TEACHER LEADERSHIP AND THE INTEGRATION OF TECHNOLOGY: COLLIDING AREAS OF REFORM

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Acknowledgements and Dedication

Many have contributed to this journey, but most of all,

To my father, who is the reason I chose education.

I am sure he is smiling and very proud.

To my mother, who passed on her inner strength and desire to do good.

Thank you for every prayer.

To my three sons Duncan, Cameron, and Gavin who are my life’s joy.

Find your passion in life my sons, and never stop growing,

learning, and contributing to this wonderful world.

And above all,

To my wife Diane who allowed me to follow my dream.

It is to you that I dedicate this work.

Only you know the time, effort, and sacrifice involved,

Often resulting in time apart from each other.

May you know that you are one dream that comes true every day.

Thank you so much.
Abstract

Teacher leadership is often cited for its potential in playing a key role in education reform. It has thus received significant attention, and there is an abundance of research that has been conducted since the concept was first discussed in research in the early eighties. York-Barr & Duke (2004) conducted a meta-analysis which addressed seven questions ranging from defining teacher leadership, identifying teacher leaders, understanding the conditions that influence teacher leadership, preparation of teacher leaders, and the effects of teacher leadership. However, much has changed since 2004, making it important not to lose sight of the evolution that inevitably has occurred.

One area that has seen significant change is the area of technology. Technological innovation has altered the world, let alone education, such that children and teachers are affected in almost every aspect of their lives. Education leaders are now faced with additional complexities not envisioned by previous teacher leadership research. The pace of change beckons continued research that not only accounts for current innovations, but provides a basis for leaders to think and plan ahead. Information and data impact all aspects of systems, process, and thereby environment. It is, therefore, important to understand how technology has impacted teacher leadership within schools.

The purpose of this study was to understand the impact that technology has had on the conditions that influence teacher leadership. Therefore, the study will attempted to provide an in depth consideration of technology, deemed to be the central phenomenon. A Case Study was conducted at an Intermediate school that had recently implemented mobile learning technology.
# Table of Contents

Abstract......................................................................................................................... 2
Acknowledgement.......................................................................................................... 3
Table of Contents.......................................................................................................... 4

Chapter 1: Introduction.................................................................................................. 6
Statement of the Problem............................................................................................... 6
Significance of the Problem........................................................................................... 9
Positionality.................................................................................................................. 10
Research Question......................................................................................................... 11
Theoretical Framework.................................................................................................. 11
Rationale for Selection.................................................................................................. 16
Conclusion..................................................................................................................... 16

Chapter 2: Literature Review......................................................................................... 17
Introduction................................................................................................................... 17
Leadership in our Schools............................................................................................. 17
Transformational Leadership......................................................................................... 19
Distributed Leadership and Teacher Leadership......................................................... 20
The Conditions that Influence Teacher Leadership.................................................... 22
School Culture and Context......................................................................................... 26
Roles and Relationships............................................................................................... 31
School Structures........................................................................................................ 36
Conclusion..................................................................................................................... 42

Chapter 3: Methodology............................................................................................... 46
Research Approach....................................................................................................... 47
Participants and Access............................................................................................... 48
Data Collection............................................................................................................. 50
Data Storage................................................................................................................. 52
Data Analysis............................................................................................................... 52
Trustworthiness............................................................................................................ 53
Protection of Human Subjects..................................................................................... 54
Confidentiality and Informed Consent......................................................................... 55
Summary....................................................................................................................... 57

Chapter 4: Findings....................................................................................................... 58
Introduction.................................................................................................................... 58
Study Context............................................................................................................... 60
Findings......................................................................................................................... 66
Chapter I: Introduction

Statement of the Problem

Education technology and teacher leadership are on a collision course. Both are considered to be powerful areas for education reform, yet very little has been done to consider the impact that the integration of technology has on teacher leaders and the influence teacher leaders can have on the use of technology in schools. Technological innovation has altered the world, let alone education, such that children and teachers are affected in almost every aspect of their lives. Teacher leaders are now faced with additional complexities not envisioned by previous teacher leadership research. The pace of change beckons continued research that not only accounts for current innovations but also provides a basis for leaders to think and plan ahead. Information and data impact all aspects of systems, processes, and thereby the environment. It is, therefore, important to understand how the integration of technology has impacted teacher leadership within schools. If we fail to understand this, then our teacher leaders will not be able to adequately keep pace with changes that occur. They will be hampered in their ability to lead, and our schools and their students will suffer.

As mentioned, teacher leadership is often cited for its potential in playing a key role in education reform (Clarke & Zagarell, 2012; Dexter, 2011; McLeod & Richardson, 2011). It has thus received significant attention, and an abundance of research has been conducted since the concept was first discussed in research in the early 1980s. Much of the research on teacher leadership has been guided by a meta-analysis conducted in 2004 which looked back over two decades and considered 140 potential sources (York-Barr & Duke, 2004). This analysis addressed seven questions ranging from defining teacher leadership, identifying teacher leaders, understanding the conditions that influence teacher leadership, preparation of teacher leaders,
and the effects of teacher leadership. The authors stressed the significance of understanding the conditions that are favorable to teacher leadership. One of the key questions posed in the York-Barr and Duke (2004) analysis, and that which findings were the most robust and consistent, concerned the conditions that influence teacher leadership. Within this topic, the authors highlighted the importance of conditions that encourage learning and leading, are participatory and non-hierarchical, and provide opportunities to engage in leadership activities. The conditions were placed into three interrelated categories: school culture, roles and relationships, and structures.

Alongside teacher leadership, technological innovation is also considered a major area for educational reform. The combination of these two initiatives offers a significant opportunity to advance reform (Robinson, 2005). However, a great deal has changed since 2004, making it important not to lose sight of the change in conditions that inevitably has occurred. The implementation of new technologies have altered the “conditions” that influence teaching (Schleicher, 2012) such that leaders are now faced with additional complexities (Stuart et al., 2009) not envisioned by previous teacher leadership research. Therefore, the purpose of this study is to understand how these conditions have been impacted through the implementation and integration of technology.

Much of the research since the York-Barr and Duke (2004) meta-analysis has focused on some aspect of the three conditional categories outlined in the analysis. For example, Angelle and DeHart (2011) focused on hierarchies that existed based on experience, position, and degree amongst teachers, and Angelle and Schmid (2007) also considered structure from the perspective of teachers and principals. A few studies focused on re-culturing schools to create strong learning environments for teachers that would be founded on a collaborative culture and greater
participation in decision making (Geisgel, et al., 2007). Finally, others concentrated research on redesigning schools for improved collaboration.

Conditions, then, are broadly covered in the three areas, but within these studies little attention is given to the impact of the implementation technology. There is no doubt that collaboration is being directly impacted by the integration of technology as educators experience an ever increasing reliance on data. As enterprise-wide technology is introduced into schools, data and systems are being shared, thus creating a greater opportunity for participation in both directions from principal to teacher, and teacher to principal. Moreover, schools have become more complex in decision-making terms, rendering participatory decision making almost essential. Hierarchical structures and thinking along these lines only hampers the great potential that technology can offer to schools. Advances in technology continually evolve and impact the way teacher leaders educate children. Research thus far has not kept up with the changes that have occurred; yet there is continued interest in more leadership amongst teachers.

Technology is creating new thinking in school design, structure, and culture, and educational leaders need to understand the framework presented by York-Barr and Duke (2004) in terms of today so as to build teacher leadership programs based on the schools of tomorrow, not of yesterday. By analyzing the impact that the implementation of technology has had on the conditions that positively or negatively influence teacher leadership, we can better understand the elements needed to create environments where both technological innovation and teacher leadership can coexist and thrive. Administrators will be able to use this information as a framework for change, and teacher leaders will be better able to succeed and positively impact student learning and achievement.
Significance of the Problem

A great deal has been written about technological change, and its impact on education showing that the integration of technology has fundamentally altered the conditions within schools (Schleicher, 2012). This presents a significant leadership challenge in our schools for both teachers and administrators. Considering the pace of technological change, there are many challenges around conducting research that is timely and useful. However, it is important to strive to close the gap to provide educational leaders research that not only informs them about current technology, but gives them insights into how to create conditions that acknowledge and embrace this new normal. Educational leaders must learn to move from being reactive to proactive, and create environments that integrate a vision for education with a vision for technology (Berrett et al., 2012; Schrum et al., 2011). A more current and ongoing understanding of the implementation of technology and its impact on the conditions for teacher leadership can inform preparation programs (Ottenbreit-Leftwich et al., 2012). Teacher leaders can be transformational leaders if they have a greater understanding of technology and the possibilities it presents as a tool for change. This is particularly significant at this time for it is clear that technological change is not just a periodic occurrence; it is an integral part of the ever changing educational landscape. Educators must think in terms of change as being part of the condition— something that was not considered in the 2004 analysis but is now very much a part of the world in which teacher leaders now educate. By not addressing this issue, the gap will only widen between teacher leaders and technology (Clarke & Zagarell, 2012), and thus jeopardize two critical areas for education reform.

(Keywords: teacher leadership, school culture, structure, roles and relationships, technology, technology implementation, principal leadership, principal preparation, teacher preparation)
**Positionality**

For ten years, the researcher has worked for leading education technology organizations and has been at the forefront of technological change in the areas of computer-based assessment, online learning, and data-driven decision making. As a result, he has been in classrooms around the world and worked with educators at all levels, seeing firsthand the positive impact that technology can have when understood and implemented correctly. Understanding that the bulk of his experiences have been in the world of education technology, the researcher recognizes the potential bias he may have toward the use of technology and is aware that his point of view comes from the vantage of the outsider bringing technology into the environment. The researcher also has substantial experience working in education and has worked with hundreds of teachers around the globe. However, having spent only minimal time in the classroom, the researcher is not a teacher. Thus, caution was needed in design, especially in the case of interviewing where knowledge of teaching is not assumed to be sufficient.

There were four areas of potential bias and misrepresentation of others. Those areas are the following: teaching, leadership, technology, and gender. As Briscoe (2005) points out, identity and situation in society shape understanding of the world.

**Teaching.** The researcher has spent the last 13 years in education working with teacher professional development. This has provided significant exposure and involvement with teachers. However, as mentioned, the researcher has neither been a classroom teacher nor spent more than a few hours at a time in a school environment. So as not to impact the potential depth of interviewing that is needed, it was important for the researcher to maintain an objective perspective and not assume that previous interactions are at all sufficient.
Leading. The researcher is a strong advocate for leadership and believes everyone can lead; however, this does not mean that everyone must lead. Since it was very possible that some participants would not want to be or act as leaders, it was important to be inclusive (Briscoe, 2005) and not show bias toward those that chose to lead.

Technology. As with leadership, the researcher has a strong belief in the need for technology in education where appropriate. It was important not to portray an attitude of technology for the sake of technology or create the perception that this is the case. As discussed, objectivity was important, especially when interviewing and interpreting information.

Gender. It was very possible that some of the participants would be female. The researcher is not part of this group and must be aware of an additional point of potential misrepresentation; however, Briscoe (2005) pointed out that “an author’s demographic positioning is a cause for suspicion, but not grounds for indictment” (p. 38).

Research Questions

The following research question is proposed:

- How has the implementation and integration of technology impacted the conditions that influence teacher leadership?

Theoretical Framework

This study focused on the impact of the integration of technology on teacher leadership using a current case. Specifically, it looked at conditions that influence teacher leadership as researched and defined in the meta-analysis conducted by York-Barr and Duke (2004). This analysis provides the most comprehensive view to date on the topic of teacher leadership, as well as a conceptual framework to guide inquiry. This study has become a key resource for research conducted since that time.
The study was structured around seven questions concerning topics such as who are teacher leaders, what do they do, and what are the effects of teacher leadership? It was in the question about conditions which influence teacher leadership where the findings were the most substantial (York-Barr & Duke, 2004). As a result of their findings, the authors proposed a conceptual framework that is comprised of seven components (See Figure 1). Within the framework, one of the major components is conditions, which includes: supportive culture, supportive principal, time, resources, and development opportunities (York-Barr & Duke, 2004).

Figure 1: Theory of Action (York-Barr & Duke, 2004)
This framework is designed to be grounded in the literature they reviewed, as well as provide a direction forward for teacher leaders to impact student learning. This “theory of action” as the authors refer to it (York-Barr & Duke, 2004, p.289) not only highlights the importance of conditions as they relate to teacher leadership for student learning; it also brings to light the other major components and how “conditions” relate to and fit into the overall scheme.

Conditions are those factors “conducive to cultivating and supporting teacher leadership, as well at those that challenge and diminish its effectiveness” (York-Barr & Duke, 2004, p. 268). The authors referred to this as one of three foundational components that emerged from the existing literature. Within their study, the authors identified three categories of conditions: school culture and context, roles and relationships, and structures. From here, they separated their findings within each category into what they refer to as “facilitators” and “challenges,” supported by research (See Figure 2). This format has structured this research by providing useful links to literature, helping guide the design, and giving reference points for discussion throughout the paper (Smyth, 2004).

**School culture and context.** An abundance of literature exists on the impact school culture has on school improvement initiatives (York-Barr & Duke, 2004). In citing the works of Katzenmeyer and Moller, and Little, the authors found that a school focused on learning, teamwork, and sharing, and where teacher leaders are valued as role models will be an environment that will facilitate teacher leadership. In contrast, lack of direction about purpose and a “crab bucket culture” (York-Barr & Duke, 2004) will create a challenging environment for teacher leaders (TLs). More recently, Roby (2011) commented on the influence that TLs can have on culture, while conversely, Ertmer and Ottenbreit-Letfwich (2010) noted how culture can
impact the use of technology, positively or negatively. Hence, the intersection between TLs, culture, and technology needs to be explored.

Figure 2: Facilitators and Challenges Table (York-Barr & Duke, 2004)

<table>
<thead>
<tr>
<th>School culture and context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitators:</td>
</tr>
<tr>
<td>· Positive environment for learning and inquiry</td>
</tr>
<tr>
<td>· Initiative is encouraged</td>
</tr>
<tr>
<td>· The environment is collaborative</td>
</tr>
<tr>
<td>· TL’s are considered role models</td>
</tr>
<tr>
<td>Challenges:</td>
</tr>
<tr>
<td>· No clear direction for organization.</td>
</tr>
<tr>
<td>· Teachers are isolated</td>
</tr>
<tr>
<td>· Egalitarianism is prevalent</td>
</tr>
<tr>
<td>· Lack of support and encouragement from other teachers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Roles and Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitators:</td>
</tr>
<tr>
<td>· Collegiality, trust and respect amongst peers</td>
</tr>
<tr>
<td>· TL tasks are essential to instruction and not just administrative or managerial</td>
</tr>
<tr>
<td>· Principals support TL’s</td>
</tr>
<tr>
<td>· Role clarity</td>
</tr>
<tr>
<td>· Understanding of about roles and relationships</td>
</tr>
<tr>
<td>Challenges:</td>
</tr>
<tr>
<td>· Hierarchical relationship structure</td>
</tr>
<tr>
<td>· Relationship with peers has changed</td>
</tr>
<tr>
<td>· Lack of role clarity between TL and peers</td>
</tr>
<tr>
<td>· Lack of role clarity between TL and principal</td>
</tr>
<tr>
<td>· No communication or feedback</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitators:</td>
</tr>
<tr>
<td>· Decision making is shared and participatory</td>
</tr>
<tr>
<td>· Hierarchical structures do not exist</td>
</tr>
<tr>
<td>· Leading is supported by</td>
</tr>
<tr>
<td>· Professional development programs that include learning and leading.</td>
</tr>
<tr>
<td>Challenges:</td>
</tr>
<tr>
<td>· Top-down hierarchical structure is in place</td>
</tr>
<tr>
<td>· No clarity regarding decision making</td>
</tr>
<tr>
<td>· Teachers are isolated and are not given time to collaborate</td>
</tr>
<tr>
<td>· No incentive to lead</td>
</tr>
</tbody>
</table>
Roles and relationships. Relationships with principals and peers play a key role in influencing teacher leaders. From a collegial standpoint, becoming a teacher leader changes the nature of their relationship with peers (Little, 1995; Miles-Weiner, 2011; Akert & Martin, 2012). The social aspects can be challenged by the new perceived role of teacher leaders. However, if these relationships are trusting and positive, they can help facilitate the role of TLs (Silva et al. as cited in York-Barr & Duke, 2004; Anderson, 2004). Concerning principals, the analysis highlights support, role clarity vis-à-vis uncertainty, poor communication, and confusion of roles as conditions that can facilitate or challenge teacher leadership. Miles-Weiner (2011) studied this relationship between principal and teacher and identified the impediments and barriers that can occur, and Teo (2011) and Berrett et al. (2012) pointed out how principals can have a significant influence on TLs’ use of technology.

Structures. Organizational structures that have been in place for decades can be detrimental to teacher leaders versus newer structures that foster learning and leading as part of a teacher’s role (Darling-Hammond, 2010; York-Barr & Duke, 2004). Traditional top down leadership structures tend to challenge teacher leaders (Randeree, 2006; Longwell-McKean, 2012). In addition, these older structures can isolate teachers (Coyle as cited in York-Barr & Duke, 2004). Hence, the removal of these older structures can act as a key facilitating condition.

As seen in Figure 2, the authors found 16 facilitating conditions and 17 challenging conditions, each supported by prior research. With the objective of fine tuning or updating these conditions, the literature review used this as a stepping off point and focused on research since 2004 to identify any work that has been done. With this as a basis, interviews were structured around these facilitators and conditions. It was intended to use each item as a basis for the development of questions, thereby guiding the research design (Smyth, 2004). The purpose was
to determine the impact that the implementation of technology has had on these conditions. The findings from the York-Barr and Duke (2004) study provide a thorough research-backed framework to inquire in this regard.

**Rationale for Selection**

The meta-analysis conducted by York-Barr and Duke (2004) provides a wide-ranging and deep look at the research to date. It is grounded in both research and theory and includes 100 cited sources from 20 years of research. Additionally, the study relies heavily on the seminal works and theories of Leithwood, Smylie, Hart, Harris, Katzenbaum, and Darling-Hammond. Since 2004, this analysis has been widely cited throughout the literature on teacher leadership.

The authors provide a structure and framework to present the findings. This same structure was used to consider research since 2004 that was guided by the previous findings. The findings from this more recent research were overlaid onto the framework to bring it more in line with current understandings of the conditions that influence teacher leaders.

**Conclusion**

Teacher leadership has great potential as an education reform initiative; therefore it is important to understand the conditions that might facilitate or challenge these initiatives. In their meta-analysis, York-Barr and Duke (2004) provided the details of these conditions based on 20 years of scholarship. However, much has changed since that time, especially in the area of technology. It has been pointed out that there is a need to bring forward the work of these researchers by accounting for the impact of the implementation and integration of technology on these conditions. The meta-analysis itself provided an ideal structure and framework to analyze the phenomenon of technology.
Chapter II: Literature Review

Introduction

As we seek ways to reform and transform our schools and acknowledge that teacher leaders can play an important role in this effort; it is important to understand teacher leadership within the context of an ever changing environment, largely due to technological innovation. To explain this situation, it was necessary to conduct a review of the literature regarding this changed environment, understand what type of leadership can be most effective, and learn what the literature says regarding the transformational role that teacher leaders can play.

In order to fully understand the need for transformational teacher leadership, the conditions that are conducive to allowing this leadership to thrive must also be examined. Within the categories of school culture and context, roles and responsibilities, and school structure, a review was conducted on the literature to understand what may have changed in regard to these conditions and to understand the relationship between teacher leadership and technology.

Leadership in Our Schools

In considering the topic of leadership in our schools, it is critical to understand the current and ever changing circumstances that are impacting school leadership. There have been a number of key developments over the last twenty years, and the following are three important examples in which effective leadership will be essential to move our schools forward:

Diversity. School enrollments have increased 12% since 2006 and are expected to increase another 8% by 2018 (Hussar & Bailey, 2009). A closer look at these numbers reveals an increase of 4% for students who are white and above 25% for American Indian, Asian, Black
and Hispanic students. Many principals feel ill-prepared to deal with the growth in the number of students from more complex populations with differing demands (Portin et al., 1998).

21st century leadership. A recent report put out by the OECD (Schleicher, 2012) highlights the need to address a more sophisticated learner who must be prepared to change with a rapidly changing world. This is all in the context of a “flat world” where competition is no longer limited to the local or regional economy but is now impacted on a global basis right from individual homes. To manage through this, there is a growing movement toward autonomy in the form of charter schools and the like, which have grown to over 5,000 schools in 2011 (U.S. Department of Education, National Center for Education Statistics, 2013). With autonomy comes a greater reliance on school leaders, which impacts their time and subsequently their effectiveness (Schleicher, 2012).

Technology. Perhaps the most profound changes in education have been in the area of technology. Nearly every aspect of our schools, from administration to teaching and learning, has been impacted by technology. Data-driven decision making, online learning, and computer-based assessment have come of age in the last 10 years, adding a level of complexity that was not anticipated when schools were designed. More so, these technologies have in no way reached their full potential, with new products and services being introduced at the same time educational leaders are implementing the most recent innovations. What makes this particularly challenging is that with 24/7 access many of these technologies are already in the hands of students, thus altering the learning environment in ways that are challenging educators worldwide (Schleicher, 2012).
**Transformational Leadership**

Transforming our schools will require transformational leadership. One of the first to define *transformational leadership* was J.M. Burns (1978) who said this occurs “when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality” (p. 20). In this case, the appeal to followers touches their moral values as opposed to their own interest (Yukl, 2012). Burns (1978) was concerned mostly about our political leaders; however, his ideas have been widely referenced and expanded on in education. In his seminal article on school restructuring, Leithwood (1994) discussed the evidence of transformational leadership practices in schools.

Leithwood and Jantzi (2005), in their analysis of transformational leadership research, identified four leadership behaviors: setting directions, helping people (modeling, support, and intellectual stimulation), organizational redesign, and transactional (management). The authors found that there was substantial and growing evidence in support of the impact of transformational leadership in areas such as school culture, organizational commitment, job satisfaction, and student outcomes.

Transformational leadership plays an important role in developing effective schools (Onorato, 2013). However, the vast majority of the leadership research on transforming schools is directed toward principals. This is primarily a result of principals being considered the only transformational leaders within schools (Anderson, 2008). Hence, a tremendous burden is placed on principals to reform schools on their own. Much has changed since schools were envisioned, and as schools move through the second decade of the 21st century, the level of complexity in leading schools has evolved in ways that make a sole transformational leader no longer sufficient (Marks & Printy, 2003).
Distributed Leadership and Teacher Leadership

Spillane et al. (2001) argued, “While individual leaders and their attributes do matter in constituting leadership practice, they are not all that matters. Other school leaders and followers also matter in that they help define leading practice” (p. 27). Distributed leadership is at the forefront of much of the leadership research. It is widely agreed that the complexity of managing schools can no longer be left to one individual (Hulpia et al., 2012; Harris, 2003) and that it is necessary to distribute functions within the leadership role across several individuals, hence, making it a more social process (Hulpia et al., 2012; Spillane et al., 2001; Harris et al., 2007). As Spillane (2006) pointed out, distributed leadership is about interactions between principals and others within a situation.

