Leading Technological Change: A Qualitative Study of High School Leadership in the Implementation of One-to-One Computing

A doctoral thesis by

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to

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Abstract

The purpose of this basic qualitative study was to identify and understand the leadership strategies used by Massachusetts high school administrators during the early implementation (first four years) of one-to-one computing. The study was guided by two research questions: (1) How do high school administrators describe their experience leading the implementation of one-to-one computing at their school? (2) What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing? Data collected came from semi-structured interviews of 10 assistant principals and principals representing eight suburban or rural high schools in Massachusetts, who were in their first four years of one-to-one computing. Through an inductive process, data was analyzed using in vivo coding, open and axial coding, and constant comparison.

Findings indicated that the goals of one-to-one computing were to prepare students for a digital world. The implementation process involved strategic planning, communication, and flexibility. In addition, change dynamics impacted emotions, the leader, and the school environment. Leadership strategies involved aspects of transformational, transactional, instructional, and distributed leadership models. From these findings, four conclusions emerged: (1) strategic planning and a well-articulated vision were key practices used in the early implementation of one-to-one computing; (2) the implementation of one-to-one computing was an organizational change, which affected all aspects of the school environment, resulting in various reactions from stakeholders; (3) one-to-one computing required distributed leadership; and (4) transformational leadership practices were the most numerous strategies used in one-to-one computing, but were used in conjunction with transactional, instructional, and distributed leadership practices.
This research is relevant for school administrators interested in understanding the leadership strategies used in the implementation of one-to-one computing. This research indicated that factors such as having a shared vision, distributing leadership to others, modeling technology integration, and providing differentiated professional development are effective leadership strategies to implement one-to-one computing. When implemented successfully, one-to-one computing has the potential to transform the school environment, shift instruction to be student-centered and collaborative, and prepare students for a digital world.

*Keywords:* one-to-one computing, distributed leadership, transformational leadership, transactional leadership, instructional leadership, school leadership, technology leadership, organizational change
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This dissertation has been quite a journey, and certainly a longer and more winding path than I would have originally imagined; however, it was a journey of professional transformation and personal discovery. My hope is that the results of this journey can be a roadmap for other school leaders who are embarking on leading one-to-one computing.

It is very difficult to put into words how thankful I am for the unyielding support of my family, especially my husband, Brian. Not once did he complain over the seemingly perpetual series of weekend days or nights, as he whisked our two boys away on adventures to give me time to work. Instead, he did his best to help me carve out time, when time was limited in the life of being a full-time, working mother. From buying me sound-blocking headphones to delivering breakfast, lunch, and dinner to my office, it was because of the support, love, encouragement, and sacrifice of Brian that I was able to complete this quest.

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT .......................................................................................................................... 2</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS .......................................................................................................... 4</td>
</tr>
<tr>
<td>LIST OF FIGURES ............................................................................................................... 9</td>
</tr>
<tr>
<td>LIST OF TABLES ................................................................................................................ 9</td>
</tr>
<tr>
<td>CHAPTER ONE: STATEMENT OF THE PROBLEM</td>
</tr>
<tr>
<td>Introduction .................................................................................................................. 10</td>
</tr>
<tr>
<td>Conceptual Framework .................................................................................................. 13</td>
</tr>
<tr>
<td>Research Problem Statement ....................................................................................... 30</td>
</tr>
<tr>
<td>Purpose Statement and Research Questions ................................................................ 31</td>
</tr>
<tr>
<td>Significance of the Research Problem ......................................................................... 32</td>
</tr>
<tr>
<td>Positionality Statement ............................................................................................... 34</td>
</tr>
<tr>
<td>Definition of Terms ...................................................................................................... 35</td>
</tr>
<tr>
<td>CHAPTER TWO: LITERATURE REVIEW</td>
</tr>
<tr>
<td>Purpose Statement and Research Questions ................................................................ 37</td>
</tr>
<tr>
<td>Scope and Organization of the Review ........................................................................ 37</td>
</tr>
<tr>
<td>Section 1: One-to-One Computing ............................................................................. 39</td>
</tr>
<tr>
<td>History of One-to-One Computing ............................................................................. 39</td>
</tr>
<tr>
<td>Impact of One-to-One Computing ............................................................................. 40</td>
</tr>
<tr>
<td>Barriers to Technology Integration .......................................................................... 43</td>
</tr>
<tr>
<td>First-Order Barriers to Technology Integration ...................................................... 44</td>
</tr>
<tr>
<td>Second-Order Barriers to Technology Integration .................................................... 46</td>
</tr>
<tr>
<td>Strategies to Overcome Barriers to Technology Integration ..................................... 48</td>
</tr>
<tr>
<td>Section Summary .......................................................................................................... 50</td>
</tr>
<tr>
<td>Section 2: Organizational Change ............................................................................... 51</td>
</tr>
<tr>
<td>Change Process ............................................................................................................ 53</td>
</tr>
<tr>
<td>Nature of Change ........................................................................................................ 58</td>
</tr>
<tr>
<td>Change Strategies ........................................................................................................ 65</td>
</tr>
<tr>
<td>Reactions to Change .................................................................................................... 69</td>
</tr>
<tr>
<td>Section Summary .......................................................................................................... 73</td>
</tr>
<tr>
<td>Section 3: School Leadership ...................................................................................... 75</td>
</tr>
<tr>
<td>School Leadership ........................................................................................................ 75</td>
</tr>
<tr>
<td>Transactional-Transformational Leadership .............................................................. 77</td>
</tr>
<tr>
<td>Instructional Leadership ............................................................................................. 89</td>
</tr>
<tr>
<td>Distributed Leadership ............................................................................................... 95</td>
</tr>
<tr>
<td>Section Summary .......................................................................................................... 99</td>
</tr>
<tr>
<td>Chapter Summary ......................................................................................................... 100</td>
</tr>
</tbody>
</table>
### CHAPTER THREE: RESEARCH METHODOLOGY

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose Statement and Research Questions</td>
<td>103</td>
</tr>
<tr>
<td>Research Tradition</td>
<td>103</td>
</tr>
<tr>
<td>Research Design</td>
<td>105</td>
</tr>
<tr>
<td>Participants</td>
<td>106</td>
</tr>
<tr>
<td>Recruitment Process</td>
<td>110</td>
</tr>
<tr>
<td>Relationship to Participants</td>
<td>113</td>
</tr>
<tr>
<td>Data Collection</td>
<td>115</td>
</tr>
<tr>
<td>Questionnaires</td>
<td>115</td>
</tr>
<tr>
<td>Interviews</td>
<td>115</td>
</tr>
<tr>
<td>Observations</td>
<td>119</td>
</tr>
<tr>
<td>Documents</td>
<td>121</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>122</td>
</tr>
<tr>
<td>Data Tracking and Organization</td>
<td>122</td>
</tr>
<tr>
<td>Coding Process</td>
<td>124</td>
</tr>
<tr>
<td>Data Storage and Destruction</td>
<td>128</td>
</tr>
<tr>
<td>Reliability and Validity</td>
<td>129</td>
</tr>
<tr>
<td>Pilot Interview</td>
<td>130</td>
</tr>
<tr>
<td>Peer Review</td>
<td>131</td>
</tr>
<tr>
<td>Check for Researcher Effects</td>
<td>131</td>
</tr>
<tr>
<td>Respondent Validation</td>
<td>131</td>
</tr>
<tr>
<td>Triangulation of Data</td>
<td>132</td>
</tr>
<tr>
<td>Reflexivity</td>
<td>132</td>
</tr>
<tr>
<td>Limitations</td>
<td>133</td>
</tr>
<tr>
<td>Protection of Human Subjects</td>
<td>134</td>
</tr>
<tr>
<td>Chapter Summary</td>
<td>135</td>
</tr>
</tbody>
</table>

### CHAPTER FOUR: RESEARCH FINDINGS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose Statement and Research Questions</td>
<td>137</td>
</tr>
<tr>
<td>Reporting of the Findings and Analysis</td>
<td>137</td>
</tr>
<tr>
<td>Study Participants</td>
<td>137</td>
</tr>
<tr>
<td>Findings</td>
<td>148</td>
</tr>
<tr>
<td>The Experience of Leading a One-to-One Computing School</td>
<td>150</td>
</tr>
<tr>
<td>Leadership Strategies Used in a One-to-One School</td>
<td>175</td>
</tr>
<tr>
<td>Chapter Summary</td>
<td>208</td>
</tr>
</tbody>
</table>

### CHAPTER FIVE: CONCLUSIONS AND DISCUSSION, IMPLICATIONS FOR PRACTICE, AND RECOMMENDATION FOR FUTURE RESEARCH

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusions and Discussion</td>
<td>215</td>
</tr>
<tr>
<td>Implications for Practice</td>
<td>232</td>
</tr>
<tr>
<td>Recommendations for Future Research</td>
<td>236</td>
</tr>
<tr>
<td>Concluding Thoughts</td>
<td>238</td>
</tr>
</tbody>
</table>

REFERENCES...........................................................................239
APPENDICES

Appendix A: Confidential Informational Questionnaire........................................259
Appendix B: Informed Consent Document.............................................................260
Appendix C: Participant Reminder Recruitment E-mail...........................................262
Appendix D: Participant Recruitment Letter.........................................................263
Appendix E: Interview Guide................................................................................264
Appendix F: Observation Protocol.........................................................................269
Appendix G: Interim Summary Form......................................................................270
LIST OF FIGURES

Figure 1: Conceptual Framework .............................................................................. 29
Figure 2: Relationship of Findings for the Research Questions ......................... 212

LIST OF TABLES

Table 1: Summary of Change Processes ................................................................. 57
Table 2: Episodic and Continuous Change ............................................................. 61
Table 3: First-Order Change and Second-Order Change ........................................ 63
Table 4: Planned Change Interventions ................................................................. 66
Table 5: Change Strategies ...................................................................................... 68
Table 6: Stages of Concern ....................................................................................... 73
Table 7: Leadership Definitions .............................................................................. 76
Table 8: Transactional Behavior Items ................................................................. 80
Table 9: Transformational Behavior Items ............................................................. 83
Table 10: Transformational School Leadership (TSL) Model .............................. 87
Table 11: Instructional Leadership Dimensions and Functions ........................... 91
Table 12: Coding Process in Inductive Analysis .................................................... 127
Table 13: Participants’ Demographics ................................................................. 139
Table 14: Summary of Findings ............................................................................ 149
CHAPTER 1: STATEMENT OF THE PROBLEM

Introduction

In his book, *Leading in a Culture of Change*, Michael Fullan (2001), proposed that as society becomes more complex, the pace of change is also increasing. Nowhere is this occurring more than in public schools as a result of the intersection between external technological innovations and internal educational practice. School administrators are experiencing the pace of rapid change when they are charged with introducing and leading the implementation of complex technology tools in their schools. This phenomenon is occurring across the United States in the numerous secondary schools who are strategically implementing one-to-one computing initiatives (Inan & Lowther, 2010). In one-to-one computing, individual students are provided with a mobile learning device (portable, hand-held electronic devices, such as laptops or tablets), facilitating access to the Internet and to learning (Bebell & O’Dwyer, 2010; Fleischer, 2012; Penuel, 2006).

Within a decade, approximately 33 states implemented one-to-one initiatives (Lei & Zhao, 2008). Some states, such as Maine and Michigan, have gone as far as to implement full-scale one-to-one programs across the entire state (Abell Foundation, 2008). While some states have had one-to-one initiatives for almost a decade, Massachusetts’s schools have only begun to implement them within the last four years. For example, in a Massachusetts Digital Learning Survey conducted by the Massachusetts Department of Elementary and Secondary Education (2011-2012), 37% of school districts reported that they planned to implement a one-to-one initiative in the near future.

The New Media Consortium, the Consortium for School Networking, and the International Society for Technology in Education annually tracks technology trends in schools
through a publication called the Horizon Report. The 2013 Horizon Report states that the increase in the use of mobile learning devices in schools is one of the most prevalent trends in education and one that will continue into the future (Johnson et al., 2013). Secondary schools are increasingly moving towards one-to-one computing because of the growing evidence that both student engagement and student learning are enhanced as a result of each student using a mobile learning device (Dunleavy & Heinecke, 2007; Holcomb, 2009; Penuel, 2006). One significant finding is that increased student use of mobile learning devices reinforces an amplified level of learner-centered activities (Creighton, 2003; Ertmer & Ottenbreit-Leftwich, 2010). For example, in one comprehensive study, 75% of respondents shared that students in the one-to-one computing schools participated in constructivist learning approaches with student-centered, problem-based activities prevailing (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2010). The research suggested that when students have access to one-to-one technology, they have improved access to the Internet to research information, to collaborate with others, and to share with an authentic audience beyond their teacher and school (Holcomb, 2009; Lei & Zhou, 2008) as well as increased personalization of learning (Spires, Oliver, & Corn, 2012). Additional positive results of one-to-one computing include: a growth in student motivation (Bebell & O’Dwyer, 2010), improvement in writing (Gulek & Demirtas, 2005; Penuel, 2006) expanded access to information for research (Lei & Zhao, 2008), integration of more project-based learning and technical skills (Oliver & Corn, 2008), better organization (Lei & Zhao, 2008) and individualized learning (Grimes & Warschauer, 2008). The implications of this research suggest an alignment between shifts in teacher pedagogy in conjunction with the integration of technology in these one-to-one computing schools (Creighton, 2003; Ertmer & Ottenbreit-Leftwich, 2010; Owen & Demb, 2004).
This new influx of mobile technology not only affects how classroom instruction will occur, but it also affects school leadership; specifically, how school administrators will need to lead in a changing school environment where the purposeful integration of technology is expected (Schrum & Levin, 2009). Current pedagogical shifts towards constructivist learning (student-centered, problem-based activities), personalization, and collaboration require effective leadership and support from a school principal, since research identifies that the principal acts as a crucial factor for educational change and reform (Marzano, Waters, & McNulty, 2005). The increased access of mobile technology for students in a one-to-one computing environment creates the potential for transformative changes across a school organization in both pedagogical practice and technology use. Numerous research findings demonstrate that a principal’s effective leadership is critical to this successful integration of technology into instructional practices and learning activities (Anderson & Dexter, 2005; Greaves et al., 2010).

