comes in the form of a letter from the school superintendent, director, or manager. You must maintain a copy of this permission with study records.

Training: All researchers collecting or analyzing data from this study must renew training in human subjects research via the CITI Program (www.citiprogram.org) every 4 years. New personnel must complete training and be added to the protocol before beginning research with human participants or their data.

Modifications: Change to any aspect of this protocol or research personnel must be approved by the IRB before implementation, except when necessary to eliminate apparent immediate hazards to subjects or others. In such situations, the IRB should still be notified immediately.

Unanticipated Problems/Adverse Events: Unanticipated problems involving risks to subjects or others, serious adverse events, and
noncompliance with the approved protocol must be reported to the IRB immediately through an incident report. When in doubt, consult with the HRPP/IRB.

Monitoring: The HRPP reminds researchers that this study is subject to monitoring at any time by Purdue's HRPP staff, Institutional Review Board, Post Approval Monitoring team, or authorized external entities. Timely cooperation with monitoring procedures is an expectation of IRB approval.

Change of Institutions: If the PI leaves Purdue, the study must be closed or the PI must be replaced on the study or transferred to a new IRB. Studies without a Purdue University PI will be closed.

Other Approvals: This Purdue IRB approval covers only regulations related to human subjects research protections (e.g. 45 CFR 46). This determination does not constitute approval from any other Purdue campus departments, research sites, or outside agencies. The Principal Investigator and all researchers are required to affirm that the research meets all applicable local/state/ federal laws and university policies that may apply.

If you have questions about this determination or your responsibilities when conducting human subjects research on this project or any other, please do not hesitate to contact Purdue's HRPP at irb@purdue.edu or 765-494-5942. We are here to help!

Sincerely,

Purdue University Human Research Protection Program/ Institutional Review Board

APPENDIX B. LETTER TO ASSOCIATION DIRECTORS

Dear [Association Director],

My name is Aaron Esper and I am a doctoral candidate from Purdue University in the Department of Educational Studies. I am working on my dissertation research. I am seeking your permission to utilize the [Association] member schools as a [rural/urban] population sample for my dissertation research. I am seeking your help with the study by forwarding this e-mail to your membership to solicit the participation.

Dear Superintendent:

Thank you for considering my request to allow your Technology Director and teachers to participate in my dissertation research. You should have received an email from Dr. Lagoni/Marcotte informing you I would be making this request. The purpose of my study is to better understand the relationship between a technology director's leadership style and teachers' readiness to implement new technology in the district. With the recent complications that arose from the COVID-19 pandemic, even as we hopefully begin to see the light at the end of the tunnel, these are important ideas as we move forward to best meet the needs of our students. The research focuses on two populations: technology directors and teachers in their district. Technology directors will be completing a leadership style inventory and teachers will be completing a survey regarding readiness for implementing new technology. This research may have direct implications for best practices in training and hiring for technology directors. The survey does not ask for any identifiable information that will not be anonymized and the results from these surveys are anonymized by the researcher after collection and in the final report as well to ensure privacy.

I would like your permission for your technology director and teachers to participate in this study. *If you are willing to do so, please reply to this email with "Yes" and cc your district technology director*. I will follow up directly with them from there. The survey should take less than 15 minutes. Thank you so much for your time.

If you would like to know more information about this study, an information letter can be obtained by sending a request to esper@purdue.edu. If you would like a copy of the results of this study upon completion, please include that in your response as well.

If you have any questions, please contact me at esper@purdue.edu or my dissertation chair, Dr. Marilyn Hirth at mahirth@purdue.edu.

Thank you for your consideration,

Aaron T. Esper
Doctoral Candidate
Purdue University, Department of Educational Studies

APPENDIX C. LETTER TO SUPERINTENDENTS

Dear [superintendent],

I am a doctoral candidate from Purdue University conducting a research study as part of my degree requirements. You should have received a forwarded email from [association director] a few weeks ago requesting your participation in the study. The purpose of my research is to better understand the relationship between a technology director's leadership style and teachers' readiness to implement new technology in the district. In these unprecedented times of the COVID-19 pandemic, even as we begin to see the light at the end of the tunnel, these are important ideas as we move forward to best meet the needs of our students. This research may have direct implications for best practices in training and hiring for technology directors.