The evidence in support of the positive aspects of distributed leadership is growing, as is the evidence that leaving the transformation of schools to one person will not work (Harris et al., 2007; Marks & Printy, 2003). However, the question is not so much that leadership should be distributed but rather how it should be distributed (Spillane, 2006). For decades, leadership was considered to be within the realm of one person, the principal. Others, especially teachers, were not hired, trained, or required to lead. This poses a dilemma for those in support of asking teachers to participate in and take on leadership functions within schools. School leaders are left with the pressures of an increasingly complex environment—looking for more leadership, only to be calling out into the darkness hoping that all teachers, or at least some, will answer the call to lead. Teachers have thus been brought to the center of the discussion on leadership within our schools. This has been an evolutionary process, for what was meant by leadership in the 1970s is now defined much differently. The concept has moved from department head to instructional leader, to something today that is more conceptual and less embedded in some hierarchical
nomenclature (Pounder, 2006). Pounder (2006) asserted that teacher leadership is a process as opposed to something related to position. This makes teacher leadership challenging to define, and even today there is no set definition of teacher leadership.

Even though the research on defining teacher leadership contains varying perspectives, certain themes are consistent throughout. Teacher leaders lead both in and outside the classroom; they influence colleagues, school administration, and the overall school community toward improvement (Frost & Harris, 2003; Danielson, 2006). In their meta-analysis, York-Barr and Duke (2004) defined teacher leadership as “the process by which teachers individually or collectively, influence their colleagues, principals, and other members of school communities to improve teaching and learning practices with the aim of increased student learning and achievement” (pp. 287-288). This definition underscores two areas of leadership: instructional and organizational. It is at the organizational level that this review is most concerned; however, while instructional leadership focuses more on learning outcomes, certain other aspects can affect the organization. For example, teachers as instructional leaders can help develop a school-wide culture of a solid work ethic and high achievement (Roby, 2011; York-Barr & Duke, 2004). At the organizational level, teacher leadership is thought to fall into the category of participative leadership, and this is where most of the research is concentrated. In this case, leadership is distributed and shared with teacher leaders, but what of transformational leadership?

Leithwood and Duke (1998) identified six categories of leadership: instructional, transformational, moral, participative, managerial, and contingency. Of these categories, the authors pointed out that teacher leadership is aligned with only instructional and participative. Hence, little or no literature up to 2004 placed teacher leadership in the transformational category. In the review of literature since then, there are indications that this has changed. In his
study of rural schools, Anderson (2008) found cases where teachers exerted such a great influence on the school that it was fundamentally transformed. He noted that the decision-making style in these schools tended to be highly interactive and distributed. Anderson (2008) also highlighted the importance of leadership reciprocity between teachers and principals.

This study points to the transformational aspect at the organizational level; however, it can be also seen at the instructional level. Pounder (2006) called this transformational classroom leadership and referred to this as the “4th wave” of teacher leadership, whereby transformation takes place at both the school and in the classroom. Thus, teacher classroom leadership can have a significant influence on student attitude and achievement. Understanding the transformational potential that teachers have both at the classroom and school level has implications for understanding the impact of technology, for technology is transformational itself at both levels. The potential of leveraging the combined effect of transformational leaders, both teachers and principals, along with transformational technology, has significant ramifications for our schools and the future of education.

**The Conditions That Influence Teacher Leadership**

In 1989, Mark A. Smylie and Jack W. Denny conducted an “exploratory” study in a metropolitan K-8 district located in the Midwest. At the time, the district had initiated a comprehensive career enhancement program, resulting from an agreement between the school board and the local teachers union to create more opportunities for development, reward, and expansion of their roles (Smylie & Denny, 1990). Teacher leadership surfaced as one way of addressing the needs of the program.

Smylie and Denny (1990) explained that up to this point, the development of teacher leadership focused on the individual as being “anointed” to these roles, assuming that, as teacher
leaders, they can drive change and that their peers and administrators will understand and support them. They pointed out that little research had been done on how organizational factors may influence the development of teacher leaders and teacher leadership within a school. The authors studied 13 teachers in their second year of the program and found that role definition and performance were significantly impacted by the organizational circumstance in which they worked. The circumstances include the structure, as well as the relationship and interactions with peers and administrators.

Another study conducted by Smylie (1992) within the same district sought to consider the interactions between teacher leaders and other teachers. This study focused on social context and psychological orientations (sense of equality, autonomy, privacy) and found that established norms for collegial relationships amongst teachers would not necessarily be offered to teacher leaders. This finding ran counter to the expectation of the Smylie (1992) study, as he had expected a positive relationship between social context and interactions between teachers and teacher leaders. Consequently, administrators must account for the professional belief systems as an additional environmental factor in understanding teacher leadership.

Weaver Hart (1994) used role theory not only to provide another interpretation of how the dynamics of a social structure can impact how roles are understood but also to show how this can affect the final design of the role within a school. Two junior high schools (North and South) were chosen to take part in a comparative study. Role theory offered three key insights: 1) when people take on a new role, they shape new expectations within the existing group, 2) existing social norms are resistant to change, and this change can cause stress, 3) as people interact they construct a shared reality (Weaver Hart, 1994). Weaver Hart found that the “competition” between new and old behaviors challenged both teachers and principals. She
found that, regardless of how well planned and structured teacher leaders were, their roles were eventually determined by how they worked in a particular school. As Weaver Hart (1994) argued: “This suggests that much thought to a particular function of teacher leadership in each unique context is warranted” (p. 494).

The aforementioned research considered teacher leadership to be assigned into pre-designed roles. The studies went on to point out that problems with this arise when these roles are placed against egalitarian norms that exist in schools. Darling-Hammond et.al. (1995) acknowledged this and presented an examination of professional development as a way to address this. Through in-depth case studies, they asserted that teacher leadership is tied to teacher learning and that it can be built into roles that do not produce formal hierarchies. As a result, leadership becomes part of the common role of a teacher (Darling-Hammond, et.al. 1995). This helps to address the assertion of Smylie and Denny (1990) that teacher leadership responsibilities need to evolve with schools and their idiosyncratic situations.

In her 1995 analysis, Weaver Hart (1995) used non-hierarchical leadership theories to look at new work structures within teacher leadership design. She contended that the ambiguities and tensions that Smylie and Denny (1990) revealed are a product of “forced collaboration” and “required participative decision making” that are part of many teacher leadership environments (Weaver Hart, 1995). Weaver Hart advocated for greater attention to the selection of an appropriate leadership model, specifically a non-hierarchical approach.

After 1995, it appears that teacher leadership reforms waned until the early part of this century when there was a “resurgence” in interest. This prompted York-Barr and Duke (2004) to conduct a meta-analysis of twenty years of scholarship. In this study, they drew on 140 sources and cited 100 articles. The research centered around seven questions relating to the how, what,
why, and who of teacher leaders. Of the seven questions, York-Barr and Duke (2004) noted that the question — “What conditions influence teacher leadership?” — was most reliable (p. 268). This analysis played an important role in the history of the work of Smylie and Denny (1990) in that it summarizes and categorizes those conditions and their interrelated characteristics. Those conditions are school culture and context, roles and relationships, and school structure (York-Barr & Duke, 2004). Understanding the conditions that positively and negatively influence teacher leadership was one of seven fundamental areas on which York-Barr and Duke (2004) focused in their meta-analysis. In fact, the authors candidly stated that the findings in this area “were the most robust and consistent” (York-Barr & Duke, p. 268). In their analysis, the implementation of technology was not mentioned as a conditional factor that impacted teacher leadership, and yet an abundance of research has been conducted since that time. It is quite possible that the reason for this omission of technology was due to the fact that technology implementations within education was still in its infancy in 2004 and prior. However, this has changed dramatically as computer use has risen significantly in the last 10 years. The use of technology has increased such that there are very few areas where it has not affected education, and its use continues to grow. It is therefore important to understand its influence, positive or negative, on teacher leadership.

In addressing the conditions that influence teacher leaders, York-Barr and Duke (2004) presented a framework which can be used to consider the integration of technology’s influence. In this framework, the authors offered three categories of conditions: school and culture, roles and relationships, and structures (York-Barr & Duke, 2004). These provide a suitable format by which to consider the impact of implementing technology. In addition, within each category the authors identified “facilitators” and “challenges.” The objective of this review henceforth is to
consider the impact of technology within this framework through the review of the literature since 2004. As acknowledged in the meta-analysis, some overlap between these categories will occur because in reality culture, relationship, and structures are intertwined on a day-to-day basis. In these cases, some effort will be made to highlight these instances.

**School Culture and Context**

York-Barr and Duke (2004) pointed out that school culture is commonly believed to have a strong influence on school success and therefore on teacher leadership. A culture of shared decision making, collegiality, and one that supports learning and teamwork, versus a culture that lacks in direction and fosters isolation, will produce very different outcomes for teacher leaders. No doubt, technology has played a disruptive role in regards to culture over the last decade, and the research shows that this disruption has consequences for teacher leaders. Teacher leaders can have a strong influence on culture (Roby, 2011); thus it is important to understand the intersection of technology, culture, and teacher leadership, so as to determine how TLs can leverage technology, as well as how they can avoid having it become an impediment.

As technology has evolved beyond the desktop and into the cloud, more technology is now accessible throughout the school building. This means that all teachers, along with their principals (and even parents and students), can share information in real time. The potential this has for supporting teamwork and sharing may be obvious, but as Ertmer and Ottenbreit-Letfwich (2010) pointed out, cultural pressures can override the potential of technology. For this reason, teachers will conform to the cultural norms, which can impact the use and potential effects that implementing technology might have.

One aspect that appears to be behind a cultural attitude toward technology, whether positive or negative, has to do with its perceived usefulness. Teo (2011) found that attitudes,
perceptions, and conditions had a direct impact on the intention to use technology. It is interesting to note that facilitating conditions such as adequate support and ease of use played the greatest role in their decision to use technology. Finally, regardless of conditions and cultural attitudes, Teo (2011) found that rapid technological change had a negative impact on teachers’ use if ongoing professional development was not in place.

The implementation of technology can provide an opportunity for tech savvy teachers to take initiative in new ways, but this appears to happen primarily when technology is valued along with the need to teach others. As Lundeberg et al. (2004) stated, “this overriding belief – that technology integration is important – along with the value they placed on teaching others was a central theme” (p. 36). In this case, the underlying belief in technology must be present in order for teachers to use it as a vehicle to take more initiative. In this sense, technology is not the driver behind teacher’s initiative; rather, the integration of technology becomes the vehicle by which teachers take initiative.

A study conducted by Muijs and Harris (2006) considered teacher-led school improvement. The authors set out to determine the ways in which teacher leaders could impact school improvement and what factors helped in this process. They identified 10 factors, such as a supportive culture and structure and, most pertinent to this review, a commitment to action inquiry and data richness. Data were used to inform process, and each of the schools was very involved in the collection of data. Thus, data — a by-product of adopting and using technology — became a key factor in supporting teacher leadership and its subsequent impact on school improvement. Once again, a supportive environment and culture that impacts the use of technology is the underlying factor, not the reverse. It is difficult to determine in these cases whether integration of technology was the catalyst that created the opportunity to take initiative.
It has been noted that teacher participation in decision making has been shown to increase educational change in schools (Geijsel et al., 2007). What role does, or can, technology play in improving the chances of shared decision making? In a study on team-based technology leadership, Dexter (2011) conducted a cross-case analysis of middle schools with laptop programs. The author found that “technology leadership should be considered a school characteristic, one shared by a team of people” (Dexter, 2011, p. 184). She further noted that the purpose for which technology will be used must be part of a vision that is shared among the technology leadership team. Peck et al. (2011) also highlighted the importance of developing school based technology teams and went on to assert the importance of recognizing those most tech savvy. While they recognized the important role technology can play, they concluded that it will be capable educational leaders that will lead any reforms through the adoption of technology.

The emphasis is thus on leaders and leadership that is shared and not on the wonder of technology. In fact, in many cases technology can be problematic as schools attempt to implement into environments that are not particularly suited for technology integration (Clarke & Zagarell, 2012). To bridge this “technological divide,” the issues at both the administrator and teacher level need to be addressed. Specifically, at the teacher level there is the concern of time to practice and use technology. It is essential that to be part of the decision-making process, teachers and administrators need the time to learn and keep abreast of current technology. As Clarke and Zagarell (2012) pointed out, collaboration is key to assuring that technology is properly integrated.

It is often the case that school cultures and teaching norms run counter to the success of teacher leaders. York-Barr and Duke (2004) referred to the “crab bucket culture” that can exist
which holds teachers back from trying to rise up as leaders. Egalitarian norms that exist make it difficult for teacher leaders to be seen as role models and examples for other teachers (Margolis & Deuel, 2009). Given the often mission critical importance of proper implementation of technology, this could be detrimental to technology reform within a school. Technology is often seen as complicated and sometimes threatening to teachers. There is, therefore, a need to develop technology leaders within the school teaching community who other teachers can look to as examples of “go to” individuals for support and guidance. Principals as key technology leaders need to look to develop cadres of teachers within a school (Chang et al., 2008). They must be able to develop this interest where they can and allow others in the community to leverage this as a way to foster a comfort with technology throughout the school. Technology may provide opportunities for teachers to lead, but if the “crab bucket culture” exists, it will hold them back and become a barrier to the potential for reform (York-Barr & Duke, 2004).

In a study conducted by Lundeberg et al. (2004), which looked at using pre-service teachers as technology leaders to support and mentor in-service teachers, their findings indicated that pre-service teachers can simultaneously teach others and develop leadership skills along the way. However, the researchers were concerned about whether these skills would carry over once new teachers are immersed into a particular school culture (Lundeberg et al., 2004). Thus, while there is value in developing technology leadership skills in preservice teachers, no guarantee exists that these efforts will sustain themselves. It is highly dependent on the culture and norms of each school.

The norm of egalitarianism was also identified in the York-Barr and Duke (2004) report as an area of concern; however, the authors pointed out signs that this was changing. These changes seemed to present themselves in the form of communities that valued collective learning
and collaboration, but it was noted that this was far from pervasive (York-Barr & Duke, 2004). The question to be posed in the context of this review is, have these communities become more prevalent and, where they are present, has the implementation of technology played any type of role?

Kopcha (2010) showed how important communities are in the development of his systematic approach to adopting technology in more student-centered ways. His approach comes in four stages in which the fourth stage is community of practice. His model is used to work through multiple barriers that include beliefs and culture. Kopcha (2010) noted that, by the fourth stage, teachers have expressed a desire to work together and share ideas about the integration of technology. By developing these technology leadership communities, a shift from expert-led to teacher-led occurs. Kopcha (2010) expressed: “The collaborative approach promotes sustainability because each generation of technology-using teachers serves as mentors for other teachers” (p. 185).

Dickerson and Helms-Stevenson (2011) pointed out that collaboration within a professional community helps decrease teacher isolationism, something that is consistent in cultures of egalitarianism (York-Barr & Duke, 2004; Margolis & Deuel, 2009). Thus, it is clear that collaboration, especially where technology is being integrated, can play a key role in success. However, collaboration and professionalism are not a cure-all and cannot be forced; in fact, if handled incorrectly, they may actually reinforce the existing status quo (Dickerson & Helms-Stevenson, 2011). Much of this is dependent on the existing relationships that exist within a culture.
Roles and Relationships

Culture, traditions, customs, and the way of life in a school are a by-product of interactions among people. The relationships that develop within a culture can influence the attitudes and behaviors of leaders (Yukl, 2012). Teacher leaders are particularly affected because of the relationships they must have with other teachers and their principal (York-Barr & Duke, 2004). To be successful, they must establish appropriate relationships that foster cooperation and communication. Failure to do so can result in the development of barriers that will impede the progress of a teacher leadership initiative (Miles-Weiner, 2011). Teaching has tended to be highly individualistic (Hargreaves & Fullan, 2012); however, there is movement toward a culture of collaboration where relationships become essential. In the last 10 years, one of the largest technological innovations has been in the area of internet computing and the subsequent development of cloud based computing. Sharing and collaboration is an essential element of cloud-based computing.

Chang and Lee (2010) conducted a study on project-based learning in which multimedia technology was used to assist in implementation. Given the time constraints, cooperation between computer teachers and subject teachers was a key factor involved in implementing such a program alongside the daily demands of teaching subject matter. While the technology provided a potential significant enhancement to the project-based learning model, it also posed support and technical needs issues for both teachers and students. The findings indicated that the team teaching approach was a success; moreover, as the author’s stated, “computer teachers sensed a newfound respect from other teachers,” (Chang and Lee, 2010, p. 967). This ties back to the findings by York-Barr and Duke (2004) of the need for positive relationships based on
trust (Hargreaves & Fullan, 2012). The complexity and sophistication involved with an implementation of technology only amplifies this need.

Role identity and definition has been, and continues to be, a problematic area for teacher leaders. This is due largely to the fact that many different interpretations of teachers as leaders exist. As a result, teacher leaders are often put into situations, especially with peers, that quickly become untenable (Miles-Weiner, 2011; Dawson, 2011). As more is learned about teacher leadership and its potential, defining this role becomes more challenging, as Angelle and DeHart (2011) revealed in the varied perceptions of teacher leaders by experience, degree, and position. This trend of complexities continues, since the needs from different disciplines such as math have added subject area requirements (Hanuscin et al., 2012) and, as discussed above, there is a subset called technology teacher leaders.

As teachers become part of the technology leadership cadre, their individual identities come into play, and in many cases they need to change (Ertmer et al., 2012). Kim et al. (2013) have shown that their beliefs about the use and value of technology play a role in their ability to integrate technology in the classroom. In fact, in the research of Ertmer et al. (2012), teachers pointed to their own attitudes as being a major impediment. More so, they required additional knowledge about how to use technology — not only about how it works but about the pedagogical methods that can be used to improve learning (Ertmer & Ottenbreit-Leftwich, 2010). What is interesting to note, are the changing attitudes of teachers toward technology. Kim et al. (2013) put forward that there has been significant effort put into professional development and preparation of teachers which may be paying off. Ertmer et al. (2012) suggested three possible reasons: a greater access to technology, a better understanding of the 21st century student, and an
increased emphasis on 21st century priorities within the curriculum that are supported by the principal.

These findings are encouraging, but challenges still exist in regards to role. Many teacher leaders are unclear about their role as leaders, and many are still concerned about how their peers will react (Dawson, 2011). This lack of definition not only frustrates teacher leaders; it also impacts the potential that a distributed model may hold. In the absence of definition, certain de facto definitions arise, and teacher leaders are often left to “figure it out on their own” (Margolis & Huggins, 2012). Margolis and Huggins (2012) stated that the lack of definition “had a pervasive impact on the success of teacher leaders” (p. 968). This lack of clarity led to misuse, underuse, and inefficient use of teacher leaders. Put in the context of the complexities of implementing technology, the effects could be detrimental.

**Principal and teacher leaders.** There is an abundance of literature on principals as leaders within a school. As teacher leadership takes hold, the shift in the role of principal from leading in a traditional hierarchical structure to leading in a more distributed environment becomes a focal point for research. The relationship between teacher and principal is crucial in any structure; however, as teachers are asked to take on more of leadership functions, this relationship takes on an even greater importance. York-Barr and Duke (2004) identified three areas where principals can become facilitators in influencing the conditions that would be favorable for teachers: 1) support through structures (to be discussed in the next section), behavior, coaching and feedback; 2) clarification regarding responsibilities of a teacher leader vis-à-vis principal; and 3) care in relation to how they work together (York-Barr & Duke, 2004). As discussed, implementation and utilization of technology require collaboration school-wide, especially among those leading any initiatives. It is crucial, therefore, that principals do what
they can to develop the leaders among them. Teachers must be able to see the valuable role they play as leaders (Phelps, 2008), and principals can lead the way in this regard.

Teo (2011) asserted that principals significantly influence teachers’ intention to use technology. Given that teacher leaders are becoming increasingly important in school improvement movements, it is important to support teacher leaders not only for their own success (Miles-Weiner, 2011) but for the success of any initiatives the principal might be championing (Akert and Martin, 2012). In other words, principals need teacher leaders; thus, any support they may give will have a return to the principal and thereby the school. Akert and Martin (2012) studied the perceptions of teachers and principals towards the impact of teacher leaders in school improvement. They concluded that teacher leaders can play a role in school improvement, but principals must first understand what motivates teacher leaders to lead beyond the classroom, as well as what barriers might exist. Only after these steps should principals provide opportunities for teachers to lead (Akert and Martin, 2012).

The connection between principal support, teacher leader success, and successful implementation of technology seems obvious; however, some research indicates that there is no push to make administrators accountable to this need (Schrum et al., 2011), even as it has been acknowledged that technology can play an important role in the lives of educators. Schrum et al. (2011) stated, “They use technology in their jobs for communications, data analysis, and student management, as well as for productivity” (p. 254). Thus, in regards to support as a key influencing factor on teacher leadership, technology has added an additional complexity that needs to be considered. Principals must be better prepared to understand the needs of teacher leaders in the area of technology integration (Schrum et al., 2011). Otherwise they run the risk of an inadequate and, in some cases, failed implementation of technology.
One of the challenges in roles is making clear where the lines of responsibility lie between teacher leaders and principals. Defining these is especially important as a distributed leadership model comes into play because there are naturally more grey areas that can arise. This is also important for teacher leaders who are new to taking on or sharing some of the functions of administration (Murphy et al., 2009). If these are not made clear, tensions can arise between TLs and principals, as well as between TLs and their peers. Trust, as Smylie et al. (2007) pointed out, is one aspect of these relationships that is particularly significant. In their study of six secondary schools, the authors focused on trust and its relationship to distributed leadership designs. In relation to domains of responsibility, trust allows for a greater sense of security, while a lack of trust brings on feelings of anxiety. Blegen and Kennedy (2000) stated: “While principals may be willing to share decision making about the issue of when and where to have the staff social of the date for parent teacher conferences, they may not be willing to give up power over many important decision for which they will be held responsible” (p. 4).

This attitude runs counter to trust and directly impacts “important decisions” such as the integration of technology. How leadership is defined and distributed is a key issue in the integration of technology in schools. It is essential that administrators recognize this and address this as it pertains to how participants plan and interact with each other (Schrum et al., 2011). While technology may be just another complex initiative that school leadership must address, it can be argued that lack of technology skills at both the principal and teacher leader level may heighten the need for definition of leadership domains.

Beyond role definitions, which can be spelled out on paper, daily interpersonal relationships must be taken into account as well (York-Barr & Duke, 2004). The relationships that can evolve between teacher and principal are complex, and it would be impossible to discuss
all the potential variations in relation to technology. However, when investigating the impact of technology implementations on the two roles, it is worthwhile to point out some of the complexities that can occur between principals and teacher leaders. Understanding the fundamental relationship that exists between principal and teacher may provide insight into why technology integrations may succeed or fail.

Anderson (2004) offered three “models of influence” that he identified in a study of six schools. The author referred to these as the buffered model, the interactive model, and the contested model. These models signify different types of relationships that existed within the schools and their high degree of variability. Each represented a degree of mutual influence ranging from a principal surrounded by teacher leaders yet insulated from interaction with others to the principal being fully engaged with the wider community. Anderson (2004) suggested yet a third scenario in which the principal is pitted against teacher leaders.