Without the principal as an active agent of change, the lack of leadership creates substantial barriers to technology integration and enhancement of classroom instruction (Anderson & Dexter, 2005; Hew & Brush, 2007). For the necessary transformative pedagogical shifts to occur within the context of one-to-one computing schools, effective school principal leadership is essential to bring about a school-wide change (Creighton, 2003; Greaves et al., 2010; Levin & Schrum, 2012). This study explored the leadership practices used by school administrators when introducing change through the introduction and implementation of new technology to their schools, specifically as their schools shifted to one-to-one computing.
Conceptual Framework

At the foundation of this study was the introduction of a change to the school: one-to-one computing. Within this changing context, this research explored the various leadership strategies school administrators used to implement one-to-one computing in their schools. In order to better understand leadership strategies, the organizational changes taking place must be identified. Therefore, the conceptual framework begins with an outline of organizational change theories and models describing the nature of change (Burke, 2008; Weick & Quinn, 1999; Cowan-Sahadath, 2010; Marzano et al., 2005), change processes (Kotter, 1995; Lewin, 1958; Luecke, 2003), reactions (Burnes, 2015; Burnes & James, 1995; Lines, 2004; Oreg & Berson, 2011; Piderit, 2000) and strategies (Chin & Benne, 1969; Porras & Silvers, 1991).

In the case of studying a transformative context of one-to-one computing, the principal, as the leader of the organization undergoing transformation, becomes a change agent and in doing so, must be able to understand the dynamics of change taking place (Weick & Quinn, 1999). Marzano et al. (2005) aptly summarize this importance: “If leadership techniques do not match the order of change required by an innovation, the innovation will probably fail” (p. 66). Whether the changes in the proposed study fall into the categories of revolutionary/evolutionary, continuous/episodic, or first-order/second-order, the type of change will directly impact the process and leadership strategies used by the principal (Burke, 2008; Cowan-Sahadath, 2010; Marzano et al., 2005; Weick & Quinn, 1999).

Effective school leadership in any change initiative starts with the actions and practices of the principal (Hallinger & Heck, 1998; Marzano et al., 2005; Leithwood & Jantzi, 1999). Accordingly, the second section of the conceptual framework focuses on school leadership theories associated with comprehensive organizational change. The school leadership theories
include transactional-transformational leadership, because this approach can be linked to innovative change (Garcia-Morales, Jimenez-Barrionuevo, & Gutierrez-Gutierrez, 2012); instructional leadership, because of the importance of shifts in classroom pedagogy (Vermeulen, Van Acker, Kreijns, & Van Buuren, 2015); and finally, distributed leadership, because one-to-one computing is a broad organizational change that often requires more than one leader (Levin & Schrum, 2012).

**Organizational Change**

To understand change in a school organization, it is vital to take a systems approach to studying it (Senge, 1990). According to Burke (2008), “when some aspect of the system is changed, other aspects eventually will be affected, thus calling for a total system approach” (p. 55). For example, in this study’s context of the introduction of mobile technology for all students in a school, changing this one aspect in the school has an impact on many other parts of the system of the school such as instructional practices (Greaves et al., 2010), student engagement (Dunleavy & Heinecke, 2007), and school leadership strategies (Levin & Schrum, 2012). Organizational changes within a system can appear in distinctive forms and have implications for leadership strategies. The first forms of change outline change theories on the patterns, rates, and types of change in an organization: revolutionary or evolutionary change, episodic or continuous change, and first-order or second-order change. Next, change processes, strategies, and potential reactions to organizational change will be highlighted.

**Patterns of change.** Within the field of organizational change, Burke (2008) delineates two patterns of change: revolutionary and evolutionary. Revolutionary change can be described as occurring as a result of a disruption, or a “perturbation to the system” (p. 69). Evolutionary change, on the other hand, develops incrementally and affects a smaller portion of a system,
rather than the entire organization. The introduction of mobile technology to all students has the potential of becoming a revolutionary change if it brings about a shift in the fundamental activity patterns and beliefs of the system. Gersick (1991) defines these beliefs and patterns of activities as the, “deep structure” of an organization, which is often profoundly embedded in an organizational culture and difficult to change. If the introduction of the mobile devices is coupled with a change to the mission and vision of the school and fundamental instructional practices, it could be considered a revolutionary change and would have implications for the leadership strategies of the principal. Alternatively, if the introduction of one-to-one technology was introduced and implemented incrementally, it would then be considered an evolutionary change. Burke (2008) contends that evolutionary changes are the most common type of organizational change whose goal is often to improve parts of the organization to lead to better performance outcomes. In an evolutionary change, systems will make, “incremental adjustments to compensate for internal or external perturbations,” but their deep structures will remain the same (Gersick, 1991, p. 17). Due to the incremental nature of evolutionary change, school leadership practices can be applied more gradually and systematically than if it were revolutionary.

Rate of change. Similar to the conceptual model of revolutionary and evolutionary changes, Weick and Quinn (1999) focus on the rate of change and describe organizational changes as being either “continuous” or “episodic” in nature. Continuous changes are similar to the evolutionary construct in that they are ongoing, happen over time, and are a result of slight modifications. Unique to the continuous change process is that the adaptations are often cumulative and can bring about significant change over a period of time. In contrast, episodic organizational changes often are “infrequent, discontinuous, and intentional,” and involve a shift
in the deep structure of the organization (p. 365). In many cases, episodic organizational changes are intentionally planned and the change agent is the prime mover of the change. In an episodic change, there is a recognition that the organization is in a state of inertia and the change agent purposefully sets out to modify the organization. If the change is episodic, then the principal would be a prime change agent and their role would be as a main leader of the change. Alternatively, if the change in the study is continuous, it will be more likely that the role of the principal would be to help make sense of the change dynamics that are in process and reframing them for the organization. Not only do change agents need to adapt to the rates and patterns of change, but the type of change (first-order or second-order) is significant as well.

**Type of change.** The change literature also describes types of change as either first-order (transactional) or second-order (transformational) change (Cowan-Sahadath, 2010; Marzano et al., 2005). First-order change, like continuous change, occurs in incremental steps that do not differ from the ways things have been done in the past. The focus of first-order change is based on the premise that members of the organization are continuously learning and adapting (Cowan-Sahadath, 2010). First-order changes are viewed as a gradual improvement, which can occur with current knowledge and skills, and the changes fit within the current norms of the organization. A first-order type of change is often embedded in the daily routines and operations in a school day. A change agent in a first-order change initiative needs to focus on alterations and shifts within the daily operations and transactional responsibilities. In juxtaposition, second-order change fundamentally alters the system, requires a new way of thinking or new skills, and conflicts with current norms. Change agents in a second-order change need to apply leadership strategies that involve inspiration, energy, to assist the organizational members through a more difficult process of change (Marzano et al., 2005).
short, whether the type of change is first-order or second-order will have significant impact on the school leadership strategies used by the principal (lead change agent) to manage the change.

**Change process.** In order for change agents to manage change initiatives, they must understand the various processes that occur in an organizational change. Change process typically occurs over time and is described as going through steps or phases, although not always in a linear fashion (By, 2005). The most significant conceptualization of the change process was by Lewin (1958), who describes the process as happening in three distinct phases: 1) unfreezing, 2) moving, and 3) refreezing. Lewin argues that organizations are naturally in a state of equilibrium and to bring about change, an organization has to enter into the first phase of unfreezing, which is to help organizational members recognize there is a need for change as a result of an internal or external force. In the second phase, the organization moves to a new organizational state, where new behaviors, values, and processes take place. Schein (1996) calls this change process, “cognitive reframing” or “restructuring”, when members are motivated to change and are open to new concepts or procedures. Finally, once the organization enters the new state of transformation, it must refreeze by anchoring the changes into the culture.

Lewin’s (1958) work has laid the foundation for subsequent practitioners and academics to follow (Nasim & Sushil, 2011). For example, in his book, *Leading Change*, John Kotter (2012), divides the change process into as many as eight steps on how to manage organizational change. Despite the numerous steps, a clear alignment exists between his steps and Lewin’s three phases. For example, the first four steps helped the organization to unfreeze because they focus on creating a sense of urgency for change, forming a collation to lead the change, and then developing and communicating the vision for change. In the steps five to seven, Kotter describes steps such as introduced new practices, removing barriers, generating short wins, and
consolidating gains. Finally, Kotter’s last step helps to make the changes become embedded in the culture by linking the changes to successful outcomes. Similar to Kotter’s process, Luecke (2003) describes in his book *Managing Change and Transition* a series of seven steps in the change process. The only fundamental difference between the models is that Luecke presents change as emerging from the ground up, rather than Kotter’s model of top-down intentionally driven change.

In summary, breaking down the organizational change into distinct phases or steps is a helpful way to help change agents to identify stages of a change and possible strategies that might be effective during those stages. In this study, the participants were drawn from schools who were in the early implementation of a one-to-one computing initiative, so they were often in the beginning stages of the organizational change process. Therefore, as part of the conceptual framework on organizational change, potential change strategies and reactions to change were explored, to better understand the entire context of the school leader’s experience.

**Reactions and strategies.** An organizational change process is not a one-way process, but involves the interactions between leadership and organization members. During the change process, members of the organization exhibit a wide range of reactions that fall along emotional, cognitive, and behavioral dimensions (Piderit, 2000). Since many changes will bring about shifts away from the status quo, reactions can include such actions as acceptance, indifference, passive or active resistance (Judson, 1991). Some of the resistance can be mitigated if members are allowed active participation in the process (Burnes, 2015; Burnes & James, 1995; Lines, 2004) or if leaders display inspirational leadership (Oreg & Berson, 2011). The research indicates the organization members will approach and react to changes in a wide variety of ways. For example, in Rogers’ (2003) research on the diffusion of innovations, he details how adopting an
innovation (such as in the case of a one-to-one computing model) is a process and members of an organization fall along a continuum in their approach to that change. According to Rogers, some of them are innovators who take risks and jump into a change, while others could be considered laggards who hold onto the status quo and avoid change whenever possible. The strategies used with each of these groups differ, according to the member reactions to the change. Similarly, the Concerns Based Adoption Model (C.B.A.M.) details a Stages of Concern framework, detailing seven stages of concern that teachers implementing change may experience during a change process. This framework’s foundation is based on the belief that to bring about a change, first a change agent must understand the concerns of the members. In this study, the leadership strategies were not only impacted by the context of the change, but also the members’ reactions to the change, as the school leaders tried to adapt to and manage the change.

When leaders look to manage change, and adapt to their members’ reactions, they can begin to apply planned change strategies. Porras and Silvers (1991) designed a model for planned change that breaks down strategies into two categories: organizational development and organization transformation. Organizational development interventions are focused more on work setting targets such as in physical settings, or organizing arrangements. In contrast, organization transformation interventions are focused on producing more radical change (within vision, purpose, and mission) that will lead to a greater paradigm shift in the organization. In a different approach to planned change, Chin and Benne (1969) construct three approaches to leading change: 1) empirical-rational, 2) power-coercive, and 3) normative-re-educative. The empirical-rational strategy is used when change agents explain why the change needs to happen by providing organization members with supporting information and research. The second strategy, power-coercive, is implemented when a leader in the organization forces a change
through a variety of actions related to their positional power. Finally, the third approach is called the normative-re-educative strategy because it focuses on engaging members through their active participation in the change process. In the study, the reactions of members, as well as the organizational change itself had a direct influence on the school leadership experience of the building administrators.

**School Leadership**

Since the context of the study was the leadership of one-to-one computing change, a framework used to guide the inquiry includes school leadership within an organizational change of a one-to-one computing environment. Research findings supported the importance of school leadership as a strong foundation for technology integration (Ng, 2008). However, due to the complexity of the nature of leadership, no singular definition or construct of school leadership exists (Burke, 2008; Marzano et al., 2005; Oterkiil & Ertesvag, 2014; Yukl, 2012). Modern leadership theory began with James Burns’ (1978) seminal book, *Leadership* where he provided the following definition of leadership: “I define leadership as leaders inducing followers to act for certain goals that represent the values and the motivation—the wants and the needs, the aspirations and expectations—of both leaders and followers” (p. 19). Yukl (2012) in *Leadership in Organizations*, developed the following definition: “Leadership is the process of influencing others to understand and agree about what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish shared objectives” (p. 7). While the definitions above are a sampling of prominent scholars in the leadership field, the common themes that arise from the definitions include the importance of having shared visions and participating in a process of motivating others to act upon those shared visions.
Yukl (2012) notes that as a result of the wide variety of school leadership definitions, researchers typically operationalize the leadership components to align with their research methods and purposes. The school leadership theories chosen for this study align with principal leadership within the context of change and innovation within a one-to-one computing implementation. School leadership research connected to technology integration has primarily focused on the following leadership models: distributed leadership, instructional leadership, transformational leadership, and transactional leadership. Of these models, distributed leadership (when leadership is distributed among many leaders) rose quickly to the top of the leadership models due to the nature of technology initiatives often being far-reaching in a school organization (Chen, 2013; Levin & Schrum, 2012, 2014). Chen’s (2013) study of school leadership in technology implementation acknowledges the importance of distributed leadership, but argues that instructional leadership (focused on impacting students’ learning) and transformational leadership (involving motivating followers through shared vision and intellectual stimulation) are useful strategies when a technological change is taking place. Furthermore, Oterkiil and Ertesvag (2014) proposes that school leadership models such as transactional (involving transactions between leaders and followers of rewards/consequences) and transformational provide the ideal balance of behaviors school administrators need to lead change in emerging technology contexts.

**Transactional-transformational leadership.** This study focused on the interdependent relationship between transactional and transformational leadership used by school administrators when integrating technology as a change initiative (one-to-one computing) within their schools. Of the myriad leadership theories, the literature indicates that the transactional-transformational leadership theory is one of the most predominant school leadership conceptualizations of the last
30 years (Hallinger & Heck, 1998; Judge & Piccolo, 2004; Marzano et al., 2005). The transactional-transformational leadership theory originates with the seminal work by Burns (1978), within the context of political institutions. According to Burns, transactional leadership occurs when a clear relationship exists between a leader and a follower involving an exchange of resources, without a higher moral purpose. For example, transactional leadership occurs when “followers agreed with, accepted, or complied with the leader in exchange for praise, rewards, and resources or the avoidance of disciplinary action” (Bass, Avolio, Jung & Berson, 2003, p. 208). In contrast, transformational leadership provides followers with a higher purpose of their goals (Judge & Piccolo, 2004). Burns describes transformational leadership as, “moral in that it raises the level of human conduct and ethical aspiration of both leader and led and thus it has a transforming effect on both” (p. 20).

While Burns delineates transactional and transformational leadership as two ends along a continuum and mutually separate, later research proposed that the two were not mutually exclusive. Building upon Burns’ original work, Bass (1985) developed a model where the two theories were interconnected with transformational leadership being viewed as an expansion or augmentation of transactional leadership. As reflected in Bass’s new conceptualization, he argues that the best leaders, in fact, use both types of leadership skills. Findings by Oberfield (2012) further support the need to first employ transactional strategies before transformational leadership strategies to have a positive effect on followers.