I would like your permission for your technology director and teachers to participate in this study. *If you are willing to do so, please either reply "Yes" to this email with the district technology director cc'ed* ***OR*** *have them scan the QR code below.* It should take less than 15 minutes. Thank you so much for your time.

If you would like to know more information about this study, an information letter can be obtained by sending a request to esper@purdue.edu. If you would like a copy of the results of this study upon completion, please just email me back and I will send it to you when it is finished.

If you have any questions, please contact me at esper@purdue.edu or my dissertation chair, Dr. Marilyn Hirth at mahirth@purdue.edu.

Thank you for your consideration,

Aaron T. Esper

APPENDIX D. LETTER TO TECHNOLOGY DIRECTORS

Dear Prospective Survey Participant,

I am a doctoral student from Purdue University, and I am conducting a research study as part of my degree requirements. If you are receiving this it means you superintendent gave me your email as part of permission for you to participate in this study. My study is trying to better understand the relationship elements between teachers and technology directors that lead to increased technology implementation. As we continue to grapple with the impacts of the COVID-19 pandemic these are important ideas as we move forward to best meet the needs of our students. The survey you would be taking will be measuring your leadership style at this time. It can be found HERE.

By agreeing to participate in the study, you will be giving your consent for the researcher or principal investigator to include your responses in her data analysis. Your participation in this research study is strictly voluntary, and you may choose not to participate without fear of penalty or any negative consequences. You will be able to withdraw from the survey at any time and all survey responses will be deleted, including the informed consent agreement.

An informed consent agreement will appear on the first screen page of the survey. All data will be anonymized after collection to ensure privacy. All results will be presented as aggregate, summary data. If you wish, you may request a copy of the results of this research study by writing to the researcher at esper@purdue.edu.

The survey will take no more than 15 minutes of your time. *After you finish, please forward the email that is shown as the exit page your survey to all teachers.* Your participation will contribute to the current literature on impact of leadership style on a teacher's readiness for technology implementation.

If you have any questions, please contact me at esper@purdue.edu or my dissertation chair, Dr. Marilyn Hirth at mahirth@purdue.edu.

Thank you for your consideration,

Aaron T. Esper

Doctoral Candidate

Purdue University, Department of Educational Studies

APPENDIX E. LETTER TO TEACHERS

Dear Prospective Survey Participant,

I am a doctoral student from Purdue University, and I am conducting a research study as part of my degree requirements. My study is trying to better understand the relationship elements between teachers and technology directors that lead to increased technology implementation. As we continue to grapple with the impacts of the COVID-19 pandemic these are important ideas as we move forward to best meet the needs of our students. The survey you would be taking will be measuring your willingness to implement any new technology at this time. It can be found HERE.

By agreeing to participate in the study, you will be giving your consent for the researcher or principal investigator to include your responses in his data analysis. Your participation in this research study is strictly voluntary, and you may choose not to participate without fear of penalty or any negative consequences. You will be able to withdraw from the survey at any time and all survey responses will be deleted, including the informed consent agreement.

An informed consent agreement will appear on the first screen page of the survey. All data will be anonymized after collection to ensure privacy. All results will be presented as aggregate, summary data. If you wish, you may request a copy of the results of this research study by writing to the researcher at esper@purdue.edu.

The survey will take no more than 15 minutes of your time. Your participation will contribute to the current literature on impact of leadership style on a teacher's readiness for technology implementation.

If you have any questions, please contact me at esper@purdue.edu or my dissertation chair, Dr. Marilyn Hirth at mahirth@purdue.edu.