Given the variability of relationships, the egalitarian norms that exist and the often vague definitions in roles and responsibilities, it is clear that much work needs to be done in making relationships work. No doubt, principals play a central role in identifying and addressing these hurdles, but teacher leaders must also be active in making things work. As leaders, they too need to proactively work with principals to develop relationships that foster collaboration. If positive relationships are in place, then a starting point exists for shared leadership within a school. Attitudes can be changed, cultures can be shifted, and schools can be transformed, but it requires a collective leadership that can put the appropriate structures in place to sustain success.

School Structures

In this section, the literature regarding school organizational structures will be discussed. The focus will be on those structures that support teacher leadership and participatory decision
making, which includes the structural dimensions of a school as well as the processes for communication and information flow. The elimination of hierarchical structures is an important aspect of creating favorable conditions. The overarching point is that, while proper culture and appropriate relationships are key factors for success, the wrong structure will hinder these efforts (Randeree, 2006; York-Barr & Duke, 2004). As new structures interact with old cultures, a reculturing effect can develop, forming new relationships and role definition. Thus, it is important to note the intersecting points that can, and perhaps need, to occur to optimize the conditions favorable to teacher leadership.

What about technology? The integration of technology in a school now occurs at multiple levels—from the classrooms to administration. What is more, this integration is now being extended to homes. With the move of technology from the desktop to the cloud, information is now accessible everywhere. Online learning, computer-based assessment, classroom teaching platforms, and the ability to generate content in real time are recent innovations that present an interesting conundrum in structures and schools that were designed at the beginning of the last century (Schleicher, 2012). So while the literature will be reviewed in terms of these existing structures, it must be acknowledged that it may be time for a completely new way of thinking that will usher in a new era of structures, create cultures based on a new set of beliefs, and introduce new roles that require different relationships. This may soon be the elephant that is sitting in the room of every discussion in regards to structure.

Linda Darling-Hammond (2010) called for a major redesign of our schools with a focus on teacher learning and collaboration. Darling-Hammond (2010) saw this as a catalyst for shared leadership and as essential to obtaining and maintaining good teachers. In her world, there is a focus on schools as learning organizations, and a key component of this is teacher
professional development. Randeree (2006) supported this concept of developing schools as learning organizations and outlined the benefits. First, learning organizations are more open and tend to be without layers, allowing teachers to engage and collaborate more freely. Second, they are boundary less with a reduced emphasis on roles. Third, learning organizations, which are inherently non-hierarchical, are less rigid and more open to change (Randeree, 2006). However, there are barriers in the path to a learning organization, such as school architectures originally designed around the factory model. Information technology as we know it today is not bound by this model and is in many ways encumbered by it.

Structures that support professional learning are highly conducive to the integration and utilization of technology in the classroom and throughout the school. Teachers, regardless of their technological savvy, need ongoing development; even those who consider themselves as more advanced users cannot keep up with the constant change and innovations being made (Clarke & Zagarell, 2012). In a study conducted by Cifuentes et al. (2011), the authors looked at three school districts to understand the impact of professional learning communities on technology integration. They found that “most teacher’s concerns and expressed barriers to technology integration can be overcome at little expense through an active learning community,” (Cifuentes et al., 2011, p.78).

Technology is complex and will require training regardless of the structure. However, as indicated, learning is more enhanced when embedded in the community and thus shared. The literature showed that structures which support learning are more constructive for teacher leaders. The literature further showed that the use of technology requires substantial and ongoing professional development. Therefore, a structure that is focused on organizational learning not only helps facilitate teacher leadership; it also aids in the integration of technology.
The intersection of technology, structure, and teacher leadership may be an area for further research, as educators struggle to find the optimum design.

Another area to consider in a discussion of structural conditions is school level. High schools, middle schools, and elementary schools have different structures and decision-making designs. The departmental subject matter structure of a high school is quite different than that of an elementary school. Angelle and Schmid (2007) analyzed teacher leadership within these structures and identified five categories of teacher leadership: decision maker, role model, intermediary positional designee, supra-practitioner, and visionary. As these categories emerged, it was clear that the application of each was largely dependent on the level of school. For example, decision maker teacher leaders were only identified at the middle and elementary school level, while there was a much higher rate of identifying teacher leaders as supra-practitioners and role models at the high school level. What is most interesting is that 0% of teacher leaders were identified as decision makers at the high school level. Angelle and Schmid (2007) pointed out that “decision maker” was defined differently at each level. Elementary schools considered their role as advisory, while middle schools considered their role in decisions as shared with the principal. In contrast, high schools indicated that all decisions were top down.

This has significant implications in relation to the integration of technology and how technology is utilized in a school. Roles and perceptions of teacher leadership can vary by school level. As principals put together their technology teams, it will be important to understand the structure and, thereby, the processes by which decisions are made. Moreover, this may be more critical information for central offices that are implementing district-wide technology initiatives. Superintendents, in particular, can play a significant role in both teacher
leadership initiatives (Wells et al., 2010). Understanding the nuances of the different structures as they relate to teacher leadership may help superintendents better support these initiatives.

Hierarchies. Spillane (2006) wrote that “the heroics of leadership genre has a stranglehold on how we think of leadership” (p. 103). In the case of our schools, the hero is often thought to be the principal; yet the heroes in our classrooms are teachers. Bringing this combined heroism together would seem to be a powerful combination. However, hierarchical structures supporting top down decision making still prevail. Shared, or participative, leadership involves empowerment, joint decision making, and democratic management (Yukl, 2012). It is not autocratic but rather results in more delegation. The positive results of this type of sharing is usually better decision quality, greater acceptance, development of all those who participate, and a decision process in which everyone is satisfied (Yukl, 2012). As previously discussed, this can be highly advantageous in the complex situations that schools currently face. Teacher leaders can thrive in this environment; however, barriers certainly exist. One such barrier is the aforementioned hierarchical structures, which is also a cultural issue that shows how structures and cultures are intertwined. As Lindahl (2008) pointed out, hierarchical leadership is often culturally entrenched, meaning that many principals reached their position as heroic leaders. The impact of this type of structure is not only unfavorable to teacher leadership (York-Barr & Duke, 2004); it also impacts technology integration.

Hsu and Sharma (2008) identified the importance of a transformational leadership team that brings combined expertise, the ability to collectively lead change, and a shared vision. They noted that the leadership team was far more important than any one individual in leading change. Most importantly, Hsu and Sharma (2008) pointed out that this holistic approach is more
inclusive of different views and enables those involved to plan for the roles, structures, and resources needed for sustained change.

With results such as those shown by Hsu and Sharma (2008), why has shared leadership not taken hold in many schools? Lindahl (2008) suggested that this is due to the lack of schools that differentiate between administration and leadership, especially as it applies to teacher leadership. Teacher leaders are often asked to take on administrative functions such as scheduling and curriculum development, which they find takes too much of their time. Consequently, they become disillusioned with leadership. Lindahl (2008) argued that these administrative functions tend to be more hierarchical in nature and help to frustrate efforts to move to a more shared structure. He concluded that, while shared leadership has benefits, more empirical evidence is needed, and Kocolowski (2010) concurred, stating that “research concerning several elements of shared leadership in the realm of educational institutions reveal mixed results” (p. 25). However, he also concluded that even with the challenges of implementing shared leadership, research shows that the benefits are greater.

The advantages of shared decision making, such as empowerment, shared vision, and higher quality decisions (Yukl, 2012), and the disadvantages of hierarchical structures, such as top-down decisions, and isolation (York-Barr & Duke, 2004), make increased efforts in the direction of participative structures more appealing. Teacher leaders require significant support from principals in the form of interaction, communication, and clarity. Moreover, they require a collaborative, collegial, and respectful relationship with their peers that can be better cultivated in a shared structure. This is very pivotal in the area of technology integration and utilization, which requires teams (Hsu and Sharma, 2008) and a sharing of ideas, skills, knowledge, and effort.
While it seems obvious which structure would be most beneficial to teacher leaders, especially when the integration of technology is a part of the reform movement within a school, structure alone is only part of the solution. People ultimately have to work together, and this requires a culture and a relationship orientation that embraces teamwork and shared decision making. Therefore, if the culture is not supportive of teacher leaders or technological innovation, and if roles and relationships are not defined and structured properly, a shared structure will either fail or not be optimized. As Lindahl (2008) acknowledged, a shared model requires a considerable shift in culture, and the process of change runs counter to the traditional structures of schools. He further pointed out that the principal is generally accountable, and this poses another possible point of resistance.

If shared leadership holds such promise, how then can a move toward shared leadership occur? What can principals and teacher leaders do to initiate change and sustain that movement through all the road blocks they must face? The answer may well lie in developing a better understanding of the relationship between shared leadership, teacher leadership, and technology integration. Future research may be needed to look closer at this intersection to understand how one impacts the other and how the three taken together may represent a single reform movement.

Conclusion

Transforming our schools will take leadership, and while much of the emphasis throughout the history of our public school systems has placed this burden on our principals, this has to change. The environment in which our schools must now operate has become increasingly complex as a result of increased diversity, the demands of 21st century learning models, and technological innovations that are reshaping how our students learn and how our schools are managed. Added to this is a world that is vastly more connected, thus bringing a
level of competition that we have not previously witnessed. The hierarchical model, which tends to promote the hero leader concept, is no longer suitable. Sharing the leadership role is fast becoming a more appropriate model for success. This brings our teacher leaders to the forefront of the conversation of school leadership and reform.

The research has shown that teacher leaders can positively impact the success of a school if the appropriate conditions are in place. However, because these conditions are constantly impacted by innovations in technology, it is important that research stays vigilant on assessing how this is impacting teacher leadership initiatives. The research indicated that technology implementations have impacted cultures, roles and relationships, and structures providing opportunities and impediments. The opportunities lie in the area of tech savvy teacher leaders who use technology as a tool to initiate change. Technology implementations appear to provide the chance or reasons for teacher leaders to lead. Thus, these implementations can become a catalyst for teachers to lead in the proper environment. Conversely, the improper environment can be an impediment. A culture that promotes isolation, and discourages initiative will work against teacher leadership or technology reform initiatives. In order to ensure that teacher leaders feel comfortable leading, the principal should continue to play a key role in establishing an environment, defining roles, and sharing decision making.

While those who are most comfortable with technology may be the first to see this opportunity, the research has shown that it is not limited to this group. With a supportive principal and culture, non-technical teacher leaders will take part in these initiatives. What is critical is the opportunity to learn. Preparation programs, both pre-service and in-service, appear to be a crucial element for success. The research has been very clear in this area: training in technology needs to be done often and it needs to be done well (Tondeur et al., 2012), and yet
teachers are still far behind the curve in learning when compared to professionals in other industries (Ottenbreit-Leftwich et al., 2012). This gap poses a significant dilemma for current technology demands but even more so for future demands. The use of technology continues to grow, and with this demand so grows the capability of what vendors are able to deliver. If teachers are already behind, this gap will only widen without major efforts going forward. This poses a threat to teacher leadership initiatives as cultures contend, roles adjust, and structures adapt.

The research indicates that the implementation of technology adds an additional complexity to the areas of culture, roles and relationships, and culture. Often teachers are dealing with the unknown, and thus more pre-service programs are beginning to address this in their programs. Tondeur et al. (2012) reviewed studies that were done in this area and identified themes and conditions needed to prepare pre-service teachers for the integration of technology. A number of their thematic findings related quite strongly to the conditions laid out by York-Barr and Duke (2004). To summarize, they found the need for technology role model teachers (role clarity), attitudes about the role of technology (culture), collaboration with peers (relationships), and planning and shared leadership (structures).

Preparation plays a key role in technology integration, especially at the leadership level. As McLeod and Richardson (2011) stated: “Preparing future citizens who are technology savvy . . . requires a school leader who is prepared to lead changes in school” (p. 216). Unfortunately, while there is progress in this area, much more work needs to be done. Schrum et al. (2011) found that most states do not require training of school leaders in the area of technology integration. Fortunately, the authors also found that many school leaders take this initiative on their own, and they make an effort to assure that others on their team stay up to date in
technology. This may be an indication that there is an awareness at the grass roots level and that a culture supportive of technology integration is beginning to develop.

This review has highlighted some of the conditional aspects that are being impacted by technology. Technology and teacher leaders are clearly on a collision course that could end up positively or negatively impacting both initiatives. Therefore, the more insight educational leaders have on this impact, the better prepared they will be to adjust and optimize the situation. Research should look to reveal and further define the conditional framework presented by York-Barr and Duke (2004). Efforts need to be made to understand the various permutations that can occur as a result of constant technological change within our complex education system. Specific schools, or categories of schools, need to be analyzed so as to add to the research on technology and teacher leadership, thereby informing school leaders, those designing pre-service and in-service professional development programs, and teachers. Technology implementations and teacher leaders provide a great opportunity for school reform. By understanding the interrelationship of these two, education leaders might be able to harness their full potential.
Chapter III: Methodology

Teacher leadership (TL) is considered to have significant potential in the area of education reform; therefore, it is important to recognize the conditions that are favorable to teacher leaders. In the last decade, the implementation of technology has significantly impacted these conditions, and it is critical that we understand this new environment so as to inform administrators, teacher leaders, and TL professional development designers.

Central Research Question

The purpose of this study was to examine the impact of the implementation and integration of technology on the conditions that influence teacher leadership. Teacher leadership is defined by York-Barr & Duke (2004) as “leading among colleagues with a focus on instructional practice, as well as working at the organizational level to align personnel, fiscal and material resources to improve teaching and learning” (p. 261). As a result, the following research question is proposed:

- How has the implementation and integration of mobile learning technology impacted the conditions that influence teacher leadership at the Mayview Intermediate School?

This research question is focused on the implementation of technology and its impact on the conditions that impact teacher leadership. The literature does not sufficiently address this issue; therefore, it is important to understand this through the experiences of teachers and administrators. Qualitative research is needed to explore and understand the central issue (Creswell, 2012). In the words of Butin (2010), this is a descriptive study that has the hope of obtaining a clearer picture of the world of teacher leaders and technology. I used an interpretivist approach in an effort to understand the following: 1) the impact that the implementation of technology has on current conditions, 2) what new conditional situations may
have emerged with new technologies, and 3) what implications this might have for the future. I looked at this from the perspectives of teacher leaders, their peers, and principals. As Ponterotto (2005) stated, “reality is constructed in the mind of the individual” (p. 129). It is important to understand their experiences in this new environment to determine if conditions have changed or what new conditions may have emerged.

Creswell (2012b) referred to the researcher as a “key instrument” (p. 45). Through the use of examination, observation, and interviews, I attempted to make sense out of the data that will be collected. Using thematic analysis, I uncovered themes that emerged. This connects directly to Ponterotto’s (2005) point that what distinguishes interpretivism is the interaction between researcher and the object of investigation.

**Research Approach**

The researcher conducted a case study in a school that had recently undergone an implementation of mobile learning technology school-wide. The school was implementing 1:1 laptops within a whole grade that included all teachers within grade 7. This was part of a two year technology plan that was used as a guide for the effective use of technology. The case study approach was appropriate to understand the real-life experiences of those interacting with the technology within a bounded system (Creswell, 2012). In order to build on and add to ongoing research in this area, this study went narrow and deep and used multiple sources of data, including interviews, participant observations, direct classroom observations, and documents.

Case studies are commonly used in the social sciences and seek to use specific examples through which to explore particular phenomena (Yin, 2009). Since the purpose was to go in depth on the topic of technology integration and teacher leadership, a case study was particularly appropriate. As Merriam (1998) stated, “the unit of analysis, not the topic of investigation,
characterizes a case study” (p.8). Stake (1978) also pointed out that case studies feature personal observations and an informal writing narrative that may bring out direct quotations. Finally, a case study was appropriate for the “how” and “why” type research questions being posed. As seen, the research questions are focused on seeking an explanation of the occurrence of technology in a school.

Case study research has a rich history dating back decades. Eisenhardt (1989) cited Glaser and Strauss (1967) for their use of case study in building theory, and, of course, Eisenhardt (1989) further developed the process of introducing theory through case study. In his seminal article, Stake (1978) asserted that, while useful in theory building, “its best use appears to me to be for adding to existing experience and humanistic understanding” (p.7). Yin (1981) offered more specific ideas on process and techniques that can be used in case study research. Over time, a number of approaches have evolved (Creswell, 2012b) such as multiple case study analysis, and quantitative and qualitative approaches.

Participants and Access

The purpose of this study was to understand the impact that the implementation of mobile learning technology has had on the conditions that influence teacher leadership. Therefore, this study endeavored to provide an in-depth consideration of technology. As Creswell (2012) pointed out, to provide such a deep analysis, the researcher must purposefully identify sites and participants. Sampling occurred prior to data collection and was focused on a group of teacher leaders within a medium sized school that recently implemented a new technology. A sample of six teacher leaders and two administrators were selected who agreed to partake in the study. This provided some variation at the site level and provided different perspectives from a
situational perspective. The sample size of eight was small to provide more depth and complexity of analysis within the site and each participant (Creswell, 2012, Creswell, 2012b).

According to Miles and Huberman (1994), theory should drive sampling, and the criteria for purposeful sampling are relevant to both site and participants (Creswell, 2012). Therefore, the York-Barr and Duke (2004) “theory of action” was used to guide the sampling strategy. The researcher asked administration in the school to identify teacher leaders involved in the integration of the technology initiatives. Definitions were used from the “who are teacher leaders” section of the York-Barr and Duke (2004) meta-analysis. The principal was able to identify those most appropriate for the study—that is those that were involved with the implementation and integration of the new technology. This might have posed a limitation, since principal/teacher relationships were part of the conditions matrix; therefore, in discussing selection with principals, the need to be bias-neutral was addressed. In an effort to mediate bias, the researcher created a rubric based on the “theory of action” and a conditions matrix to help guide selection. These identified the specific aspects of conditions under consideration and provided school leadership with a framework for selection. Once a list was established, each teacher was sent a letter indicating their identification by the principal. The letter specified the criteria for selection, the purpose and value of the study, and whether or not they would be interested in participating. A sample of six teachers and two administrators agreed to partake in the study.

Recruitment procedures were reviewed with district and school administration as part of obtaining permission to gain access to both site and participants. The design of the study was part of a discussion that included the following (Creswell, 2012):

- Protection of anonymity (see section on Protection of Human Subjects)
• Respect of the site property and the need to minimize disruption of classroom or school activities
• Time required
• Questions asked and processes used for interviews and observations
• Potential risks to site and participants

It was determined that no incentives would be offered.

Data Collection

Semi-structured interviews took place in April, using a questionnaire that was developed by the researcher based on the York-Barr and Duke (2004) conditions table. This period was chosen to give the teachers and administrators time to experience the new initiatives within the current school year. At this time, participants had the benefit of almost a full school year of operational implementation (Fixsen et al., 2005) of the technology. Interviews lasted approximately one hour and took place at the school site accessible to the implemented technology. Classrooms were the most preferred location but not necessary, as long as the researcher and participant could access the technology for reference or possible demonstration. Per the York-Barr and Duke (2004) table, questions were structured around conditions that can be situational or cultural, role and relationship based, or structural. Therefore, it was anticipated that the participant might want to demonstrate use or involvement. Accessibility was be particularly important for observations, because they provided an opportunity to study participants in the actual setting (Creswell, 2012).

In addition to the interviews, participant observations and direct classroom observations took place, making this an iterative process. There was a need to obtain first-hand information and experience as researcher of what is actually happening in practice. The researcher was a
“nonparticipant observer.” In other words, it was not the intention of the researcher to become involved in this process, so that he would be able to observe more easily (Rubin & Rubin, 2012). An observational protocol was developed to help guide the observation and act as documentation of the event. The observations took place in three classrooms, and in areas where teacher leaders are interacting with the implemented technology. Time and duration were agreed upon ahead of any scheduled observation with participants and school administration. The protocol also included what was observed and shared with participants. Given the need to identify what impact technology implementation has had on conditions found in the York-Barr and Duke (2004) study and what new conditions may have emerged, observations were pre-planned and structured (Miles & Huberman, 1994).

All interviews were recorded and observations documented. The data was collected by the researcher through digital recordings and on site observation notes. Creswell’s (2012b) six steps in the analysis of data was followed. First, data was organized and interviews and notes from observations were transcribed. Second, the data was coded using In Vivo coding in order to make sense of the information. Third, the researcher looked for emerging themes. This thematic analysis included a description of these themes as they related to the themes that emerged from the York-Barr and Duke (2004) study, specifically the “facilitators” and “challenges” table. As a result, findings were reported that showed consistencies with the York-Barr and Duke (2004) study, along with any new themes that emerged. The final step was a validation of the findings. The researcher used triangulation to confirm information collected from each candidate and observations. In addition, member checking was used by asking certain participants to review the findings for accuracy.

Data Storage
The researcher conducted all interviews and observations; thus, all data was collected and managed by him as well. Interviews were recorded using an Olympus Note Corder DP-201. Recordings, transcripts, collected documents, and observation notes were stored in a locked cabinet at the researcher’s locked home office. No one beyond the researcher had access to this information. Upon completion of the study, all of the aforementioned data was destroyed by the researcher.

Data Analysis

The researcher used an interpretivist approach to data analysis, adhering to key analytic features outlined by Miles and Huberman (1994). The authors identified the following steps in sequence.

- Coding text from interviews and observations. In Vivo coding methods pertaining to this study was used so as to draw upon the participant’s voice.
- Using In Vivo, a two-cycle process will be conducted which will require coding, review, and recoding. The second cycle will be conducted to identify similar phrases and patterns.
- These patterns and consistencies will be taken to the round of observations which will be conducted after initial interviews.
- Data analyzed from observations and interviews will be triangulated to determine consistent themes.
- From these themes and generalizations, conclusions will be drawn in a formal set of findings.

Trustworthiness
It was important to consider the validity of the data to assure the accuracy and trustworthiness of the information collected. Miles and Huberman (1994) asserted the importance of testing the meanings that emerge, stating “otherwise we are left with interesting stories about what happened, of unknown truth and utility” (p. 11). Creswell (2012b) used the term verification in place of trustworthiness and considered this a process of determining the accuracy of findings. Qualitative research by its nature has an inherent aspect of trustworthiness built through the intense time spent directly in the field, through direct interviews which will be recorded to improve reliability (Roberts et al., 2006), and through observations and in-depth descriptions of the situation and participants.

It is this personal interaction that will be used as a basis for building quality. However, the researcher recognizes that points of view can vary and individual experiences can differ such that further validation is necessary. Therefore, the researcher used three strategies of validation: triangulation, clarifying researcher bias, and member checking.

**Triangulation.** It has been pointed out that multiple forms of data will be utilized throughout the study, such as interviews, observation, and documents. All data was coded, and the themes that emerged were then compared and confirmed. This triangulation helped assure accuracy, since multiple sources of data (Creswell, 2012b) were used. Saldana (2013) asserted that this will help enhance the trustworthiness of any findings.