**Transactional leadership.** Bass and Riggio (2006) detail the following main components of transactional leadership: management-by-exception (active and passive) and contingent reward. Contingent reward is when transactional leaders identify expectations for their followers and offer rewards for meeting the expectations. Active management-by-
exception is when leaders actively monitor and evaluate their followers’ actions, and intervene when necessary. In contrast, leaders exhibiting passive management-by-exception do not aggressively monitor their followers’ actions and only respond when an issue occurs.

Specific to school settings, transactional leadership serves various purposes: to deal with underperformance, respond to external pressures, address managerial tasks, or to cope with difficult circumstances (Mette & Scribner, 2014; Smith & Bell, 2011). Additionally, transactional leadership establishes expectations for performance as well as builds a foundation of trust in a leader (Bass et al., 2003). This study explored which transactional leadership strategies (e.g., management-by-exception and contingent rewards) school administrators described as indispensable in the implementation of one-to-one computing.

**Transformational leadership.** In the transformational leadership model, leaders display one of the following factors: charisma/idealized influence (provides vision), inspirational motivation (high expectations), intellectual stimulation (promotes intelligence), and individualized consideration (gives personal attention) (Bass, 1990; Bass & Avolio, 1994). Extending beyond the four categories of transformational leadership behaviors, Leithwood & Jantzi (2005) apply transformational leadership to a school environment and develop further measurements of behaviors that fall into three categories: setting directions, developing people and redesigning the organization (p. 181).

During the 1990s, the application of transformational leadership theory flourished because educational leaders increased their focus on school innovation, which often requires significant change (Hallinger & Heck, 1998; Hallinger, 2003; Marks & Printy, 2003). Transformational leadership has been found to have a positive correlation to school innovativeness (Garcia-Morales et al., 2012; Moolenaar, Daly, & Sleegers, 2010), to have the
potential to change organizational culture (Geijsel, Sleegers, Leithwood, & Jantzi, 2003; Smith & Bell, 2011), to have a positive relationship with changing teacher practice (Leithwood & Jantzi, 2005) and to improve commitment to school reform (Geijsel et al., 2003). Yuen, Law, and Wong (2003) argue that leading technology innovation centers on engaging and empowering teachers, which are key elements of transformational leadership (p. 162). In Sergiovanni’s (2007) description of the benefits of transformational leadership, he highlights, “when shared meaning and significance are present, teachers respond with increased motivation and commitment” (p. 75). Therefore, since transformational leadership, “focuses on increasing the organization’s capacity to innovate” (Hallinger & Heck, 1998, p. 169) and “technology leadership is inherently linked to innovation” (Kearsley & Lynch, 1994, p. 6), this study also explored which transformational leadership strategies school administrators described as essential in the implementation of one-to-one computing. Additionally, since the context of integration of one-to-one computing occurs within classrooms, this study also incorporated instructional leadership strategies in its conceptual framework.

**Instructional leadership.** School leadership research demonstrates frequent linkages between transformational leadership and instructional leadership (Hallinger, 2003; Marks & Printy, 2003, Marzano et al., 2005). In fact, instructional leadership practice was one of the most studied leadership constructs along with transformational leadership because of its linkage to improved student learning outcomes and effective schools (Hallinger & Murphy, 1986; Hallinger, 2003; Marzano et al., 2005). Instructional leadership centers on practices related to teaching and learning (Bush, 2003) and focuses on the core of curriculum, instruction, and assessment (Marks & Printy, 2003). Instructional leadership practices can be direct (focused on
improving teaching in the classroom) and indirect (focused on creating school conditions and policies that support teaching) (Bendikson, Robinson, & Hattie, 2012).

While there is no single definition of instructional leadership (Murphy, 1988), there are models of instructional leadership that have been developed. Hallinger and Murphy (1985) outline the following dimensions of instructional leadership: defining the school mission, managing the instructional program, and promoting a positive school climate. Reitzug, West, and Angel (2008) organize the practices of instructional leadership into the following categories: (a) relational instructional leadership (increased learning comes from building relationships); (b) linear instructional leadership (increased learning comes from developing systems of structures, interventions, and monitoring); (c) organic instructional leadership (increased learning comes from leading ongoing reflection and collaborative learning by teachers); and (d) prophetic instructional leadership (increased learning comes from a higher calling or vision that members of the school work towards).

Despite the varied functions listed for instructional leadership, Hallinger (2003) highlights that the, “instructional leader (i.e., the principal) seeks to influence conditions that directly impact the quality of curriculum and instruction” through targeting first-order changes in a school, such as setting goals, supervising classroom teaching and curriculum (p. 338). However, with the influx of mobile learning devices in schools, the responsibilities of principals as instructional leaders have changed (Flanagan & Jacobsen, 2003). Instructional leadership now involves integrating technology into classroom pedagogy for improved student learning (ISTE, 2009). Due to the complexity of a technology-rich school, leadership practices cannot always be limited to instructional leadership by one individual (Levin & Schrum, 2012). In a recent study on the impact of school leadership and technology implementation, Chen (2013) finds that
principals display both instructional leadership and transformational leadership, but it also was distributed among other teacher leaders as well. Similarly, Marks and Printy (2003) contend that instructional leadership is closely linked to transformational leadership and in more complex school environments is integrated and shared amongst other leaders. Therefore, this study also looked at whether the school administrators shared their leadership of the one-to-one computing across other leaders in the school as well through the lens of distributed leadership theory.

**Distributed leadership.** Recent research literature suggests that distributed leadership can also be found in conjunction with transformational and instructional leadership practices involving technology change initiatives (Chen, 2013; Seong & Ho, 2011). The research suggests that with complex technology initiatives, it is highly likely that the leadership may be distributed beyond the principal. Distributed leadership theory espouses that leadership occurs when, “leadership practice is stretched over multiple leaders” who have numerous responsibilities for leadership (Spillane, 2006, p. 15). Instead of focusing on a single leader, such as a principal, distributed leadership emphasizes placing leadership practice at the center, and that leadership practice is developed through the interactions of leaders, followers, and their situation (Spillane, 2006). However, the principal is not removed from distributed leadership, instead, school administrators are often at the center of supporting and facilitating others to bring about changes (Harris, 2011). Furthermore, Harris (2011) contends that as schools adapt to new environments and expectations, multiple leaders will be needed to respond to complex changes. For example, in a comprehensive study of bringing about change in schools through technology integration, Levin and Schrum (2012) apply distributed leadership theory as their conceptual framework in order to encapsulate the interactions and processes of leadership practice taking place in the award-winning technical infused schools. Similarly, Seong and Ho (2011) find that distributed
leadership is evident, alongside transformational leadership and instructional leadership in their study of leadership of technology change. Since recent research literature indicates the need to expand or broaden leadership beyond the principal, (Levin & Schrum, 2012; Seong & Ho, 2011) distributed leadership theory was also included in the proposed study.

**Summary of Conceptual Framework**

The context of this study was set within a framework of organizational change. The nature of that change (rate, patterns, and types) influenced the leadership strategies employed by the school administrators. This study of leadership strategies within a one-to-one computing context, narrowed its school leadership theoretical construct to transactional-transformational leadership because of its strong link to innovation (Garcia-Morales et al., 2012) and producing changes within schools (Oterkiil & Ertesvag, 2014; Smith & Bell, 2011). Furthermore, within the context of one-to-one computing, where innovative mobile devices are placed in the hands of all students, transactional-transformational leadership does not alone promote technology integration into pedagogy without being combined with instructional leadership practices focused on student outcomes (Vermeulen et al., 2015). More recent leadership literature suggests that leading a one-to-one computing environment is complex and a primary change strategy used by school administrators requires broadening the leadership base (Levin & Schrum, 2012), therefore, distributed leadership was also included in the study. The organizational change framework and corresponding school leadership strategies will build a foundation of inquiry into understanding patterns of leadership practices described by school administrators in a one-to-one computing context.

Figure 1 provides a conceptual framework linking the one-to-one computing context with organizational change and school-based leadership strategies. It is divided into three primary
sections: (1) organizational change, (2) school leadership strategies, and (3) reactions to change. At the top of the framework is the overarching umbrella of the context of the study, which was one-to-one computing implementation. This context sets the foundation for the complex interactions that take place within the school environment. Since the key participants in the study were the school administrators, they were placed in the center circle of the framework.

The first section of the framework is organizational change and it is divided into two types of change (evolution/continuous/first-order vs. revolutionary/episodic/second-order) and corresponding organizational change processes and strategies. The second section, school leadership strategies, is divided into four types: transactional, instructional, distributed, and transformational. The third section, reactions to change, was included in the framework because within an organizational change there were subsequent reactions by participants. These influence the school leadership decision-making by the school administrator. The dashed arrows between the three sections indicate that organizational change, leadership strategies, and reactions are in an interactive loop in the change process. Overall, the focus of the conceptual framework of the study was to explore the leadership strategies used by school administrators in the context of one-to-one computing and resulting organizational change dynamics.
Figure 1

Conceptual Framework

Notes: Adapted from: (Bass & Avolio, 1994; Hallinger, 2003; Lewin, 1958; Marzano et al., 2005; Porras & Silvers, 1991; Romanelli & Tushman, 1994; Spillane, 2006; Weick & Quinn, 1999).
Research Problem Statement

Across the United States, there is an increasing amount of money spent to expand technology within school districts. This influx of funding is a result of a growing number of studies that show a positive impact on student learning through the use of technology in schools, including the use of a one-to-one computing model (Dunleavy & Heinecke, 2007; Grimes & Warschauer, 2008; Holcomb, 2009; Penuel, 2006; Silvernail & Lane, 2004). As many schools invest in the purchase of mobile learning devices for students, the one-to-one computing model will become more of a norm in the future, rather than the exception (Bebell & O’Dwyer, 2010). While some states, like Michigan and Maine have led one-to-one initiatives for almost a decade, school districts in Massachusetts are just in the early implementation phase of one-to-one computing. Given that large-scale change initiatives need strong leadership (Marzano et al., 2005), and school leadership is essential for technological change (Ng, 2008), by exploring leadership experiences of school administrators in one-to-one computing districts, other school administrators could benefit from detailed descriptions on leading such a change.

Furthermore, research indicates that the implementation of a one-to-one computing initiative is complex and has the potential to bring about transformative changes in schools, such as an increased constructivist pedagogical approaches centered on student involvement in problem-based activities (Greaves et al., 2010) as well as increased student engagement and learning (Dunleavy & Heinecke, 2007; Holcomb, 2009; Penuel, 2006). To amplify the potential positive outcomes of one-to-one computing, school leaders must understand the various leadership roles and strategies required to bring about transformed teaching and learning (Afshari et al., 2008). However, despite these recognized outcomes, a gap exists in the literature,
particularly in qualitative studies on how school administrators are best able to lead and foster technology integration in one-to-one contexts (Dawson & Rakes, 2003; Ng, 2008).

While there is a growing body of research on the quantitative evaluation of student outcomes in one-to-one computing environments, much of the focus has been on the effects on teaching and learning, rather than the leadership involved. Therefore, this study adds to the research literature by providing much needed exploration and detailed descriptions from school leaders themselves about their leadership experiences in one-to-one computing schools. The study focused on the nature of school leadership strategies (instructional, distributed, transactional, and transformational) school administrators use in the context of an organizational change of one-to-one implementation. Specifically, the study involved qualitative interviews of current school administrators (both principals and assistant principals) from a variety of rural and suburban high schools in Massachusetts who had been directly involved in leading their one-to-one computing schools. This inductive inquiry into nature of school leadership described by the school administrators provided guidance regarding the process, best practices, and the overall experience of leading a one-to-one computing school.

**Purpose Statement and Research Questions**

The purpose of this basic qualitative study was to identify and understand the leadership strategies used by Massachusetts high school administrators during the early implementation (within the first four years) of one-to-one computing.

Based on the conceptual framework and qualitative methodology of the study, the research questions that guided this study were as follows:

1. How do high school administrators describe their experience leading the implementation of one-to-one computing at their school?
2. What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing?

**Significance of the Research Problem**

School administrators need to better understand the most effective strategies to support their leadership in the implementation of one-to-one computing in their schools (Bai et al., 2002; Corn et al., 2010; Dexter, 2011). Effective leadership during the implementation of technological change is essential for success (Anderson & Dexter, 2005) and since many school administrators have not undergone formal training in leading technological change (Flanagan & Jacobsen, 2003), this study provided input from the field highlighting emergent patterns of leadership strategies in one-to-one computing implementation. Not only does this study further school administrators’ understanding of leadership strategies that support technology integration, it also provides much needed leadership information for school district leaders looking to support their building administrators in leading one-to-one computing schools.

This research problem emerged as a problem of practice for the researcher, who once was a building administrator trying to transition a high school to a one-to-one computing environment. It quickly became apparent that there was a lot of research on why moving to a technology-rich environment was beneficial for student motivation (Penuel, 2006), student learning (Silvernail & Lane, 2004), as well as a way to shift pedagogy to a more student-centered approach (Ertmer & Ottenbreit-Leftwich, 2010). However, there was little research at the time to guide an administrator on how best to lead a one-to-one computing initiative. Furthermore, in Massachusetts, very few high schools had taken on the challenge to move to one-to-one, so there was little guidance from the field, other than a couple of schools who were in their first year.
Since that time, there has been a gradual increase of schools in Massachusetts moving to one-to-one computing, but there is still a lack of qualitative research of leadership approaches.

Therefore, the first research question sought to better understand what the experience of leading one-to-one computing was like for a school administrator. For example, research indicates that school leaders must overcome various barriers to technology integration (Oliver, Mollette, & Corn, 2012) and the complex nature of technology leadership can be overwhelming (Flanagan & Jacobson, 2003). To answer the first research question, the study hoped to learn about the barriers to implementation that the leaders had to face and what they believed helped to overcome those barriers. Additionally, the first research question probed for more details from the school administrators on advice they would share with colleagues who might be considering a one-to-one computing initiative.

The second research question explored in more detail the nature of school-based leadership strategies employed in one-to-one computing implementation. For example, did the school administrators take a more transformational approach where creating a shared vision and modeling technology use were strategies they chose to employ? Alternatively, did school administrators choose more transactional leadership approaches by providing incentives for active teacher participation in technology integration? Did school administrators shift to a more distributed approach of leadership and create a team to transition to one-to-one computing? The patterns of leadership strategies that emerged from this study will help other school administrators better understand the variety of strategies they can use in their own implementation process.