Thank you for your consideration,

Aaron T. Esper

Doctoral Candidate

Purdue University, Department of Educational Studies

APPENDIX F. MLQ LICENSE AND SAMPLE ITEMS

Aaron Esper

To Whom It May Concern,

The above-named person has made a license purchase from Mind Garden, Inc. and has permission to administer the following copyrighted instrument up to that quantity purchased:

Multifactor Leadership Questionnaire

The sample items only from this instrument as specified below may be included in your thesis or dissertation. Any other use must receive prior written permission from Mind Garden. The entire instrument may not be included or reproduced at any time in any other published material. Please understand that disclosing more than we have authorized will compromise the integrity and value of the test.

Citation of the instrument must include the applicable copyright statement listed below. Sample Items:

As a leader ….

I talk optimistically about the future.

I spend time teaching and coaching.

I avoid making decisions.

The person I am rating….

Talks optimistically about the future.

Spends time teaching and coaching.

Avoids making decisions

Published by Mind Garden, Inc. www.mindgarden.com

Sincerely,

Mindgarden.com

APPENDIX G. STAGES OF CONCERN QUESTIONNAIRE

I agree to participate in this survey [Yes] or [No]

Which of the following age ranges do you fit in?

District:

The purpose of this questionnaire is to determine what people who are using or thinking about using various programs are concerned about at various times during the innovation adoption process. The items were developed from typical responses of school and college teachers who ranged from no knowledge at all about various programs to many years' experience in using them. Therefore, a good portion the items on this questionnaire may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale.

For example:

This statement is very true of me at this time. 0 1 2 3 4 5 6 **7**

This statement is somewhat true of me now. 0 1 2 3 **4** 5 6 7

This statement is not at all true of me at this time. 0 **1** 2 3 4 5 6 7

This statement seems irrelevant to me. **0** 1 2 3 4 5 6 7

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with adding addition technology resources or a future technology implementation. We do not hold to any one definition of this program, so please think of it in terms of your own perceptions of what it involves.

Remember to respond to each item in terms of your present concerns.

Thank you for taking time to complete this task.

1 I am concerned about students' attitudes toward another technology implementation.

2 I now know of some other technology approaches that might work better than something new.

3 I am more concerned about existing technology.

4 I am concerned about not having enough time to organize myself each day.

5 I would like to help other faculty in their use of additional technology resources.

6 I have a very limited knowledge of potential technology resources to add.

7 I would like to know the effect of additional technology on my professional status.

8 I am concerned about conflict between my interests and my responsibilities.

9 I am concerned about revising my use of technology.

10 I would like to develop working relationships with both our faculty and outside faculty using any additional technology resources adopted.

11 I am concerned about how having additional technology resources affects students.

12 I am not concerned about having additional technology resources at this time.

13 I would like to know who will make the decisions in the new system.

14 I would like to discuss the possibility of using additional technology resources.

15 I would like to know what resources are available if we decide to adopt additional technology.

16 I am concerned about my inability to manage all additional technology requires.

17 I would like to know how my teaching or administration is supposed to change.

18 I would like to familiarize other departments or people with the progress of additional technology resources.

19 I am concerned about evaluating my impact on students.

20 I would like to revise any additional technology's instructional approach.

21 I am preoccupied with things other than additional technology.

22 I would like to modify our use of additional technology based on the experiences of our students.

23 I spend little time thinking about obtaining additional technology resources.

24 I would like to excite my students about their part in using additional technology resources.

25 I am concerned about time spent working with nonacademic problems related to new technology resources

26 I would like to know what the use of additional technology resources will require in the immediate future.

27 I would like to coordinate my effort with others to maximize the effects of additional technology resources.
28 I would like to have more information on time and energy commitments required by additional innovation.
29 I would like to know what other faculty are doing in this area.
30 Currently, other priorities prevent me from focusing my attention on additional technology resources.
31 I would like to determine how to supplement, enhance, or replace additional technological resources.
32 I would like to use feedback from students to change additional technological resources.
33 I would like to know how my role will change when I am using additional technological resources.
34 Coordination of tasks and people is taking too much of my time.
35 I would like to know how additional technological resources are better than what we have now.