**Clarifying researcher bias.** The researcher has spent over six years working with education technology and has an orientation toward optimizing technology use in education. Therefore, the process of “reflexivity” was used by considering this bias in the final analysis. Thomas et al. (2006) asserted that that this can act as additional measure of validity. Also, it was
important that this bias was acknowledged to participants and that the researcher had them consider this as part of the member checking process.

**Member checking.** Participants and administration had input on all initial documents. In addition, in order to validate this process, participants were asked to review coding and themes (Creswell, 2012) in an effort to address any inconsistencies or inaccuracy early in the study. Lastly, the researcher shared all findings with administration and study participants. Because it was important that interpretations were clear and accurate, the researcher aimed to have progressive checks by all stakeholders throughout the study to enhance trustworthiness (Thomas, 2006).

**Threats to internal validity.** With the exception of the researcher bias mentioned, no other internal threats occurred or were found.

**Protection of Human Subjects**

It was the job of the researcher to conduct research that was responsible and ethical (Creswell, 2012). As Wester (2011) pointed out, five main principals need to be considered for IRB approval: respect for persons, autonomy, protection of vulnerable populations, beneficence, and justice. In regards to respect for persons, the researcher acknowledged the important role that teacher leaders played in the integration of technology in schools. However, since they are teachers first, this study respected their overarching responsibility to the students that they serve. Concerning autonomy, it was made clear not only to participants but to principals and administration that there was no obligation to participate and that participants were free to decline involvement at any time. This was made clear verbally as well as in any written communications, including the informed consent form.
While teacher leaders are not considered a vulnerable population as defined by the IRB, the researcher felt that they might have felt partially compelled to participate knowing that their principal identified them as a potential candidate for participation. Hence, the researcher was sensitive to this situation and took it into account in communication and interaction with potential and actual participants. In a similar fashion, while there was no anticipated harm that might have come to participants, it was the responsibility of the researcher to not discount the possibility. Therefore, questions were reviewed by administration to assure that they did not negatively impact those involved (Rubin & Rubin, 2011). In addition, a detailed design review was conducted with administration and those involved, assuring that observations, interviews, collection of data procedures, and analysis were conducted under the most ethical standards. It was the intention of the researcher to provide transparency throughout the study. Finally, this study was intended to not only benefit the school and district but to be shared with anyone interested in its purpose and outcomes. The researcher made clear to all participants that the intended benefits and results will be shared and ultimately published.

Confidentiality and Informed Consent

Given that this study will take place within the same school district, the potential exists that participants may be concerned that information might be shared with colleagues and administration. The researcher also notes that research relies on truthfulness and that participants must be free of concern that sensitive data might be disclosed (Adinoff et al., 2013). The researcher has determined that it is therefore important to assure confidentiality of information and identity within the study. In order to do this, the researcher will take the following steps:

1. Teacher leaders will be identified by their principals as potential participants. Although the principal will not know the final participants selected, it will be important to further
assure their anonymity. Pseudonyms will be used to protect the identity of each participant and schools partaking in the study (Creswell, 2012b).

2. Data from interviews, observations, and informed consent forms will be stored off-site at a location known only to the researcher. In addition, this data will be stored in multiple locations so there is no opportunity for correlation between data sets.

3. All equipment used for recording of interviews will be owned by the researcher and maintained in a secure location known only to the researcher. No school or district equipment will be used.

4. All reporting of information and discussion with principals or district leadership will not include the identities of participants. Specific responses will not be shared but only themes that may have emerged from the data.

5. All data will be destroyed by the researcher upon completion of the study.

6. The researcher will act as the sole transcriber of interviews and handler of data.

Prior to acceptance, it was made clear to identified teacher leaders that partaking in the study is completely voluntary and that, even after deciding to participate, they may withdraw at any time (Rubin & Rubin, 2012). In addition, it was pointed out that they may skip a question if they felt that there may be some risk in responding.

The researcher shared with each participant the design, purpose, and potential benefit of the study (Creswell, 2012b). This allowed each participant to determine if they were comfortable with participating. All risks were explained to the contributors, and written consent was garnered via an informed consent form (Appendix A).

**Obtaining IRB approval.** The researcher took the following steps to obtain IRB approval, in accordance with Northeastern IRB guidelines:
A. Complete IRB training and obtain and submit IRB certification
B. Review proposed research with advisor and obtain consent from all participants
C. Complete and submit IRB application with appropriate supporting documentation
D. Address any changes or feedback if necessary.

Summary

To understand a complex topic like the impact of the implementation of technology on teacher leaders, it is important to conduct a study that follows a specific set of procedures. In this situation, the researcher chose the case study approach to capture the circumstances and conditions that are impacted or created through the implementation of technology within a school environment. The procedures chosen were interviews, participant observation, direct classroom observation, and review of documents. The triangulation of information from these sources provided robust data for analysis, discussion, and final conclusions on the topic.
Chapter IV: Findings

Introduction

This study was conducted to determine the impact of the implementation of mobile learning technology on the conditions favorable to teacher leadership. Teacher leadership and technology represent major areas for potential reform, and understanding their interrelationship will help advance both initiatives. Favorable conditions have been documented in previous research (Angelle & DeHart, 2011; Angelle & Schmidt, 2007; Berrett et al., 2012; Geisjel et al., 2007; York-Barr & Duke, 2004.), but new technology continues to change the school environment. This study was structured to consider the impact of a recent implementation of technology at a school site. This chapter presents the findings from a case study at an intermediate school in New England. The site was chosen for its recent implementation of a mobile learning initiative and for its attention to teacher leadership within the school.

The chapter will begin with a description of the site and a background and history of the mobile learning initiative. The purpose of this section is to provide context for the findings that will be presented later in the chapter. The history of technology implementations at the site is important, since each initiative acted as a building block for the current 1:1 mobile learning initiative being used in this research. In addition, a discussion of the site along with a brief background on participants will be provided.

The following section will be a presentation of the findings by the primary research question and its subcomponents, which address the three constructs for the study: school culture, role and responsibilities, and school structure. The primary research question and sub questions are presented and discussed using Figure 2: Facilitators and Challenges Table from Chapter 1.
Figure 2: Facilitators and Challenges Table (York-Barr & Duke, 2004)

<table>
<thead>
<tr>
<th>School culture and context</th>
<th>Facilitators:</th>
<th>Challenges:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive environment for learning and inquiry</td>
<td>No clear direction for organization.</td>
</tr>
<tr>
<td></td>
<td>Initiative is encouraged</td>
<td>Teachers are isolated</td>
</tr>
<tr>
<td></td>
<td>The environment is collaborative</td>
<td>Egalitarianism is prevalent</td>
</tr>
<tr>
<td></td>
<td>TL’s are considered role models</td>
<td>Lack of support and encouragement from other teachers</td>
</tr>
<tr>
<td>Roles and Relationships</td>
<td>Collegiality, trust and respect amongst peers</td>
<td>Hierarchical relationship structure</td>
</tr>
<tr>
<td></td>
<td>TL tasks are essential to instruction and not just administrative or managerial</td>
<td>Relationship with peers has changed</td>
</tr>
<tr>
<td></td>
<td>Principals support TL’s</td>
<td>Lack of role clarity between TL and peers</td>
</tr>
<tr>
<td></td>
<td>Role clarity</td>
<td>Lack of role clarity between TL and principal</td>
</tr>
<tr>
<td></td>
<td>Understanding of about roles and relationships</td>
<td>No communication or feedback</td>
</tr>
<tr>
<td>Structures</td>
<td>Decision making is shared and participatory</td>
<td>Top-down hierarchical structure is in place</td>
</tr>
<tr>
<td></td>
<td>Hierarchical structures do not exist</td>
<td>No clarity regarding decision making</td>
</tr>
<tr>
<td></td>
<td>Leading is supported by</td>
<td>Teachers are isolated and are not given time to collaborate</td>
</tr>
<tr>
<td></td>
<td>Professional development programs that include learning and leading.</td>
<td>No incentive to lead</td>
</tr>
</tbody>
</table>

This table is a list of conditions that are favorable and unfavorable to teacher leadership as identified by York-Barr and Duke (2004), and these are used as topics to present the findings and
themes that emerged from the study. The chapter concludes with a summary of results and an attempt to highlight the most robust findings. The findings are then tied back to the research questions, and key themes are identified and prioritized in terms of the strength of the findings.

**Study Context**

The Mayview School District, located in New England, is the largest district in the region and represents seven schools with a total of 4,900 students (Massachusetts Department of Education, 2013). The district plays a lead role in the determination, acquisition, and implementation of technology. Its organizational structure includes a technology committee, community outreach group, and a district technology department. In addition, there are four Teacher Leaders for Grades 6, 7, and 8, and seven technology assistants. The district also has a student help desk led by students from various classes. The technology for the district is guided by a detailed technology plan; the most recent plan addresses the mobile learning initiative under study, which runs from 2014 to 2016 (Mayview Public Schools, 2014a).

The Mayview Public Schools (MPS) Technology Plan listed three goals: creating an environment for diverse learners, supporting teachers to become confident users, and making staff and students accountable for learning and using technology. It was clear that the MPS teaching and learning community was a critical factor in its success and that all had to make a commitment to adopting technology in the appropriate way. Hence, the plan had a strong technology literacy and professional development component.

Technology adoption was a highlight in the plan, and the district was using the Substitution Augmentation Modification Redefinition (SAMR) (Mayview Public Schools, 2014a) model to drive this forward. The SAMR model provides a progressive approach to adoption that the district was using to guide an ever deeper use of technology as a support for
student-centered learning, a theme that will be discussed later in the chapter. It was evident from the findings that the SAMR model and thinking that it requires was part of the MPS technology culture.

The plan cites a strong focus on professional development as seen in their desire to follow the National Education Technology Standards for teachers (Mayview Public Schools, 2014a). Professional development was provided in a number of ways, including a once a year “Home Grown” technology conference that allowed staff to share their knowledge with peers. In the 2012-13 school year, the District Ed Team provided over 57 thousand participant hours of professional development (Mayview Public Schools, 2014a). The professional development provided was referred to throughout interviews with participants and will be discussed as a specific finding.

Finally, it is important to note the investment which the district had made in infrastructure. In 2014, a major capital improvement project was written to improve the district infrastructure and prepare for an enterprise wireless system. MPS recognized the substantial growth in mobile computing across the globe and that “mobile devices are changing the face of education” (Mayview Public Schools, 2014a, p. 17). It was essential, then, to lay the foundation for a focus on mobile learning which ultimately laid the ground work for the current initiative under examination.

Mobile learning was a core component of the MPS district technology plan. It was the belief of the district that learning is personal and that it is essential for their schools to provide ways for students to engage in the learning process— to allow them to become creators as opposed to consumers of information (Mayview Public Schools, 2014b). Mobile devices and the technology that they provide were seen as important tools to enhance this process. Moreover, in
order to deeply personalize their learning, it was important that each student have their own device, as opposed to being shared. For this reason, the district decided in 2014 to purchase iPads for every seventh grader. The site at which these would be deployed was the Mayview Intermediate School (MIS), which is the site partaking in this study.

In 2014, Mayview Intermediate School served 775 students in Grades 6 and 7. The school had recently transitioned from serving students in Grades 7 and 8. The school had 64 teachers, an average class size of 15.4, and a student teacher ratio of 12.1:1. The student population was comprised of 37.8% free or reduced lunch, 15.1% students with disabilities, and 3% non-English language learners. The median age range of staff was 41-48, while the largest number of staff (28.2%) fell in an age range of 49-56. Ninety six percent of staff were white, and 83.6% were female (Massachusetts Department of Education, 2013b).

The current 1:1 iPad initiative that was studied was part of a history of mobile learning exploration in the district and school (Mayview Public Schools, 2014). In 2007, laptops were introduced through a grant for assistive learning. A special education class provided a set of laptops, and these are still in use today. In addition, Computers on Wheels (COW) were introduced and were still in use at the time of this study. In 2008, a cart of 20 iPod Touches were acquired and an additional 10 in 2013. These have been used by struggling math students and ELD students. In 2009, nine iPads were purchased and provided to teachers for two weeks at a time on a loan basis. Ultimately, many teachers purchased their own devices, prompting a greater awareness of demand for these devices.

In 2010, a pilot was conducted to determine the varying uses of iPads vs. notebook computers. The pilot helped determine what tasks were most appropriate for a chosen device. In addition, it provided insight into what adaptations would be necessary to move to iPads as a
student mobile learning device. The following year, four carts of 30 iPads were purchased for Grade 7 at Mayview Intermediate School. Research on the initiative continued, and in 2013, a presentation was made to the school committee on the Grade 7 Mobile learning initiative.

The district technology team used the initiative to provide a leadership opportunity for educators teaching Grade 7 at MIS. It was assumed that there was a limited number of iPads that would be available for 1:1 use. Teachers were put in cross departmental teams of four and asked to develop a proposal for why their team should be chosen to pilot the iPads with students. It should be noted that the eighth grade was initially approached but turned down the opportunity, while the seventh grade eagerly took part. This will be discussed in more detail in the findings section as part of the discussion of themes which emerged. It is relevant in that it provides additional characterization of the teacher leadership inherent in the MIS seventh grade. As proposals were submitted, it was eventually revealed that each team would be provided laptops for what had turned out to be a complete seventh grade mobile learning initiative. As a result, in March of 2014, 400 iPads were given to seventh grade students.

The researcher inquired as to why the rollout took place at the latter part of a school year and not at the beginning. This was done purposefully so as to work through any administrative start up issues early on and begin the next school year without incident. Lastly, as a result of the ongoing success of adoption, the sixth grade will become part of the 1:1 initiative in 2015, thus providing increased continuity of use. More will be discussed regarding the transition to Grade 8 and the lack of technology at that level.

The implementation of mobile learning was largely the vision of the district technology director and the previous principal at MIS. Their strong collaboration helped spur the project forward. Because the implementation of the mobile learning technology at MIS required the
involvement and collaboration of multiple stakeholders, it was important to gain perspective through different lenses to understand the conditional impact this implementation had on the teacher leaders involved. Therefore, participants were chosen from district and school technology teams, school administration, and school staff.

Teacher leadership was a key component of the district’s strategy for successful implementation of technology. The district followed standards established by the International Society for Technology in Education (ISTE) which state the importance of leadership in the use of technology. This was also reinforced in the District Technology Plan through professional development. The district was very deliberate in their desire to promote leadership in technology and sought to build a culture of teacher leadership through technology implementations. Hence, there was a clear connection between the development of technology and of teacher leadership. The following describes the participants. Genders may or may not be reported accurately.

District technology director: As a key driver of technology in the district, the district technology director played a key role in moving the mobile learning initiative forward. The director had been part of the district for over 10 years and was a previous classroom teacher. The director was a strong advocate for technology, teacher leadership, teacher professional development, and student-centered learning.

School principal: The principal had been part of the school for 24 years. The first 16 years were as a classroom teacher, and then 8 years as assistant principal. He was made school principal in 2013. As assistant principal, he played an important role in presenting the counter perspectives to both the district technology director and the previous principal at their request. His role of questioning and posing an opposite or alternative position helped vet the project more thoroughly and avoid the pitfalls of potential bias.
Teacher leader A: The seventh technology teacher had been in the role for six years. This teacher was recruited by the district technology director for this new role while teaching Grade 3. This teacher leader had become a key interface for teachers and administrators for technology within MIS, specifically for the mobile learning initiative. The role of the Information Literacy and Technology Department at MIS was to help students develop the skills and knowledge to be successful then and in the future. In addition, the teacher leader A worked in support of teacher leaders playing a strong advocacy role for technology in the school.

Teacher leader B: The teacher had been teaching at MIS for several years. She considered herself to be an early adopter of technology, and her peers have validated this perception. She was often a “go to” person amongst her team and was also a strong proponent of getting the students to use technology as a resource for deeper inquiry and learning.

Teacher leader C: This teacher was fairly new to the education and teaching arena, having transitioned some years before. Not strongly skilled with technology but very open to learning and using it in the classroom, he was very comfortable acknowledging this but was firmly behind the initiative and constantly involved in his own professional development. This teacher also had his class partake in the classroom observation component of this study.

Teacher leader D: Teacher leader D had been part of previous implementations in the school and provided unique and valuable insights into how the school had learned through each experience. Laptops were introduced to some students in 2007-08 and were still in use at the time of the study. Not a technology guru, much of the knowledge he gained had been self-taught, exemplifying the type of teacher leadership in the school.

Teacher leader E: This teacher had previously taught sixth grade and was able to provide a perspective of a teacher outside the 1:1 initiative. At the point of this study, Grade 6 was using
the cart model. This teacher leader was able to provide valuable insight into the varying conditions in both Grade 6 and 7, along with the transitional requirements of moving into mobile learning at the start of the school year.

Teacher leader F: This teacher had been at the school long enough to have experienced multiple implementations of technology. As a department head, this teacher leader was able to provide perspective on the impact of technology across a department over several years.

Findings

The purpose of this study was to determine the impact that the implementation of mobile learning technology had on the conditions that are favorable to teacher leadership. This section presents findings in relation to those conditions and identifies any new conditions that might have emerged. The section is organized around the research question and sub-questions, and states the findings as they related to key conditions identified in Figure 2: The Facilitators and Challenges Table. The findings are stated in terms of whether they were supportive or not supportive of the particular condition in question.

Research Question 1: What was the Interplay between School Culture, Technology, and Teacher Leadership in the Implementation of Mobile Learning Technology at Mayview Intermediate School?

The culture of a school plays a significant role in improvement programs in schools (Ertmer & Ottenbreit-Letfwich, 2010; York-Barr & Duke, 2004). In regards to teacher leadership, attitudes toward learning and views of teacher leadership and supportiveness help create an environment either conducive or unfavorable to teacher leadership. Culture can have a similar effect on improvement initiatives through technology. Findings are presented in regards
to the interrelationship of culture, technology, and teacher leadership. The following five themes emerged from the data:

- There is a school-wide focus on teaching and learning.
- There is encouragement for taking initiative
- There is an expectation for teamwork and collaboration
- Teacher leadership is valued as something positive
- There is an acceptance of the future and the need for change

**There is a school-wide focus on teaching and learning.** This section reviews these findings and how the implementation of technology had positively influenced the focus on teaching and learning at the Mayview Intermediate School—specifically through more individualized learning and instruction. Each interview had references, sometimes multiple ones, to the theme of learning as being a primary reason for any actions taken in regards to the use of technology. The principal referred to an “academic spirit challenging the building.”

The catalyst for this culture was an initiative started by the previous principal referred to as effective effort purported by a Stanford Psychologist. The movement around effective effort started when the school transitioned from being a middle school (7 and 8) to an intermediate school (6 and 7). When first asked about the school culture, teacher leader B remembered how this became a school-wide focus that included students. She indicated how one of the key components of effective effort was using your resources, and how the iPads could be used as more than one resource.

In addition, the school principal spoke of how students created their own goals and how there was a heavy focus on academic goals in particular. One of the goals was using one’s resources, and the principal found technology an ideal tool for getting students to use this vast
resource. He said, “So right away when you have a mobile learning device at your fingertips that is a huge resource.” The technology director also referenced effective effort in discussing the culture of the school. She tied technology into effective effort because it allowed classroom practice to shift to being student-centered. She pointed out that now the students had a choice and the power to make their own learning decisions. As she expressed, “they can use their passion.”

Student-centered learning was part of a school-wide focus on learning, and no doubt mobile learning initiative had helped in this effort. Teacher leader A commented on how she was seeing more teachers “putting that learning in the hands of the students,” and this was validated during classroom observations. She believed that as the 1:1 technology became more integrated there would be a switch to more student-centered versus teacher-directed learning. In addition, the technology had allowed the teaching of all students, which is especially important in a learning environment serving multiple cultures.

Teacher leader E referred to it as putting more ownership in the hands of the individual students. She saw it as being more personalized through technology and providing more doors of opportunity for learning. The Teacher leader D agreed but went further in terms of providing more access and allowing more participation: “I just think of the shift that’s allowed the students to be in the classroom.” The passion behind these statements further reinforced the importance of the students and the learning as being the centralizing need behind the use of technology.

Yet, while there was a strong movement toward student-centered learning, there was a hesitance to say that the school had reached that goal. As one teacher leader put it, “we would love to be there, and we think the iPads are helping, but we’re not there.” However, there was general acknowledgement that this was the right journey to be on and that technology was
helping. Teacher leader B summarized it by saying it’s “not what device, not what curriculum, but effecting learning,” thus driving home the overarching theme of a school-wide focus on learning that teachers, administration, students, and family support. Each participant in some way brought the conversation back to this theme along with the student’s involvement in the learning process. The espousal of effective effort and student-centered learning using technology as a tool to support and enhance both were dominant themes supporting a school-wide focus on teaching and learning.

A sub-theme of a school-wide focus on learning was technology was changing the way teachers interacted with students. Teachers recognized that the students were now growing up with technology so that, in many respects, the students knew more about the technology than the teacher, a reality which created a different classroom dynamic. A teacher leader commented on how a teacher would find that with one student in a class “you would actually hand it over to them, and let them teach you.” Teacher leader D concurred, “You have to rely on the kids.” The technology director pointed out that, given the power of information that is now accessible to students; the teachers had a whole new role: “You give the kids the iPads and they figure it out.” In other words, the students did not need training on the iPads because they are already accustomed to the technology.

The principal commented that the iPads became a way to get the learning in the hands of the students: “Our idea wasn’t to get kids good at iPads . . . It was to get kids excited about learning.” Teacher leader C “wanted to do it because we really thought it would add depth and breadth to our lessons . . . and we would be identifying with the students where they have some expertise.” He also felt that it allowed students to pull together their own education. The sense of owning their own learning was shared by each teacher. Teacher leader C felt that not only had
it enhanced the learning that goes on in the classroom; it also allowed students more opportunity to take the work home and practice there. This empowerment of students within a school-wide culture of learning provided a unique environment that teacher leaders in MIS had embraced. The technology director commented: “the power of technology is when the teacher says . . . ok kids we have a problem here, and we’re going to solve it together, and they (the teachers) model the behavior you want to see in the student.”

**There is encouragement for taking initiative.** Interviewees stated that technology provided many new opportunities to take initiative and was an important aspect of school culture for teacher leadership at MIS. Examples of this are provided, along with comments from teacher leaders. A question from the interview protocol addressed this specific issue, and the findings were put forth. First, the mobile learning project overall provided an opportunity for teacher leaders to take initiative. Groups were challenged to make a proposal, and the best was to be chosen. “We jumped at the opportunity,” stated one teacher. The development of a proposal required extra time and effort, but there was no hesitation. One teacher pointed out how the building was full of people that like to take on challenges, and the implementation of iPads was a challenge in which teachers were encouraged to take part. Another teacher commented on how they wanted to challenge and further themselves. The technology director noted that, “it takes a lot of trial and risk, and a shift in pedagogy,” but these did not appear to be a deterrent for the MIS teacher leaders. “I’m not very technical, but you can’t be afraid,” stated one teacher.