Overall, the intent of this qualitative analysis of school leadership in one-to-one computing was to enable school administrators to describe their experiences in detail to discover
patterns and themes of leadership strategies across multiple schools. As there was little research in the direct influence of school leadership strategies on one-on-one technology change management, this study offers guidance that is greatly needed by school administrators (Bai et al., 2002).

**Positionality Statement**

Since this was a qualitative study, I was the key instrument in the study to gather information through interviewing participants (Creswell, 2007). Therefore, as the key instrument in the study, a potential threat to the validity was possible. Researcher bias regarding various technology leadership strategies could not be discredited because I was involved in leading a similar one-to-one computing initiative in my former role as an assistant principal of a high school. In order to minimize researcher bias, I used an inductive data analysis approach, which allowed themes and patterns to emerge from the interview data. Furthermore, I used member checking (Creswell, 2007), to allow for the participants to view the credibility of my descriptive interpretations and emergent themes.

One challenge of the study that I had anticipated was that I knew many of the school administrators in the selected sites, because of my participation in various committees for the Massachusetts Secondary School Administrator Association. While I had a level of rapport established with a number of the participants, it was important that I clearly articulated in advance the purpose of the interview and did not allow any previous relationships to influence the questioning or interpretation. Additionally, the network of secondary school principals and assistant principals in Massachusetts is relatively small. Therefore, I ensured the participants of the utmost certainty of confidentiality of their responses and locations, so they felt free to share their experiences openly.
Definition of Terms

**Constructivist learning:** a learning theory that identifies that people create knowledge and meaning for themselves through their interaction with their environment and each other.

**Deep structure:** the culture, patterns of activity, practices, and beliefs underlying an organization (Gersick, 1991).

**Distributed leadership:** interactions of leadership practice between leaders, followers, and situation (Spillane, 2005).

**Early implementation:** the first four years of an initiative.

**Episodic change:** a change that is infrequent intentionally planned and usually involves a shift in the deep structure of the organization (Weick & Quinn, 1999).

**Evolutionary change:** a gradual or incremental change in an organization (Burke, 2008).

**First-order change:** incremental and gradual change (Marzano et al., 2005).

**Mobile learning device:** portable, hand-held electronic devices, such as (laptops, tablets, or smartphones) that facilitate learning.

**One-to-one computing:** providing every student and teacher with a personal digital wireless device with up-to-date software and access to the Internet at school (Penuel, 2006).

**Revolutionary change:** a change in a system as a result of a sudden occurrence and it fundamentals affects the deep structure of the organization (Burke, 2008).

**Second-order change:** a drastic, sweeping, or deep change that requires new thinking (Marzano et al., 2005).

**Technology integration:** infusing technology tools into curriculum and instructional practices to enhance student learning.

**Technology leadership:** the act of leading others to use and integrate technology.
**Transactional leadership**: a leadership model when followers comply with leader expectations in exchange for reward and resources or to avoid disciplinary action (Bass et al., 2003).

**Transformational leadership**: a leadership model where the leader inspires and motivates followers through paying attention to their individual needs, creating a shared vision, and stimulating their intellectual creativity (Bass & Avolio, 1994.)
CHAPTER 2: LITERATURE REVIEW

Purpose Statement and Research Questions

The purpose of this basic qualitative study was to identify and understand the leadership strategies used by Massachusetts high school administrators during the early implementation (first four years) of one-to-one computing.

Based on the conceptual framework and qualitative methodology of the study, the research questions that guided this study were as follows:

1. How do high school administrators describe their experience leading the implementation of one-to-one computing at their school?
2. What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing?

Scope and Organization of the Review

This literature review is organized around the themes of one-to-one computing environments, organizational change, and school leadership. The first section includes the history of one-to-one computing in schools and provides background of how and why schools are shifting to this model in rapid fashion. This section further describes the research on the impact of technology on student learning, instructional practices, alongside strategies for technology integration and the barriers schools face. This first section provides a full overview of the context of a major organizational change (moving to a one-to-one computing model), which was the focus of the study.

The second section outlines the nature of change, change processes, change strategies and reactions to change that can occur in an organizational change, as with the implementation of a one-to-one computing model.
The third section is central to the literature review because it outlines core school leadership theories and research studies, which are the focus of understanding the principal’s role in leading the implementation of a one-to-one computing initiative. The key leadership strategies in the third section will include transformational-transactional, instructional, distributed, and their relationship to a technology rich environment.

Keywords for the literature search include the following: one-to-one computing, 1:1 laptop initiative, mobile learning, ubiquitous computing, technology integration, ICT, school innovation, technology leadership, organizational change, organizational innovation, change process, planned change, resistance to change, organizational management, school leadership, principal leadership, transformational leadership, transactional leadership, instructional leadership, distributed leadership, and shared leadership. The primary databases used to conduct the literature review were Scholar OneSearch tools and EBSCO Integrated Search, which draw from many databases through one single search. Through this process, the majority of the articles came from the following subsequent databases: Academic Search Premier, EBBSCOhost Education Research Complete, Emerald A-Z Current Journals, Gale Cengage Academic OneFile, JSTOR, PsychINFO, ProQuest Education Journals, and SAGE Complete. Additionally, reference lists were also reviewed to find additional research literature for the review.
Section 1: One-to-One Computing

History of One-to-One Computing

Over the past two decades, school systems have looked to reduce the ratio of computing devices for students through the adoption of one-to-one computing initiatives where every student receives a personal digital device for learning (Fleischer, 2012). The purposes and goals for each of the large initiatives vary, but tend to fall within one of the following categories: to improve student achievement, to reduce the digital divide between students who have technology resources and those who do not, to secure future economic competitiveness, to enhance teaching practices, and to improve students’ 21st century skills (Bonifaz & Zucker, 2004; Corn, 2009; Rockman, 2003; Zucker, 2004).

State initiatives fund several one-to-one computing programs. For example, one of the first comprehensive projects was the Maine Learning Technology Initiative (MLTI) with the expansion of laptops to all students in grades seven and eight beginning in 2002. Additional large-scale programs include the Florida’s Leveraging Laptops program, Michigan’s Freedom to Learn (FTL) program, North Carolina’s 1:1 Learning Technology Initiative (NCLTI), Texas’ Technology Immersion Projects (TIP), and Pennsylvania’s Classrooms for the Future (Argueta, Huff, Tingen, & Corn, 2011). Other states further investigating one-to-one laptop programs include New Hampshire, New Mexico, and Vermont (Schnellert & Keengwe, 2012). In some cases, when states did not initiate one-to-one computing goals, large school districts did so on their own. The largest example of this is the Henrico County Public School System in Virginia, who deployed laptops to all students in grades 6-12 with the objectives to close the, “digital divide” and improve students’ 21st century skills (Argueta et al., 2011). Other smaller programs
include single classrooms or single grades, with goals of adding new grade levels each year (Rockman, 2003).

Despite the scale or identified goals of the one-to-one computing programs, a growing body of evidence suggests that there will continue to be a steady growth in one-to-one implementation in schools (Greaves, Hayes, Greaves Group, Hayes Connection, & Market Data Retrieval, 2008). With this expansion, evaluation studies and implementation studies of one-to-one computing are on the rise (Penuel, 2006). A close analysis of both types of studies in this section will provide the background needed to identify the key outcomes, implementation practices and how school leadership fits into this changing context.

**Impact of One-to-One Computing**

**Student engagement and motivation.** An increasing number of studies suggest that one-to-one computing positively affects student motivation and engagement. Evidence demonstrates that in one-to-one computing environments, student motivation increases, (Cavanaugh, Dawson, & Ritzhaupt, 2011; Fleischer, 2012; Harris & Smith, 2004; Mouza, 2008), student time-on-task is higher, and student interest in learning rises (Grant et al., 2015). A mixed methods study by Lowther, Inan, Ross, and Stahl (2012) provides a descriptive summary of the positive impacts of a one-to-one computing initiative. The purpose of their study was to measure the effectiveness of Michigan’s Freedom to Learn One-to-One initiative. The researchers collected data across 195 schools using survey instruments such as teacher technology questionnaires, survey of computer use, student surveys, classroom observations, data analysis of achievement data. Some of the results included student reports that laptops helped them to become more interested in learning. Similarly, in a study by Silvernail and Lane (2004), teachers across Maine’s one-to-one computing schools identified that they also saw increased...
improvement in engagement, participation, and motivation of their special education students, in addition to the general education students.

While the research suggests that student engagement increases in most instances (Corn, 2009; Corn, Huff, Halstead, & Patel, 2011b; Silvernail & Lane, 2004; Silvernail, Pinkham, Wintle, Walker, & Bartlett, 2011), a few studies indicate that the increase in access of technology does not always bring about increased student engagement, and depends on the level of classroom management and integration (Donovan, Green, & Hartley, 2010). For instance, the introduction of one-to-one computing, if not managed well by teachers, can detract from student learning (Annan-Coultas, 2012; Dunleavy, Dexter, & Heinecke, 2007).

**Student achievement.** Despite calls for technology integration to improve student academic achievement, there is inadequate evidence that directly links one-to-one computing with increased achievement academic assessment data (Lowther et al., 2012; Penuel, 2006), especially in state assessments (Rockman, 2003). However, there is some promising data of positive trends in achievement as indicated by a quantitative study by Gulek and Demirtas (2005). In their study of a laptop’s immersion program’s impact on student achievement, they evaluated grade point averages, end-of-course grades, district writing assessments, norm-referenced tests, and California state achievement tests. The analyses of outcome measures indicate that participates of the laptop program are more likely to earn higher test scores and grades for writing, English Language Arts, Mathematics, and overall Grade Point Averages (GPAs).

The findings in the area of writing are consistent with a number of studies that demonstrate improvement in writing skills in one-to-one computing programs (Grimes & Warschauer, 2008; Gulek & Demirtas, 2005; Mouza, 2008; Silvernail et al., 2011). Special
education students have also experienced improvement in writing. Harris and Smith’s (2004) study suggest that students with disabilities also display improved outcomes in writing such as improved quality and increases in the quantity of what they wrote. In other studies, students report that one-to-one computing improved their organizational and study skills as well as research skills (Harris & Smith, 2004; Lei & Zhou, 2008; Lowther et al., 2012; Silvernail & Lane, 2004). Students identify that additional benefits include increased improvement in communications, easier access to course materials, and improved note taking (Annan-Coultas, 2012). Evidence also suggests that one-to-one computing leads to some improvement in 21st century skills such as creativity, communication, collaboration, and critical thinking skills (Corn, 2009; Lowther et al., 2012; Rockman, 2003; Topper & Lancaster, 2013).

**Impact on teacher instruction.** Not only is there evidence of the impact of one-to-one computing on students, but also on teacher pedagogy as well. Cavanaugh, Dawson, and Ritzhaupt (2011) conducted a study of Florida’s *Leveraging Laptops* program, with the purpose to identify the changes in student-centered teaching that happened because of the introduction of laptops to all students. In their comprehensive study of 440 teachers across 47 K-12 schools in Florida, they identify that the infusion of technology, along with professional development, did have a positive impact in teaching practices. They note that, "…the program seems to be serving as a catalyst for positive change from traditional teaching environments to ones that are student-centered and engage learners in meaningful use of computers to enhance learning” (p. 368). The instructional changes observed in additional research studies include an increase in teachers acting as coaches in a classroom, with reduced direct instruction and a more student-centered classroom (Cavanaugh et al., 2011; Oliver & Corn, 2008; Silvernail et al., 2011).
This is similar to outcomes that one-to-one computing increases opportunities for project-based learning (Corn, 2009; Gulek & Demirtas, 2005; Oliver & Corn, 2008). For example, observational data from a mixed-methods study by Oliver and Corn (2008) indicate an increase in project-based learning opportunities after one year of implementation of one-to-one tablet computing at a private middle school. Additional instructional benefits include: increases in individualized instruction (Silvernail & Lane, 2004), student collaboration (Mouza, 2008; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2011), and formative assessments (Dunleavy et al., 2007). In a longitudinal quantitative study by Shapley et al. (2011), the purpose was to investigate the effects of technology immersion on students’ academic achievement. In this experimental study of twenty-one technology immersion middle schools and twenty-one control middle schools in Texas over three years, they discovered the following results:

1. The technology immersion promoted technical proficiency and reduced disciplinary problems in classes, but had higher absenteeism.
2. The infusion of technology resources changed the nature of classroom activities where students interacted more often in small groups to discuss assignments, help one another, and to collaborate on projects.
3. The effect of technology immersion was not statistically significant on reading and mathematics achievement, but the direction of effects was positive across the cohorts.

**Barriers to Technology Integration**

Although evidence exists that one-to-one computing can impact student learning and teacher pedagogy, it is not always the case that the simple introduction of ubiquitous computing will bring about changes in the classroom (Annan-Coultas, 2012; Dunleavy et al., 2007;
Garthwait & Weller, 2005; Holcomb, 2009). Numerous studies illustrate that the integration of technology into pedagogy can be slow, complex, and influenced by numerous factors (Inan & Lowther, 2010). Two primary barriers to technology integration include: “first-order barriers” such as lack of time, technical support, and proper training and “second-order barriers” that include limited understanding of how to design instruction with technology, a lack of willingness to integrate technology, and an incongruence between instructional style and classroom management (Yang & Huang, 2008). School leaders who are faced with leading a one-to-one computing initiative can find the complex nature of leading technology integration overwhelming (Flanagan & Jacobson, 2003) and often difficult to implement (Shapley et al., 2011). The research recommends that leaders of one-to-one computing must take on numerous roles to successfully overcome barriers and bring about successful change (Oliver, Mollette, & Corn, 2012). Therefore, it is important for school leaders who are implementing a one-to-one computing program to fully understand the complexities of implementation, including leadership strategies needed for a successful program.

**First-Order Barriers to Technology Integration**

**Scheduling.** Structural and organizational obstacles can contribute to constraining teachers from technology integration. For example, when classes are limited to less than one hour, teachers have less time to incorporate technology, while teachers who are in schools with block schedules report a higher usage of technology in their classes (Becker, 2000). Time outside of classroom instruction is also critical, as teachers need time to prepare to use technology in their classroom lessons (Keengwe, Onchwari, & Wachira, 2008). Silvernail and Lane’s (2004) study results demonstrate that teachers reported a lack of time to explore and learn about how to integrate technology becomes a significant obstacle to their success. If teachers do
not have enough preparation time, they feel that the time needed to prepare technology is overly burdensome (Hew & Brush, 2007) and a substantial barrier to integration (Yang & Huang, 2008).