From the administrative point of view, there was a clear desire to allow teacher leaders to take initiative. The opportunity was offered with the hope that teacher leaders would take the initiative, and there was genuine satisfaction in having these teachers take part, learn, and grow. The technology director said, “It’s really kind of fun to watch these teachers grow with regards
to things they try and the things that they begin to implement. It’s pretty powerful.” The principal highlighted a particular instance in which one teacher had taken the technology farther than was conceived of at the beginning. He saw this as the use of technology providing an additional outlet for taking initiative. Whether it’s within the classroom, being able to communicate more regularly with parents, or being able to support their students at home, technology had provided various opportunities not foreseen when the investment in mobile learning was initially considered.

It is interesting to note that the environment for encouraging initiative could be traced to the effective effort concept that was described in the previous section. Teacher leader E commented on how the whole school had been bought into a growth mindset “not just for our students, but for all of us. We’re always learning something new, you can always be better than the day before. It just takes effort.” This was a cultural underpinning that aided in fostering an environment for teacher leadership. Asked if the technology initiative brought this culture forward even more, this teacher responded how it was one more challenge to take on. Hence, the teacher demonstrated an apparent level of confidence that there was an opportunity and almost an expectation to take the initiative. In this way from the initiative perspective, the 1:1 mobile learning project became a means and an end.

The principal, however, highlighted the fact that, while technology allowed many teachers to expand their repertoire, the technology was still just a tool. While the technology enhanced their ability, he felt it was the school’s philosophy towards their students that had the greater impact. This implies that initiative might have been taken regardless of the availability of technology. The overall environment it would seem was favorable, and the technology roll out provided additional options for teacher leaders to take initiative.
No doubt seemed to be present in the minds of participants that the new technology impacted the environment. Teacher leader F pointed out how she had seen teachers change and adopt the technology. She gave the example of a teacher who, once the mobile learning technology was understood for its potential, became a strong advocate and started taking more initiative through co-planning and sharing with other teachers. So, not only was initiative encouraged on an individual level, there was also encouragement for peers to take initiative together, and teacher leader E felt there was still room for more opportunities to share, work together, and take initiative in a more collaborative way.

There is an expectation for teamwork and collaboration. This section considers the expectation for teamwork and shared responsibility as a condition favorable for teacher leaders. The findings were robust in this area and are discussed in terms of the impact of the mobile learning initiative. Working in teams was not a new concept at the school, and when the 1:1 mobile learning initiative was introduced, it was presented as a competition. Cross-departmental teams that included math, special education, social studies, and English were assembled, so that individuals had to work together and share the responsibility for preparing a proposal. Teacher leader D commented on how it was presented much as a challenge to the seventh grade teams. The challenge was: Which teams can come up with their best reason for wanting these carts? Teach leader D explained how “it was presented almost like a competition. We all came up with the presentation to the technology department as to why our team should be granted a cart.” Because no technology person was on the team, it was essential that each person contributed. In addition, since no one person could make decisions, it was clear that there was an expectation of cooperation.
A further indication of teamwork and the technology implementation’s impact occurred just prior to the 1:1 initiative when iPads were limited and distributed via carts of 20. Teacher leader D reflected on how they would establish a schedule two weeks at a time and rotate through the curriculum, but that eventually became problematic: “We would tweak the schedule, usually around lunch time or during PLCs and re-tweak the schedule about every two weeks. Different teams did it differently. It took a lot of work on our (team) part to make it effective.” In this case, it was the limitation of access to the technology that created a need for teaming and collaboration. Teacher leader E commented that “a lot of us within each department meet on our own. We look at our projects, and we say how can we integrate iPads?”

The technology director stressed her firm belief in teams and was able to articulate the value and leadership that each individual brought to the team. As she said,

One of the reasons why we do so well is because of the teamwork that we have. This is the kind of environment that we survive in. Each one had an area of expertise, but when it comes time to solve a problem we come around the table.

She went on to say, “when we rolled out 400 iPads in one day, which was challenging . . . it was the teams that took over.” The principal also spoke positively about the environment and the importance of teamwork. He saw technology creating additional criteria for consideration when assembling teams. For example, there was a need to have a teacher leader of technology on each team. Although this was not a specific function defined as part of their job, the intention was for them to be a go-to person within the team.

Teacher leader A expressed that they had the expectation of sharing responsibility for adopting the technology, “so that distribution or exchange of resources, and all that kind of information, is happening more frequently among teachers.” She went on to note the impact it
had on some younger less experienced teachers who, while perhaps intimidated in the new environment, might have had a higher comfort with technology: “Maybe I’m struggling with my classroom management, but I have this lesson. It’s really getting my kids to do this. Have you seen it? Can I show you how to use this with your students?” Teacher leader F felt that technology had caused a greater equity of information along with more shared experiences around the school. However, she would not go as far as to say that the new technology had been transformational. Her reflection on this was quite insightful: “We never have taught when there wasn’t any technology.” This may bring to light a time that we have now come to in education when most teachers have now had substantial exposure to technology. As this study is focused on the implementation of a particular technology, it may be important for future research to consider each new technology as having a unique set of conditional requirements.

**Teacher leadership is valued as something positive.** If teacher leadership is valued by administration and peers, many barriers to success are removed (Hargreaves & Fullen, 2012; Miles-Weiner, 2011, Ackert et al., 2012). New technology initiatives such as the 1:1 program being studied are providing opportunities for teacher leaders to provide valued leadership at multiple levels. Teacher leader A recognized her own growth in leadership as peers increasingly recognized the value of the services she was providing. During the interview and observation of Teacher Leader A’s class, peers approached with questions. Another way others experienced this was being asked to lead professional development. Teacher leader D stated, “I know with PD days, the last few years the district has asked for teacher leaders,” and teacher leader E agreed, “Typically this has been more administration-led back in the day, and this has moved to more teacher-directed.” Teacher leader B also commented on the opportunities to lead
professional development sessions. Throughout the interviews, there was a sense that the building and district had embraced teachers becoming educational leaders.

The technology director cited a number of examples of teacher leadership and highlighted the importance of having exemplars:

Connecting teachers with teachers. I can’t stress that enough. Exemplars, because I think the second a teacher walks into a class and they see another teacher doing it, they walk away and say, ‘I can do this.’ They come away inspired, and incredibly motivated.

The principal also recognized the importance and value of teacher leaders and felt that those who were already leaders recognized the mobile learning initiative as an opportunity to extend their leadership. He commented on the presence of a lot more teacher leaders in the building now, and remarks from teachers seemed to support this. Teacher leaders were seen as highly valued by both administration and peers, and there also appeared to be camaraderie among teacher leaders regarding the purpose of what they were trying to achieve. According to the technology director,

the technology brings everybody together. We’re in that ubiquitous learning environment. Everybody has it. It’s not Mrs. Jones has it on Tuesday, and Mrs. Jones has it on Wednesday, so that’s that collective common purpose, and it’s because of that that people are coming together.

The principal referred to the support and learning that had taken place and the bonds that were created as a result of this interaction.

General agreement existed that technology presented a common language and a common purpose among the different disciplines. Each commented on the sharing that would happen in regards to new ways to apply or use the technology. In some cases, the learning was structured
through scheduled professional development, but in many cases it was an informal sharing of ideas. In fact, teacher leader E commented on the desire to have administration push them even further in what they could do with technology. In this sense, not only was it evident that teacher leadership was valued; an awareness was present on the part of teacher leaders themselves that their leadership was valued.

The fluidity of communication and sharing was also evident, which seemed to foster more leadership and interaction among teacher leaders. Teacher leader D remarked that he might find an idea one evening and come in the next day and share it with a colleague: “We talk a lot, but I think all of us have that colleague in particular that we’re bouncing ideas off of.” Teachers gave no indication that they were isolated or that the “crab bucket” culture referred to by York-Barr & Duke (2004) existed at the school, and it was clear that within the 1:1 mobile learning initiative there was encouragement and a general desire for teachers to lead. The technology director commented in regards to leadership: “I think it’s key.” He went on to express that technology had helped enhance the value of leadership in new ways that even teachers were surprised to see. Teacher leader B offered this observation in regards to peers: “It was just all hands on deck in doing whatever they could in order to get this technology into the hands of the students. So, it’s really a nice bonding experience for all of us.”

**There is an acceptance of the future and the need for change.** As new technologies have been introduced in the last 10-15 years and as the rate of change has accelerated with no let up on the horizon, educators and educational institutions have been forced to alter their ways of thinking and attitudes toward change. The findings at MIS indicated that administration and teachers had both embraced technology and the change that was inherent in adopting a mindset toward thinking and planning for the future. Teacher leader A spoke of her own experience. She
was not always a technology teacher but transitioned from teaching third grade. “I knew this was the way of the future,” she said, and that “this teaching needs to change.” The technology director put it more directly: “The interesting thing is the kind of culture you want to build around modern education . . . When you hear me talk about education, it’s about modern education today.”

Teacher leaders had a similar perspective. Teacher leader C commented on the need to get on the bandwagon because the kids were growing up with it: “It really for us felt like, this is the way to go. This is how their life is going to be, and if you look at college ready right now . . . it’s all technology in college.”

It was clear, however, that the need to look toward the future was not driven by technology as much as by the changing reality of education and learning. This may be different from years ago when technology first began to impact schools and the classroom. Perhaps the need was driven to keep up with technology; in contrast, as pointed out by the technology director, now it was a drive to keep up with the modern educational needs of the students. And teacher leader B seemed to agree:

Things are living out there in the internet universe, and we need to build these kids skills in that . . . So, I think the focus on this has been really trying to hone our skills in helping the kids become more global thinkers with the technology.

Change, however, does not always come easy. Teacher leader A had a similar comment, “The whole global communication piece which is what we’re stressing with our kids,” but noted the resistance of some teachers in this new world. Change seems to be a regular condition when it comes to a technology integration like the 1:1 initiative, and as seen at MIS, it appeared to occur at multiple levels: classroom management, teaching and pedagogy, communication with
peers, students, parents, and administration. When teacher leader A first saw technology, she could see that teaching needed to change: “Kids can show so much more. They have access to differentiation, personalized learning, all those pieces.” With the mobile learning initiative, one of her greatest challenges, as it was for all involved, was getting the teachers to move from making it an iPad lesson to a subject matter lesson. She highlighted the experience of one subject matter teacher, and his first “aha” moment when they had to write, answer, and explain everything on the iPad. She could see him change his instruction from that point forward and become a strong advocate for technology as part of instruction.

Although change is not new to teachers, teacher leader F put it in perspective. She pointed out how many initiatives teachers have been through, such as new reading programs, “but technology isn’t going away. You’re not going to say; oh we’re not going to use technology.” Teacher leader B stated: “I think we definitely did have to start changing thinking, because as the generations come through the kids are more and more tech savvy.” She goes on to comment further: “It’s a whole new way of thinking. How do you integrate the technology piece every single day?” Hence, the findings showed a conditional need to embrace the change that the implementation of technology fosters. The technology director summarized: “It takes a lot of hard work. It takes a lot of trial and error, and risk, and a shift in pedagogy.” However, change was not always embraced, and there were still pockets of resistance for various reasons. This is not unusual, but the integration of technology brings a particular brand of resistance that was revealed in the findings. (Clark & Zagarell, 2012; Kim et al., 2013; Teo, 2011)

With the introduction of technology such as iPads, there was a considerable amount of control that was being put into the hands of the students to guide their own learning. The “sage on the stage” style of teaching, as it was referred to in the interviews, was being countered by
more student-centered learning at MIS. “So we still have teachers who control the front of the classroom. I’m seeing less of that, and more of teachers putting the learning in the hands of the students,” commented teacher leader A. This was seen during observations of two classrooms where students were conducting work while the teacher guided the learning. The power of technology was being recognized, but there still existed that state of resistance due to lack of comfort with this new type of teaching. The technology director told how teachers traditionally have been trained: “I can’t get up in front of my kids if I don’t have all the answers. . .” However, she pointed out that there was a whole new role, because every piece of information was now available to students at their fingertips. The challenge at MIS was getting the teachers to recognize this and adapt to this new condition. Both teacher leader B and teacher leader F acknowledged the reluctance on the part of some teachers and a lack of openness to change.

Regardless of the resistance, each agreed or could point to examples in which someone changed and embraced technology. Teacher leader B noted: “It’s a struggle for some people. I will say, and I think this is just having it longer in the building . . . there are more people getting on the train now than there were originally.” It is interesting to note the time element. Is it the presence of technology in the world, as all teachers become more exposed to technology, or is it that direct exposure that has to be in place for greater adoption? In a classroom observation, the teacher was a self-proclaimed technophobe. However, direct exposure to the power of the iPads made this teacher a convert, and it was clear during the observation that technology was fully integrated in a guided learning manner — not in a traditional stand and deliver mode.

**Summary.** In summary, five themes emerged around the question of culture and its relationship to technology and teacher leadership. First, there was strong school-wide focus on teaching and learning, with a growing emphasis on empowering students through the use of
technology. Second, teacher leaders are encouraged to take initiative, and the mobile learning initiative provided more opportunities both at the individual and peer level. Third, there was a high expectation for teamwork with the introduction of the mobile learning technology at MIS that required both departmental and cross departmental collaboration. Fourth, teacher leadership was valued at both the administration and peer level, and the new technology provided opportunities to lead in new ways. Lastly, there was an acceptance of the future, and an acknowledgement of the need for change at MIS that was held by teacher leaders that helped foster a greater adoption and use of the new technology.

**Research Question 2: How have Roles and Relationships between Teacher Leaders and their Peers and Principal been impacted as a result of the Mobile Learning Technology Implementation at the Mayview Intermediate School?**

This section addresses the second construct — roles and responsibilities. An explanation is provided concerning the importance of this vis-à-vis technology. Five themes emerged from the data:

- The implementation of mobile learning technology created a different level of respect for teacher leaders.
- Relationships between peers and with administration are positive and built on trust.
- The implementation of mobile learning technology provided a greater need for collaboration and became a tool to increase collaborative interactions.
- There was clarity of roles and responsibilities during implementation.
The implementation of mobile learning technology created a greater need for support, and became a vehicle for feedback between teacher leaders, peers, and principal.

Role respect is defined in relation to subject area and instructional expertise. The findings are discussed in terms of changing roles as some teachers, once respected only for their instructional expertise, now thrive as technology leaders as well. It is noted how conditions have particularly changed in this area. As with any relationship, trust is essential to developing positive working relationships. As new technologies are introduced, many teachers find themselves in a changing environment having to trust other peers and students in areas they once had control. The findings around trust are presented, along with the impact that technology had on the environment.

Concerning clarity of domain, it was important that MIS administration was clear about where common ground existed and where teachers could and could not lead. The balance between providing an environment where teacher leaders wanted to take initiative and where administration had to draw the line was an important one to establish. The findings are discussed in terms of this balance and how important it was to establish this not only for teacher leaders but also for the success of the initiative. As technology is often new, it provides challenges for principals to define their domain. Finally, open and ongoing feedback and communication is a positive condition for teacher leaders. This section provides a list of findings of how technology provides tools for ongoing surveys which allow teachers to give feedback. Technology provides tools to collaborate and communicate with peers and administration on a timelier basis, which may allow teacher leaders more opportunity to give feedback.
The implementation of mobile learning technology created a different level of respect for teacher leaders. Interviews indicated an overall positive level of respect among teacher leaders and peers, and teacher leaders and administration. The mobile learning roll out, however, may have impacted the teacher leaders in a way that allowed them to thrive in different ways. The principal put it this way:

I think people who were intrinsically leaders anyway recognized that technology is a big component, and continued to be a leader. When you see yourself as that leader, you’re going to do what it takes to know what you need to know to stay in that role. . . These teachers use technology in a way that improves themselves as leaders.

For some, like teacher leader B, technology became a way to develop respect in additional ways, not just in her subject matter. This allowed that respect to go beyond her department to other functional areas in the school, but one had to be willing to put oneself out there, a step which is not always easy with peers. Teacher leader B expressed this reality: “As far as change of relationship with peers it’s tough. It’s hard to put yourself out there to show people how to do something.” She conceded that you have to be careful how you deliver a message to peers so as to avoid compromising the respect that you may have earned by appearing condescending in tone. She went on to say that it is different with an administration that is happy to see you taking initiative.

One consistent comment from participants was in regards to teacher leaders of technology stepping up to help others who do not easily gravitate to technology but are nevertheless respected educators. The principal gave the example of a teacher who was widely respected, but technology was not their strength: “You can’t believe how many people line up to be able to get with this person and help them with technology. . . ‘I probably can’t give this
person much teaching assistance, but I can help them in this role of technology.’” Teacher leader E pointed out how people who are good at certain technologies became go-to persons not only between people of different subjects but of different grades. Because of the natural respect that seemed to exist, it was often the case that teachers would get help from other teachers, and this was supported by administration. This cooperation was indicated in a comment from the technology director: “We encouraged Grade 8 teachers to come over and spend a day here. . . go work with another science teacher, and spend a day in the classroom and see what this (technology) can do.” The findings did not indicate any level of hierarchy amongst peers — only collegial respect. Technology then became another level of respect that could be earned by those teacher leaders who took advantage of the situation.

**Relationships between peers and with administration are positive and built on trust.**

Trust and positive relationships were key conditions for the success of teacher leaders, and this was a consistent theme at MIS both among peers and with the administration. Because many of the teachers had worked together for a number of years, a level of familiarity was already in place before the 1:1 initiative. There was general agreement that this helped foster a good environment for the integration of the new technology. Teacher leader B noted how, since a level of trust had always been present, there was no need to be afraid of failing or acknowledging that one’s way may not be the best.

Teacher leader A reinforced the idea that relationships were absolutely built on trust; however, she did not see technology impacting this one way or another: “I think teachers who were willing to ask for help with a lesson plan, whether the technology is involved or not, are still going to be those teachers.” However, she did feel that teachers were more ready and willing to have people come into their rooms or themselves visit other rooms. In light of this, it
seems that, while the trust was there, the technology may have initially created a less trusting environment due to lack of confidence with the new technology. From her own perspective, she had seen technology as helping foster a deeper relationship with peers. In this case, technology was a catalyst that helped build a trusting relationship. When asked about relationships with peers, the principal did not hesitate to say, “Yes, trust is a big part.” He went on to comment how there had been little turnover and that many of the staff were still in the building. Also, he referenced his own longevity at the school — first as a teacher, then assistant principal, and now principal. This helped in building a level of comfort and trust within the school. This was also observed in interactions among participants.

Finally, both teacher leader C and teacher leader F, who were interviewed together concurred that relationships were built on trust. Concerning the impact of technology, teacher leader F commented: “I don’t know if it’s impacted the trust, but it had impacted the relationships. I have relationships with people I wouldn’t have.” Teacher leader C went on to say that “you and the science and English teacher can talk about how to turn on this, how to save this page. So you are talking with different people.” Trust, in this case, seemed to have a greater impact on technology than the reverse. However, implementation of technology appeared to enhance trust by providing an additional opportunity to build trust. The theme of trust was consistent with the themes of sharing and teamwork previously addressed. The findings indicated a positive working environment that had brought about advantageous working relationships among teacher leaders and with administration.

**The implementation of mobile learning technology provided a greater need for collaboration and became a tool to increase collaborative interactions.** The findings regarding the theme of collaboration were the most robust. There was a clear atmosphere of
collaboration at MIS, and while this section is focused primarily on roles and relationships between teacher leaders and peers and with school administration, it is worth mentioning the findings on collaboration between district, school administration, and teacher leaders. The overall environment set an underlying tone of cooperation that was sensed throughout the project.

The first indication of collaboration and its essential importance to the project was between the district technology director and the previous principal. A conversation between the two initiated the project and an agreement to move forward. The current principal emphasized the importance of this collaboration and the shared passion the two had for the project. After the principal retired, the collaboration continued between the district technology director, the current principal, and teacher leader A. As the current principal expressed, “So there’s that collective conversation going on.” This coordination was and, at the time of the study, continued to be essential, and the district technology director pointed to this as one of the key reasons why they were successful.

The next indication was how the project was introduced. As mentioned, cross-departmental teams were asked to collaborate on a proposal, and the best would be chosen. As teacher leader D commented: “So we collaborated as a team, and formulated presentations to the technology department and the administration…” Since this was not specific to one department or one subject (i.e. science or math), it made it possible and important to do it in this way. The importance of this was that it provided much broader insights into the needs and varying issues that might come up in a school-wide implementation. Technology was often implemented in this way across the enterprise, thus heightening the need for collective input.
Technology also became a tool to increase collaboration. Teacher leader B gave the example of being able to work together with other teacher leaders from other subjects: “What kind of projects could we meld together?” If it’s something where students are using technology, they can just bring it up on their iPad. The teachers then could collaborate on a project that might run across different subjects, and the technology allowed them to facilitate this type of instruction.

Teams helped build relationships which went beyond the teams themselves and translated to collaborations among individual teacher leaders. Teacher leader B had this to say: “It certainly helps me with the science teacher, and we tend to look things up together with the technology and say how can this better both of our classes?” Teacher leader F also gave an example of a teacher who was initially resistant to technology and was “now helping to co-plan with me.” She noted that this was a teacher who was not originally a user of technology but had now fully embraced it. This teacher was part of the observations that were conducted, and it was clear that technology was fully embedded into classroom instruction. Asked if she felt whether technology was enhancing collaboration, teacher leader F said:

I think we’re at a point where we are looking at how we can use it across the curriculum. . . I think to bring in social studies and ELA is something that we’re working on, but I think it’s our next step.

The findings show that the mobile learning implementation had helped create more horizontal relationships among peers, and this had directly impacted collaboration. Teacher leader F stated, “I have relationships with people I wouldn’t have.” Teacher leader C concurred that he now worked with different people to solve issues, “so you are talking with different people,” and both agreed that conversations with teacher leaders previously would not happen,
whereas now they spent hours planning with them. Teacher leader E and the teacher leader D who were interviewed together providing an opportunity to observe their interaction, also supported the impact that technology had on collaboration. “A teacher that I used to work with last year is in my room almost every day . . .”

Collaboration seems to fall under two general categories — the more structured lesson planning and the trial and error type of discussions in which peers share ideas on how to use the technology. While the former has an established arrangement, the latter happens on an as-needed basis and is more unplanned. Thus, it is more fluid and not restricted to teacher leaders of one particular subject. As revealed before, teacher leader D and another teacher colleague often came together, one saying, “I tried this application out, and it failed miserably, but then I re-tweaked it and it worked.” Teacher leader B also spoke about her interactions helping other teachers learn the technology and make better use of applications. In regards to working with another teacher outside of her subject, teacher leader B pointed out how they would look things up together with the technology to see how something might improve both classes. Thus, the study revealed a need for different levels of collaboration that helped foster relationships more horizontal in nature. In fact, the findings indicate that as technology becomes more ubiquitous, there is a greater need for collaboration among peers who cross disciplines.

Finally, an additional finding that falls under the theme of collaboration and may have indirect impact on roles and relationships within the school is collaboration with students. Teacher leader F stated, “I see a lot more collaboration with the kids,” and teacher leader B agreed. Participants noted a greater participation between students and with teachers when it came to using the technology in the classroom. This may need to be considered as a new aspect
of the environment favorable to teacher leadership — that of increased collaboration between teachers and students on the best use and adoption of technology in the classroom.

**There was clarity of roles and responsibilities during implementation.** Implementations of technology are complex and if done poorly can impact adoption and the ultimate success or failure of the project (Berrett et al., 2012). The mobile learning initiative had a multitude of implementation issues with which to contend, including timing of the initial rollout at the end of the school year and then again at the beginning of the year. In addition, the district had to contend with the training of teachers, adoption, in-classroom use, and ongoing technology issues that needed to be addressed. The logistics required substantial coordination on the part of administration and teacher leaders. Fortunately, much experience had been gained in dealing with the previous implementation of the cart model. The scheduling of sharing was challenging but ultimately a key factor in success. Teacher leaders highlighted the important role the principal played in establishing schedules and accommodating needs.

The creation of teams was very purposeful, with acknowledgement of the important role each individual could make based on their background and skills. In consideration of technology, there was a teacher leader of technology on each team. There was confidence in the teacher leaders in the buildings, but the principal was also careful to provide a clear environment to succeed: “We set parameters on what you can do on your own and what we would like to help you with.” He spoke about being clear on setting boundaries that provided enough space and capacity to allow staff to solve problems on their own, but also help keep away from potential conflicts that might arise.

This was a key factor in the success of the implementation. The principal pointed out the importance of not intervening but still providing guidance and assistance. This was seen in the
positive interaction between teacher leader A and other teacher leaders which was also validated by observation. She had a very clear understanding of the remit but was given freedom to work within parameters. As the principal stressed, “for any principal looking to take this on, you better know your staff and who you can ask for help.” So while there was the natural role of each individual given their specific function, the mobile learning initiative required additional functions and tasks outside a teacher leader’s day-to-day work.

The implementation of mobile learning technology created a greater need for support, and became a vehicle for feedback between teacher leaders, peers, and principals. The relationship that teacher leaders have with their peers and administration is an important condition for creating an environment for success. Communication, support, and feedback needs to be fluid and ongoing. The mobile learning initiative, as did previous technology implementations, appeared to create a need for an increased level of each of these due to the complexity, shared nature of the program, importance of adoption, and demands for learning new ways of teaching. The teams helped provide a built-in format for teachers to communicate and support one another. They were also used as a forum for feedback.

Teacher leader B spoke about the transition to MIS and how, prior to moving, colleagues would meet once per month. Things changed with the move and increased with technology. She stated: “Now that we get more and more with technology, I meet with my colleagues once a week, and say ‘have you tried this,’ and this is my online resource that I’m building.” When asked if the new technology enhanced the communication, teacher leader B commented:

They’d been happening for the previous year before iPads. Now it enhances everything because it’s like I just found something we can use for a lesson. Now does everyone use it? No. Does everyone at least try to implement something? Absolutely.
It is important to note the excitement that teachers leaders had when this communication and support occurred.

Support was also available from the teacher leader A. It was clear that this role was created as a result of growing technological need and use. In fact, teacher leader A was recruited from teaching third grade. She explained: “The superintendent contacted me and asked if I would be interested in moving from elementary school to this newly established intermediate 6/7 to teach a brand new course that had never been offered. . .” While the role was structured to provide technology literacy instruction to students, she also worked very closely with teacher leaders and was a teacher leader herself. She expressed, “I see myself as a coach, and it’s a role I would like to do more of.” She often commented on the additional assistance and support provided to teachers and was eager to do anything to help in learning and adoption. As a classroom teacher, there was a clear understanding of the demands in the classroom that technology and the transition to new instruction could place on a teacher. She stated, “I then try to approach people in a soft way and encourage help.” Moreover, it was important to be vigilant of the needs of teacher leaders and maintain the pulse of what was happening. The principal encouraged and supported this as well and acknowledged the support role that teacher leader A played with teacher leaders and with him.

I know that if a person is struggling with a certain component of lesson planning or something, I have a teacher I can go to. You can’t handle every problem. You need that type of support or this would be unmanageable. And if this was something the teachers didn’t recognize as a benefit, if this was something they balked at, just imagine how really difficult this would have been over the past four years.
The findings indicate a solid level of support from administration for the initiative and its success. This translated into support for teacher leaders. It was observed that administration encouraged participants to take part in the mobile learning initiative from the start, and while there were no technology coaches or integration specialists, there was a sense of solid support from the tech department when needed. Teacher leader D acknowledged: “They do an amazing job and advocated for us to have the resources and entrusted us that we’re going to use them to the best of our ability.” However what is interesting to note is that, in the absence of support, teachers often found that student in the classroom. Teacher leader D commented, “You’d actually hand it over to them and let them teach.” This is a theme that was throughout the interviews and observed and will be discussed later as a new conditional aspect of technology integration.

From an administration perspective, they saw the importance of support from the beginning. “You’ve got to have that culture in your building that supports this,” stated the technology director. She saw the importance of having a coach, and while this is not the way teacher leader A’s role was structured, they had tried to work with her time to make her more available to teachers. Ideally, there would have been mobile coaches for the 1:1, something the technology director saw was successful at another school. The technology director also played a role of support, and this was acknowledged in interviews with all participants. She also pointed out the important role of support the principal provided.

The MIS principal had been involved with the mobile learning project for four years. As assistant principal, he saw his role in “logistics, management, and with some hands on education of the teachers who would be utilizing the technology in the classroom.” He also saw this as an opportunity for his own professional development on the possible uses of the technology. He
expressed how he went to great lengths to create schedules that optimized the time needed to use the iPads: “Instructing teachers, and building capacity for them to have lessons that coordinated the use of the technology.” This appeared to be an essential and overarching level of support needed for success that is distinctive to a technology integration project. It was apparent that technology required an extra level of support and coordination, especially from administration. At this site, this was helped by an ostensibly genuine recognition for the need to support teachers. The principal pointed out during the interview that, “this is the longest I’ve ever sat in my office.” The need and desire to be visible and supportive was frankly stated. In addition, they were being proactive and had invested in MTSS (Multi-Tiered System of Supports) to help define the many situations and stakeholders. This was indicative of the importance the administration placed on support for teachers.

Along with the support provided, administration was always looking for feedback from teacher leaders, and technology was often the tool of choice to obtain this information. Surveys were conducted, and technology provided an easy way to gain this information quickly and efficiently. Not only did the surveys provide important data for administration, they allowed teachers the opportunity to give their opinion. Both teacher leader E and F agreed: “I think as teachers we have a lot of voice.” In addition, they saw the surveys as a tool to provide voice to students. Hence, mobile learning technology rollout not only provided a need for additional support; it also was used as a tool for feedback, which thus improved support. Teacher leader B pointed out how much quicker things are with technology: “You know, you’re able to get that instant result.”

**Summary.** This section considered the findings in relation to roles and responsibilities. It was found that the introduction of the mobile learning technology created an opportunity for
tech savvy teacher leaders to develop a different level of respect from peers and administration that went beyond their subject knowledge. It was also found that relationships between peers and administration were positive and built on trust, and that the mobile learning initiative provided an additional chance to strengthen these trusting relationships. In regards to collaboration, because of the nature of the implementation of 1:1 mobile learning, the new technology became a tool to increase collaborative interactions. However, the complexity of the implementation also fostered the need for clarity of roles and responsibilities. Finally, the implementation of the new technology created an even greater need for support, communication and feedback that had to be ongoing throughout the project.

Research Question 3: How has the Mobile Learning Technology Implementation Impacted the School Structure that Teacher Leaders work within?

The last construct of school decision making and operating structure is addressed in this section. Once again, the research question is restated and explained in terms of the findings. The different types of structures are briefly outlined to provide clarity of this section. Four themes emerged from the data:

- There is a hierarchy, and top-down decision making exists, but there is a strong sense that teacher leaders have a voice.
- More time was needed to collaborate, learn, practice, and lead.
- Professional development, formal and informal, was an indispensable component of the initiative.
- Even with supportive structures, impediments still exist.

Beginning with hierarchical structures, the removal of these is a key facilitator of teacher leadership. This section reveals the findings regarding the hierarchy at the site and whether or
not technology had any impact in removing this barrier. Had mobile learning initiative promoted a fundamental reordering of the workplace?

Concerning shared decision making, the overall structure is non-bureaucratic and as a result of technology is highly interdependent. This section analyzes this interdependence gleaned from the research and puts forth how technology had impacted decision making both vertically and horizontally throughout the organization.

Is decision making top-down, or is it participatory? The findings revealed a top-down structure; however, teachers felt they had a voice facilitated via technology. In this section, the hierarchical structure of the site is discussed, along with how decisions were made and how the mobile learning initiative was used to facilitate teacher input into decisions.

Not only do teachers need to have access to each other due to the interdependent nature of their work; they need time for this access. Teachers have traditionally complained about not having enough time, especially in this age of constant testing. An examination of the findings concerning more access and more time for access to their peers or administration is presented. And, while time to collaborate is important, it is the collaboration itself which is most in need. Technology is often highlighted for the collaborative tools that can be made available. With this capability, what had been the experience at this study site in regards to collaboration among peers?

Finally, structures that promote teacher development and learning are a key factor for the success of teacher leaders. Professional development is a key aspect of the district technology plan, and this is explained in this section. Findings are then explained as they relate to the district technology plan and what actually occurred.
There is a hierarchy, and top-down decision making exists, but there is a strong sense that teacher leaders have a voice. While a structure existed which provided a protocol for how decisions were made, there was no indication that it was strongly hierarchical in nature. There appeared to be a close relationship between district office, school administration, and teachers. While the drive for mobile learning was initiated at the district-level, teachers were brought in immediately as teams to make proposals for using the iPads. A strong indication of the lack of hierarchy was in the decision of where to implement the iPads. Initially, the district chose the eighth grade as the place to start, but the district technology officer changed direction after consulting with eighth grade teachers. She explained: “We thought the eighth grade would be the best place to start, and after interviewing the teachers in Grade 8, there wasn’t a lot of buy in or interest either at the administration level or at the teacher level.” As a result, they changed direction and approached the principal at MIS at the time who was interested in participating. The director commented on the developing partnership which subsequently involved the teacher leaders. In a traditional hierarchical structure, the eighth grade would most likely have not been given any choice but to participate.

If the mobile learning initiative had any impact on removing any hierarchical barriers, it was due more to the nature and complexity of the implementation. The technology director recognized the need “for all pieces,” including people, infrastructure, communication, along with the limitations of a small technology department. Coordination was critical, and any barriers would have negatively impacted the success. Furthermore, the ongoing input from all involved was crucial, as was user buy-in. This would have been difficult to achieve within a hierarchical structure. Lastly, the hierarchical structure would not lend itself to the shared decision making that was needed and took place at MIS. Teacher leaders were included in much of the dialogue
that took place regarding the implementation, even though decision making was still perceived to be top-down.

When asked how interactive the district was with teachers, the answer from the technology director was:

Hugely. We set our district vision, and I’d start working with administration and teacher leaders here, and before you know it I would change my mind and walk out the door. . . Very interesting, hugely interactive discussions where, you know you’ve got both sides coming together, and that can only be done in the proper environment.

However, when asked if technology had played a role, the answer was no. She insisted that it was the people but went on to explain: “The technology brings everybody together. We’re in that ubiquitous learning environment. Everybody has it . . . so that’s the collective common purpose.”

While teacher leader A felt that the teacher voice was being accounted for and heard, she was concerned that teachers may not always feel that was the case. This could have been an issue of understanding or communication. It may be such that their voice was being heard but that administration was getting a directive with no other option. It may not have been getting communicated, or perhaps it cannot always be communicated. However, she also believed that built-in conduits such as herself could raise issues with administration, especially when it came to technology. She saw technology as a great tool for enhancing that two-way communication and shared decision making through things like the previously mentioned surveys.

From the administration perspective, no large bureaucratic processes or structures appeared to slow down or impede any decision making. There was a sense that it was an
interactive decision-making environment with lots of involvement from teachers. They may not have been able to engage each teacher individually, but with surveys they could receive ongoing feedback and cultivate a sense of participation from all teachers. This, of course, was the perspective of administration, but what about the teacher leaders? Did they have a voice in the process, or did they have a sense that all decisions were top down? The findings revealed somewhat of a combination of both elements.

Beginning with teacher leader B, her observation was that, while decision making was top-down, “it’s done with a lot of questions and feedback from administration to staff.” Her feeling was that a blanket decision was never made, nor was there ever a sense that administration did not care. They showed genuine interest in how people felt and how comfortable they were with decisions. Teacher leader B also attributed much of the ability to get quality and timely feedback to technology. Through tools like Survey Monkey, they were able to put together quick surveys before making any decisions. Also, given that the surveys may have been anonymous, she felt that more could participate and not feel threatened or uncomfortable, as can happen in a more open environment in front of other people. Teacher leader D commented in a similar fashion concerning decision making: “I think it’s still the administration making the overall decision, but I think as teachers we have a lot of voice,” and teacher leader E agreed. Teacher leader D also remarked on the ability to use surveys via technology. He also noted the positive use of surveys for getting input from students. In both cases, the aspect of immediacy and anonymity seemed a benefit in the use of technology for conducting surveys.

Lastly, both teacher leader C and teacher leader F concurred that decision making was top-down but with input. One teacher leader said more specifically, “We have input, but it’s top-
down. There’s no question about it.” However, this teacher also stated that the preference might be more toward having administration make the decision: “I don’t think anyone in this school above me, if I would go to them and give them advice or a suggestion would not listen to me.”

Teacher leader F noted how administration would often ask her opinion of an idea.

In summary, while decision making appeared to be top-down from the teacher’s perspective, there was a strong feeling that their voices were being heard and that they had input into decisions. The impact of technology seemed to be more as a tool for providing feedback on a timely basis. This may help bridge the gap between pure top-down decision making and no feedback at all. The environment at MIS seemed to be one that would promote more sharing and feedback, and in this case technology may be a tool for this to develop beyond what would be possible via face-to-face interactions or paper-based surveys, which are cumbersome to administer and more difficult to assess, thereby slowing down the overall process.

More time was needed to collaborate, learn, practice, and lead. Lack of time is a consistent complaint within the education community, and this was no less true for this initiative. Having adequate time was an important condition for teacher leadership, and the findings at this site indicate that this need increased as a result of the scope and complexity that comes with an implementation of technology. Four areas of need emerged from the findings: time to learn, time to practice, time to collaborate (informally and formally), and time to implement in the classroom. Each of these will be addressed separately, but it should be noted that there are interdependencies among the four, which will be highlighted.

Time to learn. The mobile learning initiative brought a level of complexity during integration, and use required substantial training on the part of teacher leaders. Well-planned and executed professional development was a critical component, but of equal importance was
access and availability of training, along with adequate time scheduled to attend training. In the case of MIS, professional development was deemed as a critical factor, and it was recognized that it was essential to provide time for training. The principal highlighted the substantial investment being put into mobile learning; thus, it was important that teacher leaders also invested the appropriate amount of time in professional development (PD). The technology director stressed, “We have to do a ton of PD with the teachers.” Last year over 58k hours of PD was provided in the district, and the technology director emphasized, “And moreover, it can’t happen after school.”

Teacher leader A elaborated on the PD days that were held and the importance of building in time to experiment with the new tools. This year they brought in a specialist for two days, and teacher leaders came in for three hours when they learned things that could be done on the iPads. Time utilization of the iPad was a key topic. Lastly, the principal noted the importance of logistics and schedule management to assure the teacher had time for PD: “I did a lot of setting up and planning PD for teachers.” Beyond the scheduled time for training, teachers had other opportunities, but they were self-directed so that teacher leaders had to make their own time. Teacher leader D commented that “those that stepped up as leaders” attended the Home Grown technology conferences held at certain times of the year, including during the summer. PLCs were also thought to play an important role in professional development, and while time was provided, it became increasingly impacted by other initiatives such as PARRC. Not only did PLCs play a role in professional development; they were an important aspect of collaboration.

*Time for Collaboration (formal and informal).* While PLCs were noted as being part of the professional development, their larger role was as a place for collaboration and teamwork.
Great effort was put into scheduling weekly time for PLCs to occur, and this was considered a key time for learning and the sharing of ideas to take place. However, other priorities impacted the opportunity for this to occur. Teacher leader A felt that the structure was there, but the follow through on taking time to discuss what teacher leaders did with iPads that day did not always happen: “A lot of our PLC’s this year have been discussing PARCC. . .You know that whole very beneficial way of creating and developing lesson plans and looking at student learning. But unfortunately . . . time.”

One could sense the concern in her voice when discussing the frustration that existed for competing priorities. She expressed, “It doesn’t give much time, and it’s exasperating to teachers and to our administration.” She knew that there was a need, and more importantly a desire, on the part of teacher leaders to learn the technology. She had also been provided additional time during the week that she referred to as “tech integration periods where I don’t have students, and I will try to observe what teachers are doing. . . I mean we have walking down the hall in the morning conversations.” In this way, and others, teacher leader A attempted to facilitate collaboration and sharing.

Informal collaboration was also found to be an important factor for teacher leaders. These collaborations ranged from a hallway conversation to unscheduled and scheduled meetings with peers. Teacher leader B felt that the implementation of technology provided additional opportunities for collaboration but that there was not a lot of time in the day, “so a lot of your collaboration you have to take the initiative and do it on your own time.” She noted that with technology such as Google Drive she could often collaborate electronically; however, this was not a replacement for sitting together with peers and saying “this is what I’m really thinking.” Teacher leader E supported this. She felt that technology provided more opportunity
and reason to collaborate and that there was still more room; yet, time was an issue. She mentioned how difficult it was to carve out time in the day, “but I think a lot of us do it. We get here early in the day, and we’re talking in the hall, and you see someone during a prep period. It’s on the fly but . . .” Both teacher leader E and F voiced the same issue. When asked what they thought it would take to get more collaboration, the response was unified —“time.”

**Time for Practice.** Beyond the formal training, collaboration, and required sharing time, there was also the need for making more time to learn by practicing on one’s own. Teacher leader B put it very succinctly: “You know it just took time of me saying I’m going to sit down, I’m going to learn this . . .” She acknowledged the amount of her own time it took to learn how to build a good lesson and make sure it was interactive, but once learned she could build a lesson in a short timeframe. Teacher leader B recognized the benefit of the technology to her classroom practices. This practice time was very important to her learning. She praised the in-service training being offered, but stated, “I still need to go home. I need to practice it.” Consistent with teacher leader B’s experience, teacher leader D also brought up the need to learn on her own, and how she spent an enormous amount of time at home, lunch, and after school.

**Professional development, formal and informal, was an indispensable component of the initiative.** The importance of professional development in the implementation of technology was recognized early on and was featured in the MIS 2014-16 Technology Plan. Providing adequate PD and support was highlighted as a key part of a framework for investing in digital learning. Professional development is thought to play a requisite role in the SAMR technology adoption model used by the district (Mayview Public Schools District Technology Plan, 2014-2016). Validation of this was seen in interviews with several participants. It was clear that this model had been internalized by those involved. As the technology director put it,
“When we talk about technology transformation, we talk about the SAMMR model, but really when I have a conversation with people it’s about skills.” She made a strong point to talk about PD: “I can’t impress upon you enough the supports you have to provide. . .” She referred to informal coaching buddies who were showing each other, team members, and quasi-technology coaches through teacher leaders.

The approach of the district was 360 degrees as well. They conducted surveys with teachers to determine the needs. “So we want to listen to the teachers,” and a lot of PD was hands on so as to get attendees to use the tools. This was an important aspect of the type of PD that was needed in a technology integration initiative. There was also PD conducted for teachers by teachers called Home Grown (Mayview Public Schools District Technology Plan, 2014-2016). “Connecting teachers with teachers. I can’t stress that enough,” said the technology director. Teacher leader B supported the benefit of the Home Grown initiative, as did teacher leader D and teacher leader E.

Next year the district is conducting a 3-credit full year course for mobile learning for which a number of teachers have already signed up. It is a “show me, talk about it, investigate it, do it with your class, and come back with what you’ve learned.” She stressed the importance of this being year-long and related that to the total cost of ownership when investing in technology. This underscores the important cost condition that usually accompanies an investment into technology. Technology, infrastructure, and professional development are key considerations to account for in such large scale implementations. Teacher leaders also acknowledged the investment being made which gave them additional impetus to make sure that the technology was adopted. They felt that with greater use would come more confidence in its benefits and ultimately more investment into more technology.
Teacher leader A played an important role in professional development and could be seen as an additional support component if required. Her role for the first three years was logistics, management, and educating teachers who would be using the technology. The principal commented on the almost indispensable role she played in supporting and supplementing his efforts. The technology director also remarked on the important part teacher leader A had played. There was a desire to further enhance the role to be more of a mobile coach similar to other integration models, but funding constraints did not make this possible. However, they had been able to work more availability to teachers into her schedule. Teacher leader A’s role was referred to as necessary and essential.

From the teacher perspective, there was general acknowledgment of the training and support that was provided by the district and school; however, there was also a sense of ownership in their own learning. One teacher leader stated, “The majority of us were self-taught in how we were going to implement the iPads into our classrooms.” In referring back to how the initiative was initially rolled out, teams were asked to make a proposal. Thus, from the start, there was a sense of knowing the level of ownership involved. As the principal put it, “so we had iPads for teacher use, but we wouldn’t give them out unless you passed a basic requirement of your own knowledge base. . .”

Even with supportive structures, impediments still exist. As seen, implementation is a critical factor in the success of technology integration. If the support structures are in place, the probability of adoption is much higher. At MIS, the findings indicated that these support structures were in place. Infrastructure, training, access, time, and collaborative environments were all important factors, but even with these, some impediments still impacted the initiative.
Two that emerged in the findings were the rigidity of the traditional teacher and the technology itself.

First, there are the findings in regards to the traditional teacher. The mobile learning initiative put the learning into the hands of the student. It demanded a different way of thinking and teaching that is more student-centered than the traditional teacher-centered model. While more and more teachers were adopting technology into the classroom, there were still those “who control in front of the classroom,” as teacher leader A put it. She admitted the reluctance to give up and potentially relinquish control of the classroom: “It is not so much resistance as the fear that they are not the expert.” She acknowledged that this is how it used to be, but things are quite different now. What seems to be helping transition some of these more traditional teachers is an awareness of the success that others are having and the fact that the students really like it, “and I’m not using it.” The technology director agreed. There is a fear of change, given that for many this is a whole new role. Getting those teachers to see the power of the technology is a key part of the implementation that must be taken into account. The change, when it does occur is powerful, and as the technology director pointed out, “When you see that happen, you know you’re making effective change.”

The second impediment had to do with the technology itself. This was seen in a number of ways. First, technical issues arose which impacted the flow of the classroom learning. Teacher leader B reported on a time when the technology went down during a class and the disruption it created. The technology team responded quickly, but it still interrupted the lesson. Teacher leader D had a similar experience: “There were definitely times where we would have a technology issue, and 25 kids would be sitting there,” hence the need for a backup plan. This would be a challenge for any teacher, but for those who have not fully embraced technology, this
could be detrimental to adoption. Then there were the logistics of using the technology. The cart model posed particular challenges of access and use within the classroom. Each teacher leader reported on challenges of scheduling and then managing distribution in a classroom. Thus, technology impacted how collaboration would take place. If not managed correctly, it had the potential to create tensions. Teacher leader E noted how there were issues of sharing.