**Technical issues and support.** In addition to needing time to prepare and incorporate technology, teachers also need to have technical support for the hardware and software, especially when the technology breaks down. Common examples of technical issues that interfere with technology use in class include: a lack of network capacity and reliability (Grant et al., 2015), loss of wireless connectivity, problems downloading files, compatibility issues, and battery life (Annan-Coultas, 2012). If schools do not have adequate technical support personnel, then teachers do not have the ability to fully integrate technology into their lessons (Hew & Brush, 2007). In one study, quick access to technical support personnel helped to mitigate technical issues that occurred (Grant et al., 2015). Consequently, the level of technical support can have a high level of indirect influence on successful technology integration (Inan & Lowther, 2010; Yang & Huang, 2008). If technology proves to be unreliable for teachers, then teachers lose confidence (Cuban, Kirkpatrick, & Peck, 2001) and will not use it unless they are certain they will have technical support (Zhao & Frank, 2003). Longitudinal studies demonstrate that needs for technology support may increase, rather than diminish, as more teachers embrace technology and integrate it further (Lei, 2010).

As school leaders look to support successful one-to-one computing initiatives, it is essential that they first overcome the first-order barriers such as scheduling, infrastructure, and technical support (Becker, 2000; Hew & Brush, 2007; Keengwe et al., 2008). Hixon and Buckenmeyer (2009) argue that teachers must first overcome first-order barriers, if they are going to move to higher levels of technology integration, so school leaders need to address these
first, before moving to address second-order barriers to integration. The descriptions by the school administrators in this study provide insight into the first-order and second-order barriers that existed in their one-to-one implementation process.

**Second-Order Barriers to Technology Integration**

**Teacher technology skills.** One barrier to technology integration stems from deficiencies and limited skills in technology skills by the teachers. When teachers have a higher level of skill in technology use, then they often use technology in, “broader and more sophisticated ways” (Becker, 2000, p. 7). For example, Silvernail and Lane (2004) note that teacher usage of technology was 20% to 30% higher when teachers had more advanced technology skills. In a more recent study in 2011, when teachers feel competent to integrate the technology, they are three times more likely to use it than those teachers who felt less competent (Silvernail et al., 2011). Similarly, Inan and Lowther (2010) identify that technology proficiency was one of the most significant factors that indirectly affected technology integration into classroom instruction.

**Teacher beliefs and attitudes.** Numerous research studies demonstrate that teacher beliefs and attitudes also play a significant role in the integration of technology in their classrooms (Becker, 2000; Ertmer, 2005). In a study of technology use in 19 schools in the Midwest, researchers Zhao and Frank (2003) administered surveys to all staff, interviewed administrators and technology staff, and conducted interviews and observations in one of the schools. Their research questions were: (a) To what degree are technologies used in schools? and (b) How are teachers engaged in technology use? It was found that the teachers continued use of technology is “determined largely by their compatibility with the aims of teachers” (p. 816). For example, when teachers believed the computers were compatible with their own
teaching style, they were more likely to use the technology. Robinson’s (2005) research confirms that when teachers fail to see the relevance of technology to student learning, they reject the use of the technology. Sometimes this occurs because teachers do not have a complete understanding of the ways technology can be used to enhance and support their curricular areas (Franklin, Turner, Kariuki, & Duran, 2001). Specifically, core academic teachers typically have strong beliefs in the need to provide content to their students that will be on state testing (Becker, 2000). As a result, some teachers view the integration of technology as a hindrance to covering the required curricular content (Hew & Brush, 2007).

Alternatively, when teachers have a more constructivist view of teaching and learning, then they are more likely to integrate technology (Tondeaur, Valcke, & van Braak, 2008). In support of this claim, a study of Maine middle school teachers found that, “approximately 57% of the teachers classified as Constructivist, as defined by their responses to teaching philosophy survey items, reported using their laptops frequently in providing instruction. In contrast, frequent use levels by more traditionalist teachers is only approximately 32%” (Silvernail et al., 2011, p. 15). Furthermore, a study by Hixon and Buckenmeyer (2009) indicates that teachers who tend to be more innovative in their thinking are more likely to integrate technology.

In summary, the role of teacher attitudes and beliefs about technology and its role within teaching and learning is one area that school leaders need to understand better to help foster a positive one-to-one computing environment that brings about deeper levels of technology integration. In this study, school administrators were asked to describe challenges they faced as leaders and specifically strategies they used to overcome these challenges in their one-to-one computing implementation.
Strategies to Overcome Barriers to Technology Integration

**Teacher attitudes.** Teacher attitudes and beliefs about learning play a significant role in how technology is used in the classroom (Silvernail et al., 2011). Robinson (2005) suggests that in order to build confidence in teachers to integrate technology, they need to have a sense of control of the technology and that technology initiatives should be linked to other school reform efforts that focus on school learning. Research reveals that teachers need to feel initial levels of success with the technology to help build confidence and self-efficacy (Ertmer & Ottenbreit-Leftwich, 2010). Furthermore, teachers need to see how technology can be used to enhance their content areas, rather than be viewed as a separate entity (Franklin et al., 2001; Keengwe et al., 2008). School leaders can support teachers by encouraging teachers to experiment and take risks with trying out new technologies (Ertmer & Ottenbreit-Leftwich, 2010).

**Peer support.** Using a mentor program is one method to help teachers with understanding how to effectively integrate technology. Mentors can provide immediate technical assistance when teachers need it, rather than relying solely on professional development events. Franklin et al. (2001) conducted a study to investigate one-on-one mentoring as a strategy for helping in-service teachers learn to use technology. The study was conducted over the span of 21 weeks where graduate students were assigned to mentor 16 teachers and doctoral students. The results indicate that mentoring helped to overcome barriers such as vision, time, access, and assessment. The mentors play an important role in the modeling of technology integration.

Ertmer (2005) emphasizes that sometimes teachers need to observe the successful use and integration of technology by their colleagues in order to change their own beliefs. Incentive programs for teachers to work with one another and observe technology integration are another potential option to promote more use of technology (Yang & Huang, 2008).
Windschitl and Sahl (2002) contend that when teachers have regular planning time set aside with colleagues for technology integration planning, it enhances their beliefs about technology integration. School leaders play an important role in providing opportunities for teachers to work with one another through mentor programs, classroom observations, collaborative meetings, and through professional development.

**Professional development.** Professional development is also fundamental to supporting technology integration. An increasing number of studies propose that in order for technology to be integrated as a learning tool, professional development must be placed at the center of technology planning (Teo, 2011; Tondeur et al., 2008). Professional development should be closely related to the teacher’s content area and context, as well as consistent with the individual needs of the teacher (Hew & Brush, 2007; Hixon & Buckenmeyer, 2009). Similarly, Windschitl and Sahl (2002) claim that for professional development to be effective, it must go beyond teaching technology tools, and provide clarity to how technology integration can transform the teaching and learning opportunities in a one-to-one classroom. Topper and Lancaster (2013) argue that, “critical to success is providing intense, sustained, teacher-focused PD with opportunities for exploration, reflection, collaboration, work on authentic tasks, and engagement in hands-on, active learning” (p. 356). A comprehensive study of one-to-one high schools in North Carolina confirms that leadership plays an important role in supporting professional development by ensuring it is funded, ongoing, reactive to teacher needs, and differentiated (Corn, 2009).

**Leadership and vision.** Leadership and the vision for one-to-one computing programs are critical factors for successful implementation (Topper & Lancaster, 2013). Through the analysis of the literature on the barriers to technology integration, patterns emerge in relationship
to leadership strategies. Initially, leaders must overcome first-order barriers to technology integration and address issues such as scheduling, technology resources, and access to technology support personnel (Becker, 2000; Hew & Brush, 2007; Keengwe et al., 2008). Then, school leaders must remove second-order barriers if the goal is to have technology integration that promotes higher-order learning. This necessitates leaders aligning school goals with technology integration (Gillard & Bailey, 2008). It also requires teachers to work collaboratively with one another to fulfill the benefits of integrating technology into pedagogical practices (Ertmer, 2005; Yang & Huang, 2008). The most prevalent strategy for overcoming barriers to technology integration is the development and communication of a shared vision with all stakeholders for the purpose of one-to-one computing (Anderson & Dexter, 2005; Creighton, 2003; Robinson, 2005; Yang & Huang, 2008). Corn et al. (2011) posits that “survey results suggest that principals who are vocal advocates of the 1:1 initiative and who can clearly articulate a vision for 1:1 can dramatically improve teachers’ attitudes towards teaching with laptops” (p. 6). Evidence suggests that when school leaders display a strong commitment to one-to-one computing and provide the necessary supports for implementation, then the initiatives are more successful (Corn et al., 2011a; Shapley et al., 2011). Since the literature supports the premise that leadership is important to successful one-to-one computing programs, this study sought to better understand the specific leadership strategies used during the early implementation of one-to-one computing at the high school level.

**Section Summary**

The history of one-to-one computing initiatives indicates that it is a growing trend that is likely to increase as school districts see positive outcomes for both student learning and engagement and teacher pedagogy. Despite the initial goals identified for the one-to-one
computing program, the research literature suggests that successful implementation of one-to-one computing can be complex. Numerous potential barriers to a successful implementation include first-order barriers such as time, scheduling, and technology support. In addition, second-order barriers included teacher beliefs and skills. School leaders must have a complete understanding of the complexity of a one-to-one implementation and the various leadership roles they must take on, to create an effective one-to-one computing environment. One critical component to this understanding is for school leaders to recognize the types of organizational change processes that take place when an innovation such as one-to-one computing is introduced into the school environment. The next section will provide an overview of the crucial components of organizational change that will ultimately influence the leadership strategies school administrators choose to use in the one-to-one context.

**Section 2: Organizational Change**

The previous section on one-to-one computing illustrates both the complexity of a one-to-one-computing implementation, but also highlights that it is a change that can affect the entire school organizational system. Research indicates that the failure rate of organizational change initiatives can be as high as 70% (Kotter, 2008). A better understanding of the processes, strategies, and barriers of organizational change is a critical skill for leaders, especially in the context of a large-scale change of one-to-one computing implementation in the proposed study. This section includes a review of literature on organizational change to include descriptions of patterns, rates, types, and processes of change in an organization, as well as highlight potential reactions and strategies used for implementing change. The research and development of organizational change theory and practices spans more than a half of century, including a number of literature reviews and synthesis with emphasis on: change drivers in an organizational change
(Whelan-Berry & Somerville, 2010); combining variance and process methods in studying change (Van de Ven & Poole, 2005); content, contextual, process, and criterion issues of change (Armenakis & Bedeian, 1999); paradox lens of organizational change (Nasim & Sushil, 2011); content of change (Burke, 2008); and recommendations for future research (By, 2005). While the research literature on organizational change has great depth, for the purposes of this study, the research literature reviewed here includes analyses of literature on: change processes (Kotter, 1995; Lewin, 1958; Lueck, 2003; Schein, 1996), nature of change (Burke, 2008; Cowan-Sahadath, 2010; Gersick, 1991; Marzano et al., 2005; Romanelli & Tushman, 1999; Weick & Quinn, 1999), change strategies (Chin & Benne, 1969; Porras & Silvers, 1991; Quinn & Sonenshein, 2007), reactions to change (Agboola, & Salawu, 2011; Anderson, 1997; Burns, 2015; Burnes & James, 1995; Lines, 2004; Oreg & Berson, 2011; Piderit, 2000; Schraeder, Swamidass, & Morrison, 2006) and models for innovative adoptions (Rogers, 2003; Anderson, 1997).

Armenakis and Bedeian’s (1999) examination of organizational change literature groups the research into four categories: (a) content, which focus on the substance of change; (b) contextual, which focus on the conditions in an environment undergoing change; (c) process, which address actions during the change; and (d) criterion, which deals with the outcomes of an organizational change. Of these categories, the content and contextual characteristics (patterns, tempo, and type) will provide a framework for understanding the nature of the organizational change within the study. Additionally, due to the nature of this study’s focus on leadership strategies, one significant focus of review organizational change literature was on process research, to help identify actions that are used during organizational change. Since the study’s emphasis was on the leadership strategies within an organizational change, as well as early
implementation of change, the research literature on the fourth category on change outcomes is not included. However, leadership strategies in the study were impacted by responses by school members to the changes, so some literature on resistance to change is also included.

**Change Process**

**Lewin’s three phases.** Change processes often occur in several phases or steps (Armenakis & Bedeian, 1999). One of the first conceptualizations of the change process was Lewin (1958), who designated organizational change as following three phases called unfreezing, moving, and refreezing. Lewin’s work on the planned approach to organizational change lays the foundation for academics and practitioners to follow (Nasim & Sushil, 2011). He posits that human and organizational behavior exists in a state of quasi-stationary equilibrium, supported by a multipart field of compelling, as well as limiting, forces (Schein, 1996). For change to take place, this force field had to be shifted, which brings about opposing powers trying to maintain the equilibrium. Lewin argues that the equilibrium needs to be disrupted or unfrozen before old behaviors can be replaced (Burnes, 2004). Therefore, in Lewin’s first phase, unfreezing, involves establishing a need for change and altering the system to move away from how things are done currently to make way for a change initiative. In an extension of Lewin’s phases, Schein (1996) identifies a more detailed view of how to unfreeze an organization: (a) disconfirmation: change begins when either dissatisfaction or frustration is created which disconfirm expectations and a driving force for changes to the equilibrium; (b) survival guilt or anxiety: when members of an organization realize that there is a gap between where an organization is and where it should be provoking feelings of guilt and anxiety; and (c) psychological safety: in order for organization members to move out of the first phase, they must feel a sense of psychological safety to move past their anxiety and to move towards change.
In the second phase of Lewin’s (1958) model of moving, the organization moves and shifts to a new form of operating, which is different from what it was doing before. This second phase can only occur after the organization became unfrozen. According to Schein (1996), changing involves cognitive reframing or restructuring, whereby members are motivated to change and willing to open themselves up to new ideas and actions. In order to move successfully through this phase to a new state, members must be able to learn through identifying the new model as well as learn through a trial and error process where they search the environment for new information to inform their change (Burke, 2008).

Finally, once the change and transformation is happening, a process must be put into place to freeze into the new state, otherwise the change will only be temporary. According to Schein (1996), in order for refreezing to work, the change must be congruent with the organizational members’ beliefs so they become comfortable with the change. Strategies that can help refreeze the change include, “trying out the new behavior, getting feedback, and then being rewarded when one gets it right” (Burke, 2008, p. 144). This last stage of refreezing stabilizes the organization into a new quasi-stationary equilibrium (Burnes, 2004).

**Kotter’s eight steps.** In a more recent iteration of change processes, John Kotter (1995, 2012) details an eight-step process that leaders should follow to manage organizational change. In his book, *Leading Change*, Kotter’s introduction to the eight-step process clearly aligns to Lewin’s three phases. This can be noted when Kotter describes the first four steps as a way to ‘defrost’ the current state (unfreeze), with steps five to seven introducing new practices and changes (move), and the last step helps to make the change stick (refreeze). It was in 1995 in his article, “Why Transformation Efforts Fail,” when Kotter first identified his eight steps for leaders to follow to implement an organizational change. After studying numerous change efforts, he
describes three lessons: (a) the change process involves numerous steps; (b) it takes a considerable amount of time; and (c) skipping steps or making mistakes at each step can lead to a failed change initiative (Kotter, 1995). The following is an outline of Kotter’s eight steps for leading a change initiative:

1. Establishing a sense of urgency: crises and opportunities are discussed and identified.
2. Creating the guiding coalition: a group with power is assembled to lead the change effort.
3. Developing a vision and strategy: a vision for change is created and strategies for achieving the vision are established.
4. Communicating the change vision: all methods of communication are used and behaviors are modeled.
5. Empowering broad-based action: obstacles to change are removed, risk-taking is encouraged, and structures that undermine the vision are altered.
6. Generating short-term wins: visible improvements are planned, created, and rewarded
7. Consolidating gains and producing more change: people who promote the change are hired and promoted while new change agents or projects are introduced to reinvigorate the process.
8. Anchoring new approaches in the culture: formalized connections made between the changes and successful outcomes (p. 3).

Luecke’s seven steps. In Luecke’s (2003) book, Managing Change and Transition, much of the focus was on how to manage a change initiative. Similar to Kotter’s process, Luecke also outlines a series of steps that an organization must experience. A key difference in Luecke’s model from Kotter’s is that rather than managing change from a top-down perspective,
it is presented as an emergent change that emerges from the bottom-up in an organization. The emergent approach to studying change emphasizes the unpredictability of change and that it is not always linear, but instead develops through a complex interaction between many parts of an organization (By, 2005). The following is a description of Luecke’s (2003) seven steps in the change process: (a) mobilize energy and commitment through joint identification of the problems and solutions; (b) develop a shared vision of how to organize and manage for competitiveness; (c) identify the leadership; (d) focus on results, not on activities; (e) start change at the periphery, then let it spread to other units without pushing it from the top; (f) institutionalize success through formal policies, systems, and structures; and (g) monitor and adjust strategies in response to problems in the change process (pp. 33-45).

In summary, there are clearly delineated phases that can occur during the change process. First, the change process occurs over time and goes through steps, stages, or phases, although not always in a linear manner (By, 2005). Second, the change process involves a transformation from a current state of the organization to a new state and during this process resources need to be put in place to sustain the momentum (Whelan-Berry & Somerville, 2010). Third, the new state of change needs to be formalized and institutionalized (Armenakis & Bedeian, 1999; Kotter 1996). Fourth, change ultimately takes place at the individual level and individual members in the organization go through cognitive and behavioral stages during this process (Schein, 1996). Table 1 provides a view comparing the aligning factors in the change processes outlined in this section. All of these factors need to be taken into account when leaders are looking to create strategies for managing a change initiative.
### Table 1

**Summary of Change Processes**

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<tr>
<td><strong>1. Unfreezing</strong></td>
<td>1. Disconfirmation</td>
<td>1. Establishing a sense of urgency</td>
<td>1. Mobilize energy and commitment through joint identification of problems and solutions</td>
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<td></td>
<td>2. Induction of guilt or anxiety</td>
<td>2. Creating the guiding coalition</td>
<td>2. Develop a shared vision of how to organize and manage for competitiveness</td>
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<td></td>
<td>3. Creation of psychological safety</td>
<td>3. Developing a vision and strategy</td>
<td>3. Identify the leadership</td>
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<td></td>
<td></td>
<td>4. Communicating the change vision</td>
<td>4. Focus on results, not on activities</td>
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<tr>
<td><strong>2. Moving</strong></td>
<td>1. Identification with the new change</td>
<td>5. Empowering broad-based action</td>
<td>5. Start change at the periphery, then let it spread to other units without pushing it from the top</td>
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<td></td>
<td></td>
<td>7. Consolidating gains and producing more change</td>
<td>7. Institutionalize success through formal policies, systems, and structures</td>
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<tr>
<td><strong>3. Refreezing</strong></td>
<td>1. Individual feels comfortable with change</td>
<td>4. Anchoring new approaches in the culture</td>
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<td></td>
<td>2. Change fits in with the organization</td>
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*Note: Adapted from Lewin (1958), Schein (1996), Kotter (1995), and Luecke (2003).*
Nature of Change

Deep structure. Gersick (1991) defines deep structure as the beliefs and patterns of activities that are deeply embedded in an organizational culture. She further describes the deep structure as the basic configuration of how the system is organized, interdependent, and helps to maintain a stable environment. It is the deep structure of an organization that helps to keep it in a state of equilibrium or inertia and ultimately, resistant to change. An equilibrium period is defined as when an organization experiences a long period of stability. During an equilibrium period “the system’s basic organization and activity patterns stay the same; the equilibrium period consists of maintaining and carrying out these choices” (p. 16). The following section provides an overview of types of changes defined as evolutionary, revolutionary, episodic, or continuous and the ultimate impact they have on profoundly changing the deep structure of an organization.

Revolutionary change. Burke (2008) describes revolutionary change as a jolt or “perturbation to the system,” whereby the deep structure has been impacted significantly (p. 69). In a revolutionary change, changes typically occur rapidly, radically, and disrupt all parts of the organizations deep structure. Another label used for revolutionary change is the punctuated equilibrium model. According to the punctuated equilibrium model, the only way to break inertia in an organization is through a radical change in all of the organizational system’s activities. In a study by Romanelli and Tushman (1994) to empirically test punctuated equilibrium, the researchers examined the longitudinal histories of 25 minicomputer producers over a three-year period. The results support the notion that the majority of organizational transformations occurred as a result of a rapid or revolutionary change, while in contrast, small modifications over time did not bring about fundamental changes. They describe that when
revolutionary periods happen, a disruption of the current patterns of activity in an organization takes place, a fundamental transformation, which leads to the creation of a new equilibrium.

**Evolutionary change.** In stark contrast to the revolutionary changes or the punctuated equilibrium model is the concept of evolutionary change. The concept of evolutionary change stems from Darwin’s model of evolution and depicts change arising incrementally over time. In the case of organizations, evolutionary changes typically include small improvements, which do not fundamentally affect the deep structure of an organization. Romanelli and Tushman (1994) refer to the evolutionary change as nonrevolutionary and that, “nonrevolutionary views suggest that fundamental organizational transformations can be observed by comparing organizational activity patterns over distant points in time, though no specific transforming event may be identifiable” (p. 1143). Burke (2008) contends that evolutionary changes are the most common types of changes that occur in an organization, whereby the focus of change consists of making improvements that fix smaller problems within the system at the micro, rather than the macro level. While evolutionary changes are the most common changes that occur in organizations, it is possible that some of the high schools may experience a revolutionary change if the one-to-one computing was introduced rapidly and was a big shift to the organization. In opposition, in some school cultures, it may be evolutionary if there was a gradual lead-up or introduction of the change. Therefore, the underlying nature of change has a significant impact on the types of leadership strategies employed by the school administrators.

**Episodic change.** Similar to the conceptual model of the nature of change being revolutionary or evolutionary, Weick and Quinn (1999) provide a comprehensive breakdown on the tempo of change in the delineation between episodic and continuous changes. Episodic changes, similar to revolutionary changes are described as, “infrequent, discontinuous, and
intentional” and identified as episodic because they occur when “shifts are precipitated by external events such as technology change” (p. 365). Often an episodic change transpires because the organization exists in a state of inertia and a dramatic shift is needed, therefore, in many cases a change agent often initiates episodic changes through intentional planning. Consequently, in many episodic changes, the change agent initiates the change. Episodic change has similarities in its framework to Lewin’s (1958) three phases of change. For example, because episodic change materializes when an organization is moving away from the condition of equilibrium and a new equilibrium must be created, it requires planned shifts in thinking and doing, requiring an unfreezing of the current state. As shown in Table 2, the analytic frameworks, interventions, and change agent roles vary quite differently between episodic and continuous changes as detailed by Weick and Quinn (1999).
### Table 2

**Episodic and Continuous Change**

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<th><strong>Episodic Change</strong></th>
<th><strong>Continuous Change</strong></th>
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<tr>
<td><strong>Analytic Framework</strong></td>
<td>Change is an occasional interruption or divergence from equilibrium. It tends to be dramatic and it is driven externally. It is seen as a failure of the organization to adapt its deep structure to a changing environment.</td>
<td>Change is a pattern of endless modifications in work processes and social practice. It is driven by organizational instability and alert reactions to daily contingencies. Numerous small accommodations cumulate and amplify.</td>
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<td></td>
<td>Key concepts: inertia, deep structure of interrelated parts, triggering, replacement and substitution, discontinuity, revolution.</td>
<td>Key concepts: recurrent interactions, shifting task authority, response repertoires, emergent patterns, improvisation, translation, and learning.</td>
</tr>
<tr>
<td><strong>Intervention Theory</strong></td>
<td>The necessary change is created by intention. Change is Lewinian: inertial, linear, progressive, goal seeking, motivated by disequilibrium, and requires outsider intervention.</td>
<td>The change is a redirection of what is already under way. Change is Confucian: cyclical, processional, without an end state, equilibrium seeking, eternal.</td>
</tr>
<tr>
<td></td>
<td>2. Transition: cognitive restructuring, semantic redefinition, conceptual enlargement, new standards of judgment.</td>
<td>2. Rebalance: reinterpret, relabel, and resequence the patterns to reduce blocks. Use logic of attraction.</td>
</tr>
<tr>
<td></td>
<td>3. Refreeze: create supportive social norms, make change congruent with personality.</td>
<td>3. Unfreeze: resume improvisation, translation, and learning in ways that are more mindful.</td>
</tr>
</tbody>
</table>

**Continuous change.** In contrast to episodic change conditions, Weick and Quinn (1999) define continuous changes as ones that are “ongoing, evolving, and cumulative” (p. 375). Instead of change appearing as one episode or event, an organization experiencing continuous change will have small adjustments and modifications over time, which will eventually lead to significant changes in the organization. In continuous changes, an organization would undergo adaptations and shifts in practices at a micro level, where change is viewed as a constant state. Unlike in episodic changes, where change is viewed as a substitution for a current state, continuous change adopts the premise of a learning organization that is constantly reflecting, adapting, and improving. In a continuous change state, the role of the change agent is to help make sense of the changes and to reframe current practice. Instead of beginning with Lewin’s (1958) phase of unfreezing, in a continuous change process, the change agent must begin with freezing the current state, rebalancing and reframing practices, and then unfreezing to help the organization learn in new ways (Weick & Quinn, 1999).

In this study, the focus was on school administrators and the nature of the leadership strategies they used in the organizational change of one-to-one computing. In Weick and Quinn’s (1999) comparison between episodic and continuous changes, it is clear that the role of the change agent is very different. Therefore, it is likely that the change agents (school administrators) may also have to adjust their leadership strategies based on the type of change (episodic or continuous).

**First-order and second-order change.** Another approach to organize the dichotomy of change is to divide into either first-order (transactional) or second-order (transformational) change. First-order change, similar to continuous and evolutionary change, emerges incrementally and organizational members view it as aligned to past practices, rather than a shift
to a new paradigm. These changes focus more on gradual improvements, embedded within the
daily operations of the organization, and fit within the current norms and practices of the
organization (Marzano et al., 2005). Within first-order changes, the adaptations are based on the
principle that the organization is a learning system focused on continuous improvements
(Cowan-Sahadath, 2010). When the leader acts as a change agent within a first-order change, the
emphasis is on adaptations within transactions and daily operations. Table 3 outlines a detailed
comparison of first-order and second-order characteristics.

Table 3

*First-Order Change and Second-Order Change*

<table>
<thead>
<tr>
<th>First-Order</th>
<th>Second-Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is perceived as an extension of the past</td>
<td>Is perceived as a break with the past</td>
</tr>
<tr>
<td>Fits within existing paradigms</td>
<td>Lies outside existing paradigms</td>
</tr>
<tr>
<td>Is consistent with prevailing values and norms</td>
<td>Conflicts with prevailing values and norms</td>
</tr>
<tr>
<td>Can be implemented with existing knowledge and skills</td>
<td>Requires the acquisition of new knowledge and skills</td>
</tr>
<tr>
<td>Requires resources currently available to those responsible for implementing the innovations</td>
<td>Requires resources currently not available to those responsible for implementing the innovations</td>
</tr>
<tr>
<td>May be accepted because of common agreement that innovation is necessary</td>
<td>May be resisted because only those who have a broad perspective of the school see the innovation as necessary</td>
</tr>
</tbody>
</table>


A second-order change, in contrast, includes, “dramatic departures from the expected”
and alters the organizational system in substantial ways (Marzano et al., 2005, p. 66). For
example, second-order change requires a new way of thinking and new skills, which often
conflict with the existing norms and practices. Transactional strategies by a change agent will
not work well within a second-order change because a second-order change is more drastic and difficult for members to experience. Thus, change agents in a second-order change apply leadership strategies that are focused on vision and inspiration to assist members in adapting to a new way of thinking (Marzano et al., 2005).

Action research completed by Cowan-Sahadath (2010), applied the organizational theories of first-order and second-order changes over a six-month period to study a business transformation strategy, called Cornerstone. The Cornerstone strategy was created to help a Hydro One Network electricity transmission system in Ontario, Canada adapt to external pressures and a rapidly changing environment. The results of the study concur with other studies that organizational change is a complex process (Whelan-Berry & Somerville, 2010) and visible, strong leadership and management from the top leaders in the organization are critical to bringing about transformative second-order change (Kotter, 1995, 2012).