Teacher leader A put it well in asking the question “is technology getting in the way?” She felt very strongly about the collaborative environment in place at MIS. She accepted that some will not readily embrace technology, but she does not see that as a negative. She explained that “it comes back to our students, so is the technology best for our students? There are times when it is not, and I think that is always freely shared here.” She noted the importance of having these discussions on an ongoing basis, because with each new group of students came new challenges and a need to reevaluate what works best: “I always tell people, just because there is an iPad doesn’t mean you’re going to use it. There are times when it’s beneficial and there are times when it’s not.” Referring back to the comments made by the technology director, who reinforced, “it’s not about the tool, it’s about classroom practices.”

Another impediment was the inconsistency of implementation from grade to grade. This had a negative impact on the ability of teacher leaders to collaborate with teachers in preceding and proceeding grades — in the case of MIS, Grades 6 and 8. Because the mobile learning technology was implemented in seventh grade, the sixth grade students came in with very little educational exposure to iPads. Therefore, this changed how quickly the teachers could use them. Recently, the sixth grade classes were given carts so, as teacher leader B pointed out, “they should already have the skills,” which would make the transition much more seamless. This also created a slight tension between the two grades, since one had the iPads and the other did not.
Also, as teacher leader F indicated, “teachers who are not having the technology are less apt to buy into the training, because they are saying, why should I bother? I don’t have the tools in front of me.” However, the most important finding was in terms of the transition and the progression of learning from Grade 6 to 7.

A similar situation existed between Grade 7 and 8. The eighth graders did not have the iPads, and they were in a different building, which made the transition more difficult on the students as well. Teacher leader C told how students came back from the eighth grade disappointed that they did not have iPads available. Teacher leader D had a similar experience and explained that the kids “hit the high school where they don’t have this technology and are advocating for themselves. They say, ‘I need this. This helped me.’” This was after the seventh grade offered to help the eighth grade learn to use the technology. So, while the opportunity to collaborate existed, there was no driving reason from the eighth grade perspective to work together with the seventh grade to provide a transition for the students. This becomes another challenge for teacher leaders that can impact their ability to collaborate and work as a team. It may also create a role respect issue unforeseen by previous research.

Summary. Four themes emerged in the findings around the third construct, school structure. The first was in relation to hierarchy. While it was found that a hierarchy existed, there was strong sense that teacher leaders had a voice. This was particularly important given the nature and complexity of the overall integration of the new technology and the need for ongoing input from all stakeholders. Second, more time was needed to collaborate, learn, practice, and lead. In terms of collaboration, time was needed both formally and informally so as to allow experimentation of best practice with peers and on one’s own. It was found that adoption and use of mobile learning technology was complicated, and required sufficient time at
multiple levels. Third, and consistent the aforementioned need for time to learn, was the need for professional development. This was found to be an indispensable component of the mobile learning initiative at MIS. Overall, the structures at MIS were found to be very supportive, however, impediments to successful adoption still existed. Three such impediments were noted: a reluctance to change and embrace the new technology, the technical and logistical issues that arose, and the inconsistency of the implementation from grade to grade.

**Summary of Results**

This chapter presented the findings from interviews and observations conducted, along with documents collected from the Mayview Intermediate School study site. The findings were presented based on the three research sub-questions which are organized around three constructs: school culture, roles and relationships, and school structure. The first question addressed was:

*What was the Interplay between School Culture, Technology, and Teacher Leadership in the Implementation of Mobile Learning Technology at Mayview Intermediate School?* There were five thematic topics: a focus on learning, encouragement for taking initiative, teamwork, teacher leaders are valued, and acceptance of change. It was revealed that there was a strong focus on learning and that this was always the overarching goal of the school in adopting technology. In fact, the mobile learning initiative was seen as an important aspect in leading to more student centered learning and empowering students to take more control of their own learning.

In regards to taking initiative, the culture is open to this, and technology provides more opportunities for teachers to take initiative within their own subject matter but also with technology itself. It was found that those teachers who had a comfort level with technology were provided a new avenue for expanding their skills, interacting with peers, and showing leadership. Combined with the school’s educational philosophies and strong orientation toward learning, the
mobile learning initiative provided opportunities to become an even stronger pedagogical leader, such that good teacher leaders became better teacher leaders.

It was also found that there was a strong expectation for working as a team and that the mobile learning initiative provided both an opportunity and a challenge. Since the initiative was throughout the seventh grade, it was essential for teacher leaders to work together and support each other during and after implementation. Also, it was seen that technology provided a common ground and purpose that went across all disciplines.

Moreover, the rollout of mobile learning technology created an additional criteria — that of a technology leader within each team. This was consistent with the finding that teacher leaders were viewed positively by the school. Administration recognized the need for exemplars, especially in complex technology initiatives. They also believed that the initiative itself provided an opportunity for teacher leaders to be positive examples and role models. This proved to be beneficial not only to those teachers not directly involved but also within the teams that were responsible for the implementation.

Lastly, it was found that there was a need for an awareness of change that technology is bringing forth. The teacher leaders saw this and embraced this new reality. Again, however, the need to embrace technological change as a “new normal” was driven by the predominant theme of education and learning first. The school recognized that teaching had to change not because of technology but because of what technology now provided and the demands of the world that the students must learn to thrive in. Therefore, awareness of this change and being open to adopt new ways of teaching and learning were important to the adoption of any new technology that might be implemented. Resistance to change did exist at MIS, but it appeared that over time
adoption had increased, as more teachers learned about the educational impact and became exemplars in perhaps a less apparent way.

The second question addressed was: *How have Roles and Relationships between Teacher Leaders and their Peers and Principals been Impacted as a result of the Mobile Learning Technology Implementation at the Mayview Intermediate School?* Topics covered within the construct of roles and relationships were role respect, trust, clarity of domain and support and feedback. It was found that technology had created a different level of respect for teacher leaders which allowed them to be successful in new ways. Some became “go-to” persons for technology, allowing them to gain collegial respect from peers. Others used the mobile learning initiative and their savvy with technology to assert themselves as leaders by offering to help others, thereby improving adoption. It was found that relationships were enhanced and new ones were established. It was also found that, while technology did not impact the trust important to teacher leaders, it did help reinforce and strengthen the trust that was already in place.

In regards to role clarity, given the complexity of the implementation, it was important to be clear about the roles and responsibilities of those involved. Technology only accentuated the demand for this need. Administration relied on lessons learned from previous implementations to be sure that the plan for implementation was clear. The teams helped in allowing teacher leaders to come together and talk through issues that might arise, and the principal was actively engaged in all logistical issues to prevent potential scheduling or communication conflicts.

Finally, technology created a greater need, as well as a means for support and feedback between teacher leaders, peers, and administration. The complexity of the implementation and the importance of adoption heightened the importance of creating a support structure both formal and informal within the school and from the district office. Collaboration between the district
technology office, school administration, and school technology department was essential. This was recognized from the beginning of the initiative and was based largely on experience from previous implementations. In addition, classroom support was required, and teacher leaders often leveraged the knowledge of their students. This may be a distinctive and new development that might require future research. Along with the support provided, administration continually looked for feedback and used technology-driven surveys easily administered and assessed for quick response. In this way, teacher leaders felt they had a voice.

Question three, How has the Implementation of Mobile Learning Technology Impacted the School Structure that Teacher Leaders work Within, was directed toward the third construct, school structure. Topics reviewed in terms of themes from the findings were: hierarchical structures, shared decision making, top-down decision making, time, collaboration, and professional development. Hierarchical structures can be detrimental to teacher leadership initiatives, and while a hierarchy did exist at the site, it was not found to be strong or rigid. The impact of the mobile learning initiative —with all its complexities and need for fluid communication horizontally and vertically in the school organization —showed that the decision-making structure was open. No doubt, decisions were still top-down. Nonetheless, teachers felt they had a voice, and the nature of the initiative required this. Administration needed input in the process to make informed decisions. It was also noted that technology played a role in breaking down structures and bureaucracies through survey tools that could be used to easily access input from teacher leaders. This had a large impact on the flow and sharing of information.

Time was another important requirement for the mobile learning initiative to be successful. Teacher leaders needed time to learn, practice, collaborate and implement the
technology in their classrooms. While administration was aware of this and went to great lengths to provide adequate time, it was never enough. Technology was moving at such a fast pace that teacher leaders were often challenged to carve out a moment either in the school day or during their own time. Also, knowledge-sharing with peers was found to be highly valued; thus, more time for informal collaboration was sought. Fortunately, the environment at the site was highly collaborative, and this was enhanced by technology. Teacher leaders collaborated on projects both within a discipline and across disciplines. The implementation of mobile learning technology helped drive the need for a more collaborative environment and open structure, and as technology becomes more present in the environment this need grows. This need for collaboration is now spilling over to include students. The technology seems to be producing a new level of collaboration that is needed between students and teachers.

The mobile learning initiative also heightened the importance of professional development. Not only was this important for individual use; it was important for overall adoption of the technology. Professional development had always been highly valued at the site, but here again, the new technology created an even greater need and different conditions to address. In fact, success of the overall program hinged on a robust program that combined both formal and informal training and active use of PLCs.

Lastly, even with a structure that largely was supportive of teacher leadership, barriers and impediments still existed. At the study site, there were three apparent barriers. First, teachers who held to more traditional teaching methodologies tended to hold back implementation. Resistance to adoption was a problem that was slowly being overcome as teachers learned to value the new technology. Teacher leaders played an important role as exemplars to show and encourage greater use. Second, there was the technology itself. At times
it did not function or became a logistical issue in terms of access. This created a situation that had to be dealt with quickly and efficiently or risk interruptions and disruptions in learning, as well as adoption by potentially resistant teachers. Third, there was the inconsistency of implementation between years. The mobile learning was implemented in seventh grade only, which created additional preparation and learning considerations for the incoming sixth graders. For those students transitioning to Grade 8, the skills developed were not used, which caused disappointment and motivation issues. Both of the aforementioned created unnecessary tension between grades that had the potential to not only impact longer term collaboration between grade teachers but also the overall flow of learning.
Chapter V: Discussion of Research Findings

Introduction and Summary of the Study

This research was driven by the need to understand the impact of the implementation of mobile learning technology on the conditions that influence teacher leaders and their ability to lead. Technology and the inexorable change that it brings to education, our schools, and our classrooms confronts our best leaders with complexities and challenges that have never before been experienced. More importantly, the pace of change does not look to be slowing; thus, in order to better prepare our teacher leaders, it is important to understand its impact. Using the conceptual framework developed by York-Barr and Duke (2004), the researcher placed conditions into three categories: school culture, roles and relationships, and school structure. This research aims to further the work that was conducted in 2004 by considering technology’s impact in light of the changes that have occurred in the last 10 years. The researcher conducted a case study of a recent implementation of 1:1 mobile learning initiative at an intermediate school in New England. The purpose of the study was to address the following research question:

1. How has the implementation and integration of mobile learning technology impacted the conditions that influence teacher leadership at the Mayview Intermediate School?

The primary source of data were interviews and observations conducted with a group of teacher leaders and administrators at the school and district. All data were analyzed and coded, and key themes were identified.

Summary of Findings

The following summarizes the findings of the impact of the implementation of mobile learning technology on teacher leadership as they relate to the three constructs: school culture, roles and relationships, and school structure. All findings came from an analysis of interviews.
with study participants, classroom observations, and a review of documents. The findings are discussed in relation to themes that emerged and is followed by a further discussion of findings in relation to the theoretical framework and then to literature.

**School Culture, Technology, and Teacher Leadership.** One of the most significant findings was the strong focus on learning at the school. This theme emerged numerous times and was seen to pervade many of the other findings. It was clear that, while the implementation had a substantial impact on the school, the primary motivation behind the mobile learning initiative was improved learning. The mobile learning initiative did, however, impact how teaching and learning was conducted. There was an important shift in mindset that had to be undertaken at the classroom and school level with both teachers and administration.

From the learning perspective, the school was moving toward a student-centered learning model, and the implementation of mobile learning technology created a condition that allowed teacher leaders to empower students to guide their own learning. In particular, the mobile learning initiative was an example of putting technology directly into the hands of the students. Where only a few years ago students had to wait for access to a computer lab, more and more they now have full-time access to technology. In this new and growing setting, teacher leaders are being forced to rethink how teaching and learning take place. They will need an environment open to allowing them to explore, take risks, and learn with their students.

Collaboration was, on the whole, very strong at the school. This was partially due to the comfort level teacher leaders had with each other after working together for a number of years. However, it was clear that collaboration and teamwork were encouraged and considered essential to success and not just a function of longstanding relationships. Adding the complexity and importance of a successful adoption of technology only reinforced the importance and need for
collaboration in a near 360 degree manner. Teacher leaders not only needed to work with
departmental peers but also across disciplines, in cooperation with administration, and alongside
technology specialists. The environmental interdependencies associated with an implementation
such as mobile learning computing necessitate collaboration and teamwork perhaps not before
envisioned by school leadership (Towndrow & Vallance, 2013). Fortunately, the school and
district leadership recognized the important role that teacher leaders play in this regard. That
valued role of teacher leaders became extremely important during the implementation of mobile
learning at the site. Administration recognized that as technology becomes pervasive in the
learning environment, there is a greater need for exemplars and an acknowledgement from peers
of the important role of these individuals.

In addition, a new conditional aspect that emerged was the importance of the acceptance,
and perhaps predilection, toward the future and the need for change. Having an awareness of
this provided the much needed motivation to embrace and adopt the new technology. Because
the team at the school was always focused on the learning, it made the transition even more
impactful. Creating an environment open to change and having teacher leaders who facilitate
change and encourage others to become advocates may increase the rate of successful adoption
(Aldunate & Nussbaum, 2013; Lei & Morrow, 2010). It may also help create a culture that
becomes more innovative in the optimal use of a technology in the learning environment. This
indicates an important new condition that may need to be taken into account for future
implementations and will be discussed later as it pertains to the theoretical framework. This may
also have ties to the student-centered learning theme, as students become increasingly adept with
new technologies and anticipate change as a part of life.
**Roles and relationships, technology, and teacher leadership.** Teacher leaders at MIS saw technology as another opportunity to lead, and this led to greater respect from peers and administration. Being an expert in subject matter was the traditional way that teacher leaders would garner respect (Mangin & Steolinga, 2011), but the mobile learning implementation has provided new avenues. Often this might tie directly to the subject matter, but this was not always the case, thereby providing opportunities to develop respect from teachers outside one’s discipline. The mobile learning initiative also offered a chance to step in and help another teacher who was a subject matter expert but might be struggling with technology. This helped break down hierarchical relationships that can negatively impact teacher leadership. There was no indication that the school had a strong hierarchy to start; however, it seemed that technology created a more level field in terms of expertise, which subsequently led to more openness for assistance from other teachers and thus a possible forum to gain respect.

Trust, another important condition for teacher leadership, was considered high at MIS. This seemed to be due to many long-term working relationships, along with an environment that administration cultivated. This produced a solid foundation for working relationships between peers, as well as with administration. The mobile learning implementation played a role in strengthening this trust mostly because of the varied level of technology skills and knowledge that existed, especially with those new to mobile learning. Since many of the teacher leaders had not used this type of technology, they relied on each other for help, which only enhanced the existing trust relationships. Perhaps the element to consider in regards to conditions is the heightened need for trust among teacher leaders, peers, and administration. Much is at risk with an implementation as costly and complex as the 1:1 mobile learning initiative. It requires a great deal of interaction among all stakeholders, and absent trust the implementation could be at risk.
Therefore, the need for a positive and trusting environment, while already an important condition, is only increased with technology. The risk of failure is quite high when implementing technology, and trust and respect for peers can only improve the probability for success.

Another factor is role clarity. It is important that everyone understands their role in the implementation (Murphy et al., 2009; Schrum et al., 2011). It was clear that the MIS administration went to great lengths to assure that everyone knew the scope and parameters for the project. This was identified early on in the planning phase, and administration acknowledged the importance of giving clear guidance in this regard. The implementation exposed teacher leaders to challenges that were not necessarily their area of comfort. Hence, it was critical that everyone knew the boundaries, while given the freedom to explore and adopt the technology. Understanding where responsibility rested — and with whom — was an important condition of success acknowledged by both teacher leaders and administration.

Lastly, in terms of roles and relationships, technology can create an increased need for support and feedback between peers and administration. The nature of the implementation required greater communication throughout the school. As with any adoption, much of the learning happens during use (Aldunate & Nussbaum, 2013), such that feedback needs to be bidirectional. In this way, teacher leaders can inform administration of their successes and challenges, and administration can instruct teacher leaders on how to adapt to what is working or not working. In addition to the importance of ongoing communication, the technology could also be used as a tool to provide such feedback. Tools such as online surveys allows for more feedback in a timely and often instantaneous fashion. At MIS, this allowed for administration to make adjustments much faster and provided teacher leaders an anonymous way to offer
suggestions and honest input without any fear of retribution. Moreover, technology support is another critical factor that must be part of the conditions for the success of teacher leaders. MIS provided support through technology specialists, but it was also noted how some schools provide technology coaches. Unfortunately, MIS could not fund this type of investment, and this was a concern that could have impacted the quality and even sustainability of the implementation if adoption was not strong.

**School structure, technology, and teacher leadership.** While there was no indication that a strong hierarchical structure existed, it was evident that decisions were primarily top-down. However, teacher leaders felt that they had a voice in the decision-making process, and technology assisted in two ways. First, as previously discussed, technology was used as a tool to solicit feedback and promote two-way communications via electronic surveys. For schools that have a strong hierarchical structure and may be trying to break this barrier, technology might be a useful tool to assist in that effort. Second, the mobile learning initiative provided an opportunity for administration and teacher leaders to partner toward a successful implementation and adoption. The district held interactive discussions right from the outset, and it was indicated that the success was largely due to the shared involvement of the two groups. Given that technology integrations tend to cross over the entire school enterprise, there is a greater chance and need for shared leadership.

The need for increased interaction between teacher leaders, peers, and administration is evident. This requires time — another key aspect for teacher leadership. Time is an important factor in many respects for a technology initiative, especially a new initiative like mobile learning. Substantial time to learn, practice, and collaborate with other teacher leaders is vital. School leaders need to be very accepting of the time involved, both formally and informally, to
allow teacher leaders to sufficiently understand and become accustomed to the new ways of teaching. It was clear from all the participants at the study site that this was important; yet, they struggled to find time, often using their personal time to practice. While the teacher leaders at MIS took the initiative to find the time, this may not always be the case and can be highly dependent on the individual. The implementation of technology, therefore, had a great impact on the condition of time, and if this is inadequate, it could jeopardize teacher leaders’ ability to learn and collaborate with other teacher leaders.

Fortunately at MIS, collaboration was a strong aspect of the culture, and even without technology, participants saw this as a very positive feature of working at the school. The underlying expectation was that they could collaborate with peers, and this was a huge advantage given the demands of the initiative. Participants counted on the collaborative environment to make the project a success, as indicated by the creation of teams. MIS was fortunate to have such an environment, and it showed how the mobile learning initiative creates a greater need for such collaboration. In addition, it opened the door for greater cooperation with peers outside one’s discipline, with administration, and even with students. The movement toward collaboration with students could be an indication that the school may be evolving toward a new model of shared learning for the entire school.

Professional development was the last condition that was considered under the school structure construct. The need was identified and documented in the district technology plan and turned out to be a key to success. A near complete structure was put in place to assure teacher leaders were properly trained. The term “near complete” is used because there were additional measures envisioned such as coaches; however, these were cost prohibitive. Cost aside, there was a clear intention to assure that an ongoing plan of professional development was available to
teacher leaders. The need to invest in PD cannot be overstated as far as the project leaders were concerned.

**Discussion of the Findings in Relationship to the Conceptual Framework**

The conceptual framework (See Figure 1: Theory of Action) used was developed by researchers York-Barr and Duke (2004). It resulted from their meta-analysis of the research on teacher leadership and is structured as a way for teacher leaders to impact student learning.

Seven components within the framework will be discussed in terms of the findings. The first is the **characteristics of teacher leaders** (respected as teachers, learning oriented, and leadership capacities). The findings revealed that the teachers were respected and, given the focus on learning in the school, were very oriented around learning. In respect to leadership capacities, while this was not directly considered, it was obvious that, based on their involvement in the project and active participation, they had leadership capacities. The implementation of technology was found to provide more opportunities to earn respect outside their discipline. It was also seen as a way to improve learning and shift to being more student-centered — a particular goal of the school. Teacher leaders showed how focused they were on the learning through the initiative they took to adopt the new technology.

The next component is **leadership work** (valued, visible, and shared). Here again, the findings were clear that teacher leadership work was seen as valuable. MIS administration recognized teacher leaders as key to the success of the mobile learning initiative. They went to great lengths to provide support to assure their success. Right away, the administration put teachers in teams which almost assured that sharing occurred, and given the high profile nature of the project, their work was no doubt visible. The mobile learning rollout played a role mostly in the area of sharing. Given the complexity of the project and the technology, teacher leaders
found themselves in need of each other, especially for sharing of knowledge, collaboration, and teamwork. The implementation of technology forced a greater need for teacher leaders to work together and to trust each other. Certainly, the school environment was already collaborative, but rollout of mobile learning technology created a greater need within a discipline and outside one’s discipline, as well as with administration.

The third component is *conditions* (supportive culture, supportive principal and colleagues, time, resources, development opportunities). Because this was the component that was the focus of this research, these have already been previously addressed. However, it is worth noting that the overarching finding was that the mobile learning initiative had a substantial impact on each of these conditions. Therefore, they should be understood in terms of that impact. For example, time, which is always at a shortage for teachers, should be thoroughly understood in relation to technology. Mobile learning and similar initiatives in schools represent a substantial investment and will require substantial time to implement, learn, and use productively. Absent this time, the project could be negatively impacted or possibly fail, which could impact longer-term use and adoptions of technology.

Fortunately, at this school the culture was a highly supportive one, and this was found to be of great importance to administration. As a result, technology specialists were provided, along with multiple opportunities for professional development. Much of this was due to the mobile learning initiative and previous technology implementations at the school, which brought the recognition of a greater need for support for the new technology. In line with this, administration recognized the important role they played in supporting teacher leaders in new ways due to the technology. In that sense, the mobile learning initiative had a substantial impact
on the conditional component of the theory of action, which, as will be seen, had a ripple effect going forward in the path toward student learning.

The next three components to be discussed set forth a course on which teacher leaders can lead, one that will ultimately result in having an impact on student learning. The first of these three is means of leadership influence (maintain a focus on teaching and learning, establish trusting and constructive relationships, and interact through formal and informal points of influence). It was clear from the findings that teaching and learning were a critical part of the MIS culture, and that this was always the main concern for teacher leaders. Throughout the interviews, both teacher leaders and administration referred to this as the priority, versus implementing technology for technology sake. Hence, there was reciprocal benefit between the teaching and learning, and the technology. The focus on teaching and learning influenced the decision to implement mobile learning, because the mobile learning technology was seen as something that could improve the teaching and learning.