In summary, the nature of organizational change can be described as being on either the end of the continuum of evolutionary/continuous/first-order or revolutionary/episodic/second-order. Continuous changes arise because a constantly learning organization is propelled to make changes to keep up with either external or internal pressures. These continuous changes are evolutionary and occur over time. They are incremental smaller changes, which affect smaller sections of an organization, but do not fundamentally impact the deep structure. On the other hand, episodic changes happen when a revolutionary change is needed and an organization has not been able to keep up with external or internal changes. These types of changes are often radical shifts and occur quickly. Revolutionary changes, otherwise known as the punctuated equilibrium model, require a large alteration of the current state of practice, ultimately transforming the deep structure of the organization.
The school leadership strategies applied can reflect the nature of the organizational change. For example, if the change is evolutionary or continuous, then school leadership strategies will likely be applied more gradually and systematically, with the leader taking the role of sense-maker involving the changing dynamics. Alternatively, if the change is revolutionary and brings about a punctuated equilibrium, it is more likely that the change agent of the school leader will take the lead in the change as the prime mover of change. Once a firm understanding of the nature of the organizational change is established, school leaders can apply various change strategies to help overcome potential resistance to change.

Change Strategies

Organizational development. As leaders look to lead and manage change, they need to understand the nature and processes of the change, then they can begin to apply planned change strategies. Porras and Silvers (1991) created a change model to organize the different approaches to planned change. They identify two types of planned organizational change interventions: organization development and organization transformation. Within their description, organizational development is a set of strategies purposed to plan changes within work settings, which produce modest adjustments to the environment and some changes to employees’ cognitions and behaviors. The planned change interventions in organizational development target work setting variables such as: “(a) organizing arrangements, (b) social factors, (c) technology, and (d) physical setting” (p. 55). Some components of these work-setting variables include: interventions in space configurations, tools, procedures, reward systems, communication modes, or job designs.

Organizational transformation. Porras and Silvers (1991) describe organizational transformation as planned strategies focused on vision changes in the organization to fit a future
desired state. The goals of organizational transformation target a more significant paradigm shift in an organization and affect a “deeper level in the organization” than in organizational development (Porras & Silvers, 1991, p. 70). Organizational transformation interventions focus on creating structures and strategies that can help facilitate a more radical change. Additionally, approaches within organizational transformation use techniques such as, “reframing,” which leaders reframe the thinking of the members to accept a new reality; and, “consciousness raising,” when leaders make the transformative processes transparent so the members are more aware of the process they are going through (p. 70). Table 4 provides a detailed view of the focus areas of interventions of each type of planned change outlined by Porras and Silvers (1991).

Table 4

Planned Change Interventions

<table>
<thead>
<tr>
<th>Type</th>
<th>Focus Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization Development (OD)</td>
<td>Work Setting</td>
</tr>
<tr>
<td></td>
<td>- Organizing arrangements: goals, strategies, formal structure, formal reward systems, ownership</td>
</tr>
<tr>
<td></td>
<td>- Social factors: culture, interaction processes, social patterns &amp; networks, individual attributes, management style</td>
</tr>
<tr>
<td></td>
<td>- Technology: tools, equipment &amp; machinery, technical expertise, job design, work flow design, technical policies &amp; procedures, technical systems</td>
</tr>
<tr>
<td></td>
<td>- Physical setting: space configuration, physical ambiance, interior design, architectural design</td>
</tr>
<tr>
<td>Organization Transformation (OT)</td>
<td>Vision</td>
</tr>
<tr>
<td></td>
<td>- Guiding beliefs and principles of the organization</td>
</tr>
<tr>
<td></td>
<td>- Purpose that comes from the beliefs</td>
</tr>
<tr>
<td></td>
<td>- Mission that is consistent with the purpose</td>
</tr>
</tbody>
</table>


Chin and Benne’s (1969) strategies for change. In a different approach to planned change, Chin and Benne (1969) outline three change strategies that a change agent might use:
empirical-rational, normative-re-educative, and power-coercive. First, the empirical-rational strategy is based on the premise that members are rational and guided by their own self-interest. Therefore, with this assumption in mind, the change agent would be best served to provide information, research, and reasons to the members to convince them how the change is in their best interest. Quinn and Sonenshein (2007) refer to this strategy as the “telling” strategy because when people try to seek to change others, the first tactic used is often explaining why the change needs to happen.

The second strategy presented by Chin and Benne (1969) is power-coercive. It is founded on the idea that change can be accomplished through the use of power. When this strategy is used, it is often as a directive from the leaders in the organization, top-down, and is based on rewards and sanctions. Quinn and Sonenshein (2007) label this strategy as the “forcing” strategy because it often uses a range of power such as leverage, threats, or even brute force. Organizational changes arise as a result of compliance by members to the directions of the leader, who is in a position of power.

In Chin and Benne’s (1969) third strategy, the normative-re-educative strategy, the underlying assumption is that members are rational, but they also conform to and are highly influenced by cultural norms. As a result, the change agent should engage the participants actively in the change process, because as members of the organization, they are critical to bringing about the change through their active participation and shifts in norms and attitudes. Changes that occur as a result of a normative-re-educative strategy are in the attitudes, skills, and values of the participants. Therefore, Quinn and Sonenshein (2007) call this strategy the “participating” strategy, however they note that this strategy is less common than the other two because it is more time-consuming and takes more skill on the part of the change agent because
control is handed over to the participants. Table 5 provides a detailed comparison of the three underlying assumptions and roles of the change agents across all three strategies.

Table 5

**Change Strategies**

<table>
<thead>
<tr>
<th>Type</th>
<th>Underlying Assumptions</th>
<th>Change Agent Role</th>
<th>Levers</th>
<th>Impact</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empirical-Rational</td>
<td>Change will take place because members are rational, self-interested, and influenced by reason.</td>
<td>To provide information, research, and reasons for a change</td>
<td>Facts</td>
<td>First-Order</td>
<td>Short</td>
</tr>
<tr>
<td>‘Telling’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power-Coercive</td>
<td>Change will take place as a result of compliance by members with the will of the leaders in power.</td>
<td>To direct the change through application of positional power, control, rewards, and sanctions</td>
<td>Power</td>
<td>First-Order</td>
<td>Short</td>
</tr>
<tr>
<td>‘Forcing’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normative-Re-Educative</td>
<td>Change will take place because members are active participants and re-educate themselves through involvement in the change process.</td>
<td>To involve members in the collaborative implementation and development of the change</td>
<td>Dialogue</td>
<td>Second-Order</td>
<td>Long</td>
</tr>
<tr>
<td>‘Participating’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


As illustrated in Chin and Benne’s (1969) theory delineating three types of change strategies, as well as in Porras and Silvers (1991) planned strategy approaches, the nature of the change has a close relationship to the strategies applied. It is in understanding the nature, context, and processes of a change initiative, which will aid a change leader in using the most effective strategies. In this study, the school leader’s strategies applied were linked to the nature, context, and processes of the implementation of one-to-one computing. Although the focus of the study was on the practices of the leader, the full understanding of the organizational change
would be incomplete without some foundational understanding in how members of an organization react to change. Therefore, the next section will provide a highlight of some of the research of reactions to change that might take place.

**Reactions to Change**

In order to implement change successfully, individual members in the organization must play an integral role in the change process, because “organizational change initiatives inherently involve change at the individual level” (Whelan-Berry & Somerville, 2010, p. 176). Extensive research exists on the various types of reactions (Armenakis & Bedeian, 1999; Anderson, 1997; Burnes, 2015; Burnes & James, 1995; Piderit, 2000; Starr, 2011), as well as phases (Judson, 1991; Rogers, 2003) people experience as a result of an organizational change. For the purposes of this review and relationship to the context of a one-to-one computing initiative, the literature on reactions to change focused on studies related to leadership, school environments, innovations, and technological changes.

**Resistance to change.** Armenakis and Bedeian’s (1999) comprehensive literature review on organizational change identifies that there are various ranges of reactions to change such as resistance, feelings of stress, or even commitment, which leaders should consider in implementing a change. Judson (1991) describes a range of possible reactions to a change that organization members might go through: acceptance, indifference, passive resistance, or active resistance. Sometimes members consider change as daunting because it is a challenge to the status quo leading to resistant behavior (Agboola & Salwau, 2011). Some potential resistant behaviors could include aggressive, violent, defensive, passive, silent, outbursts, stalling, and absenteeism (Armenakis & Bedeian, 1999; Starr, 2011). Starr (2011) completed a study focusing on principals managing a major change. Some examples of extreme resistance went as
far as vandalism, threats, and sabotage. Typically, resistance to change is viewed as a negative force to keep the status quo, but sometimes resistance can be viewed as positive as well when it is offering alternative approaches and perspectives to a problem or change (Piderit, 2000). In fact, Piderit describes reactions to change as multidimensional because they fall along emotional, cognitive, and/or behavioral dimensions, where responses are not consistently always positive or negative, but ambivalent reactions are possible as well. Furthermore, the notion of cognitive dissonance is relevant to understanding resistance to change. Cognitive dissonance is defined as when people sense inconsistency between what they think (cognition), believe, and how they behave leading to frustration or uncomfortable feelings and then resistance (Burnes, 2015). This is similar to Lewin’s force field theory where people are caught between forces driving change and forces restraining change to keep the status quo creating dissonance. Therefore, when people are presented with an organizational change that is not aligned with their values, beliefs, and behaviors, then it will likely be met with resistance (Burnes & James, 1995).

**Participation and leadership effects.** Numerous studies illustrate that the level of participation in a change by organization members has an impact on the level of resistance to a change (Burnes, 2015). Moreover, Burnes and James (1995) contend that involving organization members in the change can lead to a greater commitment. Analogously, a study by Lines (2004) suggests that a positive relationship between member participation and successful strategic change exist when participants have a perceived need for change. Lines (2004) further explains that the “effects of participation are stronger when the change is intended to increase the level of efficiency in the organization” (p. 211). Additionally, results from the study indicate that authentic encouragement to participate, as an equal member of the change, is a crucial factor in the success of the change. A study by Schraeder et al. (2006) on employee involvement in and
reactions to technology changes, further demonstrates that resistance is reduced when members are involved in the planning of a technology change process.

Leadership styles and behaviors also have been found to have an impact on the level of resistance to change. In a study by Oreg and Berson (2011), of 75 school principals and 586 teachers, it was established that teachers’ resistance to change was found to be negatively related to the principals’ openness to change and transformational leadership behaviors, and positive related to the principals’ own disposition to resist the change. Along the transformational leadership subscales, the one category that had the strongest effect on members’ reactions to change was inspirational leadership.

**Diffusion of innovations.** Rogers’ (2003) research and work on the diffusion of innovations is closely connected to the change process and reactions to change and incorporates the potential reactions to innovative change and leadership strategies to manage change. Since this study included the introduction and implementation of an innovation of one-to-one computing, the diffusion of innovation model is helpful to understanding members’ reactions to change, and in turn, what types of strategies might be the most effective. In the diffusion of innovation model, adoption of an innovation is a process and members of an organization fall into five categories of adoption:

1. **Innovators**—These are the members who are risk-takers and willing to try the innovation right away. Change strategies are not needed for this group.

2. **Early Adopters**—These are people considered to be leaders of opinion in the organization. They are aware of the need to change and are willing to adopt new ideas. Change strategies that help include providing information about the change and implementation.
3. **Early Majority**—These are not usually leaders. They usually want to see evidence that an innovation’s success, before they are willing to adopt it. Effective change strategies include evidence of the effectiveness of the innovation.

4. **Late Majority**—These members tend to be doubters, who will only adopt a change after the majority of people have tried it and had success. Change strategies include sharing how many people have used the innovation and the levels of success.

5. **Laggards**—These members are the most difficult, because they hold onto the status quo and avoid change when possible. Change strategies for this group include, pressure from peers, fear, and statistics.

**Concerns Based Adoption Model.** Another prominent model for understanding the process of implementing educational change is the Concerns Based Adoption Model (CBAM). The underlying assumptions in the CBAM model is that change is a process, achieved through individuals, is highly personal, involves both feelings and skills, and can be facilitated by interventions (Anderson, 1997). One important element of the CBAM is the Stages of Concern framework, which describes seven stages of concern that teachers implementing change may have across a change process. This framework is based on the premise that if a change is going to succeed, the concerns of the people implementing it must be addressed. If leaders understand the level the members are at, they can target interventions to help reduce resistance and lead to the adoption of the change. Table 6 provides a detailed overview of the Stages of Concern framework.
### Table 6

**Stages of Concern**

<table>
<thead>
<tr>
<th>Stages</th>
<th>Description</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconcerned</td>
<td>Aware that the innovation is being introduced, but not really interested or concerned with it</td>
<td>Involve teachers in discussions and share information to increase interest</td>
</tr>
<tr>
<td>Informational</td>
<td>Interested in some information about the change</td>
<td>Provide numerous ways to share clear and accurate information about the innovation</td>
</tr>
<tr>
<td>Personal</td>
<td>Wants to know the personal impact of the change</td>
<td>Recognize personal concerns and connect with teachers who have concerns to encourage them</td>
</tr>
<tr>
<td>Management</td>
<td>Concerned about how the change will be managed in practice</td>
<td>Clarify the steps of the innovation to address “how-to” issues and provide solutions to practical problems</td>
</tr>
<tr>
<td>Consequence</td>
<td>Interested in the impact on students or the school</td>
<td>Provide opportunities to see how the innovation works elsewhere</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Interested in working with colleagues to make the change effective</td>
<td>Provide opportunities to work collaboratively</td>
</tr>
<tr>
<td>Refocusing</td>
<td>Begins refining the innovation to improve student learning results</td>
<td>Help these teachers channel their new ideas to make improvements for the innovation</td>
</tr>
</tbody>
</table>


### Section Summary

In summary, the literature suggests that organizational change occurs at the individual level and therefore understanding individual reactions and possible resistance to change are helpful in implementing a successful change. By recognizing the individuals’ level in the Stages of Concern Model, or their inclination in the Diffusion of Innovation Model, a leader can react with interventions that meet the individuals at their current state in the relationship to an innovative change (Anderson, 1997; Holloway, 2003; Rogers, 2003). Additionally, having an understanding of the multi-dimensional reactions to change along the cognitive, behavioral, or
emotional dimensions can help a leader understand the dissonance or ambivalence that might exist and how to address it adequately (Piderit, 2000). Finally, the literature strongly supports participation by members along the change process as an effective strategy (Burnes & James, 1995; Schraeder et al., 2006) as well as transformational leadership dimensions such as inspirational leadership and visioning (Oreg & Berson, 2011). Leadership and management of organizational change was a common theme that resonated throughout the organizational change literature. The next section will provide an in-depth review of relevant types of school leadership strategies that provide a solid foundation for this study.
Section 3: School Leadership

Much of the previous research literature on organizational change suggests that change agents are an important part of the change process. Therefore, since the focus of this study was on leadership strategies in a one-to-one computing initiative, this section will provide an overview of the current research on school-based leadership to better understand strategies the change agents (school administrators) often implement. This section will begin with a synopsis of the study of leadership in the last century, specifically within the context of school leadership. Then, it will describe the key components of the transactional and transformational leadership theories. Finally, an overview of instructional leadership and distributed leadership literature will be provided.