A second way teachers lead is through trust and positive relationships. At MIS, these were part of the culture largely due to long-standing collegial relationships that had been built over time. It was because of this trust that teachers were willing to reach out for help from other teacher leaders. In this case, the positive environment helped the implementation of the technology. If the implementation of mobile learning technology had any impact, it was to provide an opportunity for trusting relationships to become stronger. These interactions occurred both formally and informally, which is the third way teachers lead.

The mobile learning implementation created multiple challenges for MIS, such as training, adoption, classroom use, logistics, and student use. As a result, there was a great need to work together. Formally, teams were structured, and professional development was
conducted. Teacher leaders took the initiative as team leaders, technology leaders, and trainers. Informally, teacher leaders reached out to help others or be exemplars. When time and resources were limited, they would step in to collaborate with others to assure the success of the project. The project provided many opportunities to lead in formal and informal ways that would not normally been available, and the implementation created conditions that demanded a higher level of influence and willingness of teacher leaders to lead.

The next component to be addressed is targets of leadership influence (individuals, teams or groups, and organizational capacity). In regards to individuals, there was a high level of one-to-one interaction among teacher leaders, mostly in the area of helping others with the technology. Teacher leaders would work with individuals within their discipline and in other disciplines would assist in improving teaching and learning practices with technology; of course, at times teacher leaders would help each other, both benefiting from the exchange. The technology provided an opportunity for those teachers who were tech savvy to develop others. In this way, they also became exemplars of leadership.

From the group perspective, the mobile learning initiative was driven by cross-departmental teams which provided the chance for teacher leaders to influence others as a team. In addition, existing PLCs and department teams gave teacher leaders a venue to interact with multiple peers. They became a large factor in the overall success of the implementation. Given the complexity and the broad involvement required with the initiative, it was essential that teams such as those at MIS were assembled. This would be quite common in the size and scope of such a project. The mobile learning initiative, therefore, created a situation that demanded teamwork and collaboration among groups of individuals. The teacher leaders at MIS used these
as opportunities for personal development, as well as for a chance to help develop and influence the group.

Finally, the technology implementations at MIS, including mobile learning, represented major changes and shifts throughout the entire school. Teacher leaders played a critical role in this and had a direct impact on their success. Administration relied on them to assist in implementation and adoption, as well as serving as exemplars for other teachers. Their voice was very active throughout, and their input helped shape the direction of the technology presently and for the future.

*Intermediary outcome of leadership* is the last part of what York-Barr and Duke (2004) referred to as the “path by which teachers lead to affect student learning” (p. 289). This includes improvements in teaching and learning practice. Since the purpose of this study was not to determine or document actual improvements in teaching and learning, it is not possible to say that this occurred. However, what was clear was that there was a keen focus in the school on teaching and learning, as pointed out from the theme that emerged. It was indicated throughout the process that this was always tantamount. So, regardless of mobile learning or any other technology implementation that had occurred at MIS, improving teaching and learning was always the first priority. The mobile learning initiative, therefore, was driven by this objective.

The Mayview Public Schools District Technology Plan 2014-2016 was an extension of the previous plan which ran from 2010-2013. The purpose, as stated in the plan, was to provide a guide for using technology effectively to improve student achievement and prepare students for the future (Mayview Public Schools, 2014a). It is important to note that the driving need for technology in MPS was to empower students and educators and provide an environment that was focused on student learning (Mayview Public Schools, 2014a, p. 6). Therefore, technology was
a means to an end, intended to improve relationships with and among students and engage them in the learning process. This was clearly an outcome, as indicated from participant comments. Students became more engaged and took more ownership of their own learning. Technology also provided a tool for relationships to develop on a level that had not before been experienced, as teacher leaders encouraged students to take the lead on using the technology in the classroom. This was also seen during classroom observations. The implementation had a direct impact on this aspect of improving teaching and learning. Thus, from a theoretical framework point of view, it should be an important consideration to understand the key role that technology plays in the relationship that appears to be evolving between teacher and student. At MIS, students were playing a greater role in their own learning, in and outside the classroom, perhaps energizing them in ways that need to be more thoroughly understood.

Will this result in improved outcomes of student learning, which is the final goal of the theory of action? Again, it was not the purpose of this study to assess outcomes. The purpose was to look at the conditions that favor teacher leadership and understand the role and impact of technology on these conditions. It was clear that the implementation of mobile learning technology had played a significant role within the theoretical framework, which must be taken into account within each component and throughout the path toward ultimately influencing learning. Given technology’s permeation of the school environment and growing inclusion in instruction, it might be thought of as an environmental factor that runs alongside the journey by which teacher leaders influence student learning. The York-Barr and Duke (2004) framework relied on 20 years of research in its design. As discussed during this timeframe, technology was just beginning to be introduced into schools. In 2015, we can now see that, while the framework
is still relevant, it must be infused with new knowledge of the role of technology and its impact on the world of our teacher leaders.

**Findings in Relation to the Literature**

**School structure and context.** York-Barr and Duke (2004) highlighted the important role that school culture plays in school success and subsequently in teacher leadership. Roby (2011) also noted the influence that teacher leaders can have on school culture. The findings revealed that one of the strongest aspects of the school culture was the focus on teaching and learning and that this had a substantial impact on teacher leaders and their attitudes toward technology. Teo (2011) and Lundberg et al. (2004) saw that attitudes would impact the intention of using technology. This study showed that the mobile learning initiative, as well as previous technology implementations at the study site, were driven by the desire to improve teaching and learning, and that this was supported by both teacher leaders and school and district administration. This had a positive impact on teacher leader attitudes and their desire to use the technology. They saw it as important to the overarching goal of improving student learning.

This appeared to have a motivational effect on teacher leaders to take initiative, another aspect of culture that was highlighted in the literature (Lundberg et al. 2004; Muijs & Harris, 2006). Not only was it found that teacher leaders, especially those that were tech savvy, took the initiative either to quickly embrace and adopt the technology in their classroom or to try to assist others. It was also found that there was a supportive environment (Lundberg et al. 2004; Peck et al., 2011) from district, to school administration, and peers, that allowed for this to occur. Without this type of environment, teacher leaders would struggle and be at risk of failing (Margolis & Deuel, 2009).
In addition to the support for individual initiative, the research showed the importance of collaborative initiative as well. Dickerson and Helms-Stevenson (2011) identified the importance of reducing teacher isolation, which can occur in a culture of egalitarianism (Margolis & Deuel, 2009; York-Barr & Duke, 2004). There was, however, no indication that this existed in any significant form at MIS. In fact, collaboration was quite strong. The initiative was driven through teams, and it was found that, since individuals often had worked with each other for several years, pre-existing relationships were already in place. Cultural norms can play a large role in impacting these relationships (Ertmer & Ottenbreit-Leftwich, 2010), and MIS was fortunate to have a culture that fostered and supported the collaboration essential in technology implementations (Clark & Zagarell, 2012). The success of the team approach is an indication of this. Dexter (2011) noted the importance of technology leadership being shared by a team of people. The findings support this but also show the importance of student involvement.

Lastly, in regards to school culture, the research points out how important it is that technology is understood and shared by all. Implementations, therefore, need to be co-led, which requires a greater orientation around technology by teacher leaders (Kochpa, 2010; Chang et al., 2008; Dexter, 2011). What was found in the literature, however, was that this was driven largely by changes in technology that were being introduced into education (Dexter, 2011; Peck et al., 2011). However, at MIS, the driver was the changing future and educational needs of the students. Decisions to adopt were no longer being made because this was the newest technology. Decision to adopt and work together as a team was more and more being thought of as crucial so as to provide an education suited to the students of today. When Clarke and Zagarell (2012) talked about the risk of implementing in environments not ready or suitable for technology, they were referring to a lack of technology readiness. However, the findings indicate that a ready
willingness to learn new ways of teaching in learning appropriate for today and being poised for the future is of greater importance if student learning is the ultimate objective.

**Roles and relationships.** Respect for teacher leaders was seen as a key factor of success in the literature (Margolis & Deuell, 2009; Mangin & Steolinga, 2011). In addition, this respect had to be supported by administration, especially as teacher leaders take on more responsibility in the decision-making process (Miles-Weiner, 2011). Per the findings, what seems to have developed as a result of technology is the need to respect teacher leaders in a different way—that is, as technology leaders. This had to occur in relationships with peers, administration, and technology teachers (Chang & Lee, 2010; Hanuscin et al., 2012; Ertmer et al., 2012). This is becoming increasingly evident in the literature, and it was substantiated in the findings. Teacher leaders were often the “go-to” person for technology questions, but more importantly, they were counted on to be the drivers of adoption. This put them in a role that appears to be evolving very quickly in modern classrooms (Schrum & Levin, 2013) and was acknowledged in discussions with participants who reflected over the years how things have changed. Where subject matter expertise was the primary focus of respect for teacher leaders, we are now seeing an additional requirement. It may be such that as technology and subject matter become increasingly intertwined, the pendulum may ultimately shift back to subject matter alone with technology as a given. The study showed that the trend is toward an integration of the two, especially since the mobile learning was seen as an education initiative, but there are still plenty of technology only issues that teacher leaders are trusted to solve.

Trust, then, continues to be a large factor of teacher leadership success (Hargreaves & Fullen, 2012; Smylie et al. 2007). As pointed out in the review of literature and what had been validated in the findings is how technology strengthens the need for trust. It was found that the
complexity of the implementation placed teacher leaders into a situation of reliance on one another since the level of knowledge and experience with this new technology varied greatly. Chang and Lee (2010) cited the challenges of implementing such complex systems while trying to address the daily demands of teaching. Computer teachers in that study commented on the newfound respect for teacher leaders, and teacher leader A at MIS remarked in a similar fashion. Overall then, respect, trust, and the positive relationships are still key conditions of teacher leadership. They are only amplified through the demands of technology.

Clarity of roles and responsibility is another important condition within this construct. Dawson (2011) pointed out how teacher leaders care about the perception others will have in regards to their leadership role, and Margolis and Huggins (2012) highlighted the problems that occur if there exists a lack of clarity. If their role is not made clear, teachers in this type of environment are left to negotiate these issues on their own. The findings revealed a mix of results in this area. First, in recognizing the scope and complexity of the implementation of the mobile learning initiative, the administration made a considerable effort to provide clarity throughout the project. In addition, where questions of clarity arose, their close involvement allowed them to address issues in a timely manner. However, a substantial amount of questions were left for teacher leaders to handle on their own. For example, while there was de facto technology leaders embedded in the project, this emerged more organically. Hence, teacher participants commented on how careful they needed to be in assuming this role. In terms of technology implementations, it may become increasingly important to be clear on identifying technology leadership within the cadre of teacher leaders (Phelps, 2008; Schrum et al., 2011).

The underlying condition that will help firm up roles and relationships is the support and feedback teacher leaders receive (Schrum et al. 2011; Miles-Weiner, 2011; Akert and Martin,
This is particularly true with the entry of technology into the education arena (Shrum et al. 2011; Ertmer, 2012), and the findings indicate that more will be needed. Administration at MIS found that leveraging technology was a way to gather feedback and show support through timely reaction to the feedback. Hence, the importance of support was acknowledged, but there was an additional awareness that it had to be ongoing and responsive to the changing needs that surfaced on a day-to-day basis.

**School structures.** The literature points to hierarchical structures as a major barrier of teacher leadership (Lindahl, 2008; York-Barr & Duke, 2004). These structures are based on the factory model. Darling-Hammond, (2010), and Schleicher (2012) contended that recent technology-driven changes will pose a challenge to this type of thinking. The findings validate this; however, schools can find ways to adapt, which was the case at MIS. Here we find a school that had successfully implemented sophisticated technology over the last several years and is now introducing mobile computing. The fluidity of communication that is required and available runs counter to a rigid hierarchical structure. While all participants agreed that decision making was primarily top-down, there was still a strong sense that they had a voice. In the decision-making process, administration had used technology to break down barriers of communication. Through the use of electronic surveys and open communication, they have been able to provide the feeling that, despite the fact that decisions may ultimately be made above, teacher leaders still have input into the process.

The literature points out how structure plays a key role in many aspects of teacher leadership success. Structures that allow for adequate time for collaboration and professional development are more conducive and more likely to allow for teacher leadership to thrive. This is especially true for technology implementations (Clark & Zagarell, 2012; Darling Hammond,
Lack of proper professional development, in particular, is seen as a barrier to a successful implementation (Cifuentes et al., 2011). Professional development was considered to be a cornerstone for success at the study site. Its importance was recognized in the District Technology Plan (Mayview Public Schools, 2014a) and was commented on throughout the interview process by district and school administration and teacher leader participants. The findings illustrated the amount of time required both formally and informally, and it is the latter that the research did not emphasize. While participants recognized formal professional development as being important, they were more apt to point to the informal training needed. From collaborating with peers and sharing new ideas, to working on their own time during the workday or at home, this showed up as a key aspect inherent in this type of initiative. The research does underline the importance of collaboration and sharing (Randaree, 2006; Lindahl, 2008), but it does not emphasize this as it pertains to technology. Further, the literature does not adequately account for the importance of self-learning in the case of technology.

Finally, there is one thing that must be in place which runs throughout each of the aforementioned conditions, and that is time. Teachers will often note the time constraints inherent in the role, especially more recently with the increase in required testing, a topic that had been widely researched. In the case of MIS, the time issue revolved around having more opportunities to experiment using the technology with colleagues or on their own. Although not mentioned specifically, structuring time during the day for these opportunities might be something to consider. Hallway conversations or dealing with problems in the moment did not appear to be the most productive way for teachers to learn, even though it supported the
condition of collaboration. As Hsu and Sharma (2008) revealed, technology integration and utilization requires substantial sharing of ideas, skills and knowledge.

**Implications for Practitioners**

Leaders abound in education, and it is essential that we unlock the potential that resides in our schools. This study had focused on teacher leaders as a particular group of leaders who stand in front of our students each day, arguably having the greatest impact. It is important that we understand the conditions that are favorable to teacher leadership. This study used a theoretical framework called the theory of action that was the result of a meta-analysis conducted in 2004. The findings support much of the research that was used to develop this framework. This means that conditions around school culture, roles and relationships, and structure are still valid. Hence, practitioners, particularly school leadership that are seeking to develop teacher leadership, can refer to this framework to understand those conditions that positively and negatively impact teacher leadership. What this study attempted to do was to take into account the impact that the implementation of a particular technology might have on these conditions.

The findings show that the implementation of technology in many cases drives a need to enhance and reinforce those existing conditions, while at other times technology produces unique circumstances. In the first case, there are more opportunities to take initiative; there is a greater need for sharing and collaboration and a need to build an environment for the informal learning that takes place. In the case of unique circumstance, there is a growing need to develop technology leaders from a cadre of teacher leaders, and a new found empowerment of students must be taken into account. Not only are these implications for school leadership; they also impact teacher leaders.
Teacher leaders have an opportunity to expand their leadership skills in two additional ways. First, they can evolve as technology leaders no matter what degree of technology skill they have. Since there is still a large technology skills gap, any level of knowledge can be useful. Second, they can grow as curriculum/technology experts as those two areas of expertise are becoming increasingly intertwined. If the conditions are favorable and the school is intent on adopting technology, then opportunities abound for those teachers who want to lead. There is a growing body of literature in this area, and this study will provide additional insights.

**Recommendations**

Three recommendations seem apparent. First, the conditions that impact teacher leaders will not only impact the success of teacher leaders; per the theory of action, they will ultimately result in improved student learning. Therefore, school leadership and teacher leaders have a vested interest in creating favorable conditions. In this situation, these two groups should cooperate in designing and developing those conditions. This co-designing approach is consistent with the literature, which supports shared decision making and collaboration between school leaders and teacher leaders. The findings at MIS showed how teamwork among these groups can impact these conditions, and as discussed, the implementation of technology only heightens this need, since it now pervades the entire school.

Second, the demands of technology and the continual need to learn new ways of using these tools makes it necessary for teacher leaders to develop their technology skills. It will be challenging to provide sufficient ongoing training and support to address these needs which change daily. More teacher leaders need to become technology leaders if technology is going to get adopted at a deeper and deeper level. As was pointed out, the traditional teacher struggles with technology, while those who embrace it only find new ways to utilize technology for the
betterment of their students and themselves. The skills of the teacher participants varied, and each expressed their own unique journey. Two characteristics common among all was their willingness to try and their acceptance that the future would be different for their students. This drove them to take on technology and lead not only as curriculum experts but as technology leaders.

Lastly, empowering students through technology was a clear theme that emerged. It would be beneficial for schools who are implementing technology to understand this ahead of time and build the student perspective into the design. In fact, more impactful may be bringing in the student voice as MIS did with the teacher voice. Teachers learned on their own how to leverage the students skills with technology, while at the same time having their students learn through the use of technology. Students owning their own learning may need to be combined with allowing them to own some of the design for that learning. A student’s perspective on an implementation at the planning phases could have tremendous adoption value, as well as deeper ownership and engagement.

Future Research

This study revealed a number of different areas for future research. First, the need for understanding technology leadership among teacher leaders is growing. It was shown that the implementation of technology opens up opportunities for teacher leaders to lead, especially for those who are tech savvy. It will be important to clarify what it means to lead in this capacity and what type of preparation will be required to become technology leaders. Research that considers technology leadership should take into account the additional leadership demands that technology can place on teacher leaders so as not to tax or overwhelm them.
Another area for future research could be the student role as a technology resource and perhaps leader. At the study site, teacher leaders recognized students’ abilities with technology and leveraged their knowledge in the classroom. It was evident that students are playing an increasingly important role in this regard, and it will be important to understand this as more technology is introduced into the education setting. In addition, the empowerment of students through technology is changing teaching, and this needs to be understood in terms of the classroom and the changing role of the teacher leader. Does this add an additional facet to the condition of collaboration between students and teachers? If students play a role in implementation, should they be included in the design? These could be important issues going forward.

Next, the implementation of technology opened up new places for potential collaboration. Collaboration with teachers outside one’s discipline, collaboration with students, and collaboration with administration are three examples. The demand for collaboration will grow as technology becomes more present in the school environment. It will take a whole school approach, as the teams at MIS showed. Collaboration and teamwork are important to the success of teacher leadership, and a deeper understanding of what this means in terms of a technology initiative will be important in the ever-changing world of technology.

Lastly, this study only looked at one type of technology. There are many types of technology being implemented at different degrees and for various reasons in schools. It will be important to understand the differences in these technologies and how those conditions favorable to teacher leadership have been impacted. This study provided one perspective at one site and showed how powerful technology can be to the lives of teacher leaders, administration, and students. If it can impact learning as the theory of action suggests, then it is essential that more
research be conducted to continue to validate this theory in an ever-changing school environment.

Limitations

This study provided additional insight into the impact of the implementation of technology on the conditions that are favorable to teacher leadership. However, it must be noted that this study was limited in its scope given that it was only one school. Expanding this research to include different schools, large and small, at different stages of their technology evolution may provide more information and perspective. This school had experience with previous implementations. A school new to technology may provide additional insight into the conditions for teacher leadership. It may also be recommended to consider different technologies. This study focused on one type of technology—mobile learning. Many types of technologies impact schools and classrooms. Additional research would provide a broader perspective on the impact of multiple technologies. As was seen at the study site, the cart model vis-à-vis the 1:1 mobile learning initiative had varying effects on adoption.

Another limitation was the number of participants. Interviews were conducted with a small group of eight participants. The findings are limited to the perceptions and opinions of a small group of teacher and school leaders. Hence, other groups of teachers such as those who operate in large urban schools might have a different perspective and experience. Expanding this research to groups of teacher and administration in different settings may provide additional opinions and themes for consideration. Future research should consider combinations of different school settings, using different or multiple technologies, whose journey in technology integration is at varying stages.
Finally, the researcher’s bias toward technology and leadership must be considered. The researcher is an advocate for leadership and technology in education. This bias may have affected the interviews, but the researcher approached each interview objectively and attempted to maintain a neutral perspective.

Conclusion

The purpose of this study was to analyze the interrelationship between two powerful areas of reform—education technology and teacher leadership. More specifically, the study sought to understand the impact that the implementation of technology had on the conditions that influence teacher leadership. The role of teacher leaders continues to grow, as does the body of research supporting teacher leadership. It is hoped that this study contributes to this research to help advance our understanding of the conditions favorable to teacher leadership as they deal with the increase in technology in our schools and classrooms. The rate of change is not slowing down and in some ways is accelerating as students become more adept and demanding in the use of technology. It is more important than ever to help create environments in which teacher leaders can thrive in their endeavor to educate our students.

The findings showed how the implementation of technology is only intensifying the demand for positive conditions in the areas of collaboration, trust, teamwork, opportunities for taking initiative, adequate professional development, and a supportive environment. These conditions were shown to be, not just favorable, but critical to success. Technology implementations in education today are a high-stakes undertakings where the risks of failure are significant. It was seen how these conditions had a significant and positive effect on the adoption of technology. It was further seen that new factors such as a more technologically astute student and a school with a passion for improving learning, combined with a vision of the
future, can be catalyzing circumstances. They are impacting the school environment in new ways that need to be better understood.

In summary, the title of this study is *Teacher Leadership and the Integration of Technology: Colliding Areas of Reform*. These two areas represent major opportunities in the areas of school reform. A true collision would be unfortunate, perhaps catastrophic, but no doubt detrimental to our students. But this does not have to happen, as this study showed. These two areas can work in a harmonious and complimentary way. More and more, our teachers are growing up with technology, and more and more they are “getting it.” They are learning to interact with their students in creative and motivating ways through technology, and the more we create positive conditions, the more our teachers will flourish and the more our teachers will lead.

**Final Reflection**

I have been observing the impact of the integration of technology in education since 2002. At that time, it was clear that a substantial gap existed between what teacher leaders knew about technology, and what they needed to know to make it work within a classroom setting. There was a concern for the unknown, and of a new type of student that was evolving. This type of thinking still exists, and it is unfortunate as this study has shown, for there are schools that have found a way to bridge that gap, and build for the future.

As I look back on the course of this project, I learned about a school that embraced technology in a way that should inspire greater investment in technology as a tool to improve learning. This school had a detailed plan that was updated regularly to account for new developments. They took a holistic approach that involved a whole grade and administration,
that was collaborative from the start, and which recognized that they were not investing in technology; they were investing in education.

This was a key take away from this work. I have found that teacher leaders are motivated by improving education. If the driving need for the implementation of a particular technology is centered on student learning, then teachers will take the lead in adoption. They will make the time, take the initiative, work with peers, and find a way to make it successful for their students. In addition, they will include their students in the process. This is a major change that I can point to since my early observations in 2002. Technology empowers students; it always has, and teacher leaders are recognizing this, and collaborating with students to enhance the learning experience for all students.

When I first began my doctoral studies, I focused on teachers as leaders. Daily in classrooms throughout the world, these individuals play a critical role in the future of our students. I saw technology as a tool that could help empower them as leaders within their classrooms and schools, hence, my interest in teacher leadership and the integration of technology. Now, almost 15 years later, I have learned that this is true more than ever before. It is my belief, therefore, that this work will add to the existing body of research that supports the important need for technology and teacher leadership within our schools.
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