School Leadership

A growing body of literature indicates that leadership has an impact on a variety of aspects of a school setting (Louis, Dretzke & Wahlstrom, 2010; Marzano et al., 2005), on school effectiveness (Hallinger, 2003; Hallinger & Heck, 1998), and in the area of leading technology integration (Anderson & Dexter, 2005; Ng, 2008). Despite these findings, due to the complex nature of leadership practices, no singular definition of leadership exists (Burke, 2008; Marzano et al., 2005; Oterkill & Ertesvag, 2014; Yukl, 2012). It is with James Burns’ (1978) seminal book, Leadership where modern leadership theory has its roots. However, Burns argues that the concept of leadership has been documented throughout history as early as the Plato’s descriptions of philosopher-kings, Confucius’ concept of moral teaching, or Plutarch’s historical writings of Roman and Greek rulers. Although no “correct” definition exists, Yukl (2012) reports that many of the definitions include a process whereby, “intentional influence is exerted over other people, to guide, structure, and facilitate activities and relationships in a group or
organization” (p. 2). Furthermore, some common elements in the definitions of leadership include the presence of shared vision or aspirations. Table 7 presents some examples of leadership definitions that illustrate the role of influence as well as shared aspirations (in bold).

Table 7

**Leadership Definitions**

<table>
<thead>
<tr>
<th>Author</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns (1978)</td>
<td>“I define leadership as leaders <strong>inducing followers</strong> to act for certain goals that represent the values and the motivation—the wants and the needs, the <strong>aspirations</strong> and expectations—of both leaders and followers” (p. 19)</td>
</tr>
<tr>
<td>Kouzes &amp; Posner (1995)</td>
<td>“Thus, we define leadership as the <strong>art of mobilizing others to want to struggle for shared aspirations</strong>” (p. 30).</td>
</tr>
<tr>
<td>Spillane (2006)</td>
<td>“Leadership refers to activities tied to the core work of the organization that are designed by organizational members to <strong>influence</strong> the motivation, knowledge, affect, or practices of other organizational members or that are understood by organizational members as intended to influence their motivation, knowledge, affect, or practices (pp. 11-12)</td>
</tr>
<tr>
<td>Yukl (2012)</td>
<td>“Leadership is the <strong>process of influencing others</strong> to understand and agree about what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish <strong>shared objectives</strong>” (p. 7)</td>
</tr>
</tbody>
</table>

*Note: Quotes from: (Burns, 1978; Kouzes & Posner, 1995; Spillane, 2006; Yukl, 2012).*

As a consequence of the wide range of leadership models, Yukl (2012) states that researchers often need to operationalize the leadership elements to align with their research purposes and methods. Comparably, in this study the school leadership strategies chosen align with the context of leading change and innovation in the context of a one-to-one computing environment. This section will provide the most common leadership models that are evident in school-based leadership literature, as well as identify the leadership models that align best with organizational change, specifically technological changes. School leadership research in the context of technology change has focused on the following leadership models: distributed leadership, instructional leadership, transformational leadership, and transactional leadership.
In comprehensive reviews of school leadership, transformational leadership and instructional leadership models were the two most predominant models and most frequently researched in the 1970s-1990s (Leithwood et al., 1999; Hallinger, 2003). The research literature concludes that transformational leadership has a strong link to bringing about change in schools (Smith & Bell, 2011), promoting innovation (Garcia-Morales et al., 2012), and increasing work effectiveness (Bass et al., 2003; Lowe, Kroeck, & Sivasubramaniam, 1996; Oberfield, 2012). Additionally, instructional leadership links with technological change in schools, because the change takes place through classroom instructional practices (Vermeulen et al., 2015).

Transactional leadership strategies will also be included because findings from Oterkiil and Ertesvag (2014) suggest that a more balanced approach between transformational and transactional leadership strategies enhances leadership success in a technological environment. Further evidence indicates that leadership in complex environments like one-to-one computing often involve an expansion of participants in leadership (Levin & Schrum, 2012), so the distributed leadership model is also relevant to this study.

**Transactional-Transformational Leadership**

A growing body of literature indicates that the transactional-transformational leadership model is one of the most predominant school leadership conceptualizations of the last 30 years (Hallinger & Heck, 1998; Hallinger, 2003; Judge & Piccolo, 2004; Marzano et al., 2005). The transactional-transformational leadership model originates from the seminal work of Burns (1978), where he delineates transactional and transformational leadership along two ends of a continuum. On the one end, Burns describes transactional leadership as the relationship of interactions between a leader and a follower where they, “may exchange goods or services or other things in order to realize independent objectives” (p. 425). Another way to view
transactional leadership is that it is based on contingent reinforcement of rewards and punishment based on performance (Bass, 1985). In contrast, transformational leadership as originally described by Burns (1978), happens when “leaders ‘raise’ their followers up through levels of morality” and leaders can be “united in the pursuit of ‘higher’ goals” (pp. 425-426). In other words, transformational leadership focuses on strategies that offer followers purpose beyond everyday short-term goals (Judge & Piccolo, 2004). Building upon the seminal work of Burns, Bass (1985) developed a new model where the two leadership strategies are not viewed as mutually separate, and transformational leadership strategies are viewed as augmenting transactional strategies. Longitudinal research findings by Oberfield (2012) support this concept of augmentation effects when he found that although transformational leadership strategies had a greater effect, the combination of both transactional and transformational strategies led to a positive effect on followers. Hallinger (2003)’s review of leadership studies support the idea that effective leadership requires components of both transactional and transformational leadership approaches. Oterkiil and Ertesvag (2014) argue that combining both transactional and transformational leadership is necessary to achieve complex interventions in an organization. This study took the view of Bass’ conceptualization that the two strategies are not mutually exclusive, but may in fact both occur simultaneously.

**Transactional leadership.** Bernard Bass (1985) in *Leadership and Performance Beyond Expectations*, describes transactional leadership taking place when a leader:

1. Recognizes what it is we want to get from our work and tries to see that we get what we want if our performance warrants it.

2. Exchanges rewards and promises of reward for our effort.

3. Is responsive to our immediate self-interests if they can be met by getting our work
done (p. 11).

Bass continues to further delineate the transactional model into two categories: contingent rewards and management-by-exception. Contingent reward appears as positive reinforcement when an employee achieves an agreed-upon performance. Conversely, Bass notes that contingent punishment takes place when an employee fails to meet the expectations. Management-by exception can be described as being either active or passive. For example, in an active management-by-exception, the leader actively monitors mistakes and errors and promptly takes corrective action. Conversely, in passive management-by-exception, the leader waits for problems to happen before taking any action. Table 8 provides an overview of behavior items from a leadership questionnaire used by Bass that illustrates the characteristics of contingent rewards and management-by-exception. Specifically, in school settings, transactional leadership behaviors have been found to meet a wide variety of purposes: to respond to external pressures, track criteria against performance goals, address managerial tasks, deal with underperformance, or maintain accountability (Mette & Scribner, 2014; Smith & Bell, 2011). The effects of contingent rewards have been studied and found to be more valid than the use of management-by-exception (Judge & Piccolo, 2004). Furthermore, research studies indicate that contingent rewards display a positive impact on performance (Bass et al., 2003), have a positive association with work unit effectiveness (Lowe et al., 1996) and correlate with transformational leadership (Bass et al., 2003).
Research results on transactional leadership show mixed outcomes. Howell and Avolio (1993) found that transactional leadership alone does not work effectively in all contexts. Their study took place over a one-year period, using the multifactor leadership questionnaire of 78 managers in a large, Canadian financial institution. The results reveal transactional leadership behaviors are negatively related to the business-unit’s performance and hypothesized that context played a role in these outcomes. They note that if an environment is undergoing change, then “a pure transactional-leadership style may be counterproductive and maladaptive” (p. 899). In contrast, Bass et al. (2003) conducted a study to measure how transactional contingent reward and transformational leadership of platoon leaders and sergeants correlates with unit performance, cohesion, and unit potency. Their results demonstrate that both contingent rewards and transformational leadership of the platoon leader predicted performance equally. They recommend future research to provide a clearer distinction between various forms of contingent rewards and the relationship effects. Some criticized Bass’s model of transactional leadership,
suggesting it lacked appropriate details and was unable to clarify transactional leadership actions within a school setting. Therefore, Leithwood and Jantzi (2005) added four management dimensions for measuring transactional leadership behaviors. In their model, they describe the following transactional categories: (a) establishing effective staffing practices; (b) providing instructional support; (c) monitoring school activity; and (d) buffering teachers from external demands. Although the contexts for studying transactional leadership vary, a large body of research suggests that transformational leadership often correlates with transactional behaviors.

**Transformational leadership.** Research findings support the concept that transformational leadership factors augment and build upon transactional leadership (Bass, 1985; Bass et al., 2003; Bass & Riggio, 2006; Judge & Piccolo, 2004; Leithwood & Jantzi, 2005). While transactional leadership focuses on exchanges between leaders and followers, transformational leadership involves inspiring followers, and motivating them to do even “more than they originally thought possible” (Bass & Riggio, 2006, p. 4). For example, a longitudinal study of transactional and transformational leadership behaviors by Oberfield (2012) found that improvements in transactional and transformational leadership behaviors both together and separately could predict improvement in follower’s satisfaction, cooperation, and work quality. As a result, Oberfield (2012) recommends that once leaders establish transactional leadership actions, they should look to meet their “followers’ ‘higher order’ needs via inspiration, individual attention, and intellectual stimulation” of transformational leadership behaviors (p. 426). Existing research indicates that transformational leadership behaviors positively correlate with work unit effectiveness (Lowe et al., 1996), follower cooperation and satisfaction (Oberfield, 2012), business-unit performance (Howell & Avolio, 1993), and motivation (Leithwood & Jantzi, 2005).
According to Bass’ (1985) transformational leadership model, leaders display the following behaviors: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. First, idealized influence is when leaders are admired, respected, and act as role models for their followers (Bass & Riggio, 2006). When leaders exhibit idealized influence, followers want to emulate them. Bass (1985) describes these leaders as displaying charisma and appealing to followers on an emotional level through displays of self-confidence, conviction, and having insight into the needs of their followers. In a meta-analysis by Lowe et al. (1996), they posit that idealized influence (charisma) is the variable most strongly related to leader effectiveness across all transformational and transactional behaviors. Second, inspirational motivation is the degree by which the leader communicates a vision that inspires and motivates followers. Bass (1985) defines this as an act of creating an arousal process whereby the leader provides either emotional appeals or stimulates enthusiasm among followers that they in turn “exert themselves beyond their own expectations and self-interest” (p. 66). Third, intellectual stimulation is a behavior in transformational leadership when the leaders stimulate their followers to be creative and innovative. This is done through questioning assumptions, reframing problems, taking risks and soliciting solutions from followers. Furthermore, followers are encouraged to take risks and try new approaches to problems. Finally, individualized consideration is when leaders: pay attention to the needs of followers, listen effectively to concerns, mentor or coach followers, and personalize interactions.

Bass (1985) was the first researcher to operationalize the components of transformational leadership into a measurable instrument. Most empirical studies of transformational leadership use Bass’s multifactor leadership questionnaire (MLQ) containing transformational and transactional leadership dimensions (Geijsel et al., 2003). Table 8 (above) displays some of the
transactional behavior questionnaire items and Table 9 provides a sample of some of the transformational components of the measurable instrument.

Table 9

*Transformational Behavior Items*

<table>
<thead>
<tr>
<th>Transformational Leadership Categories</th>
<th>Sample Questionnaire Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charismatic Leadership/Idealized Influence</td>
<td>Makes everyone around him/her enthusiastic about assignments</td>
</tr>
<tr>
<td></td>
<td>I have complete faith in him/her</td>
</tr>
<tr>
<td></td>
<td>Is a model for me to follow</td>
</tr>
<tr>
<td></td>
<td>Commands respect from everyone</td>
</tr>
<tr>
<td></td>
<td>Makes me proud to be associated with him/her</td>
</tr>
<tr>
<td></td>
<td>I am ready to trust his/her capacity to overcome any obstacles</td>
</tr>
<tr>
<td>Inspirational Motivation</td>
<td>Heightens my motivation to succeed</td>
</tr>
<tr>
<td></td>
<td>Motivates me to do more than I originally expected I would do</td>
</tr>
<tr>
<td></td>
<td>Makes me do more than I expected I could do</td>
</tr>
<tr>
<td></td>
<td>Is an inspiration to us</td>
</tr>
<tr>
<td></td>
<td>Inspires loyalty to him/her</td>
</tr>
<tr>
<td></td>
<td>Inspires loyalty to the organization</td>
</tr>
<tr>
<td>Individualized Consideration</td>
<td>Gives personal attention to members who seem neglected</td>
</tr>
<tr>
<td></td>
<td>Finds out what I want and tries to help me get it</td>
</tr>
<tr>
<td></td>
<td>You can count on him/her to express his/her appreciation when you do a good job</td>
</tr>
<tr>
<td></td>
<td>Is satisfied when I meet agreed-upon standards for good work</td>
</tr>
<tr>
<td></td>
<td>I earn credit with him/her by doing my job well</td>
</tr>
<tr>
<td></td>
<td>Treats each subordinate individually</td>
</tr>
<tr>
<td>Intellectual Stimulation</td>
<td>His/her ideas have forced me to rethink some of my own ideas which I had never questioned before</td>
</tr>
<tr>
<td></td>
<td>Enables me to think about old problems in new ways</td>
</tr>
</tbody>
</table>

*Note:* The questionnaire items are drawn from Bass’ (1985) leadership questionnaire of descriptive statements about superiors (pp. 210-214).

During the 1990s, the transformational leadership model took hold in research in educational contexts as trends in educational reform began to focus on whole-school reform and increased school innovation, both of which often require large-scale organizational change (Hallinger & Heck, 1998; Hallinger, 2003; Marks & Printy, 2003). In fact, Hallinger (2003) posits that when transformational leadership is applied in schools, it helps the organization to develop its capacity to innovate and to inspire commitment by its teachers. Bush and Glover
(2014) note, “when transformational leadership works well, it has the potential to engage all stakeholders in the achievement of educational objectives” (p. 558). Across the research literature, transformational leadership displays a positive correlation with changing organizational culture (Geijsel et al., 2003; Smith & Bell, 2011), enhancing organizational innovation (Garcia-Morales et al., 2012; Jung, Chow & Wu, 2003; Moolenaar, Daly, & Sleegers, 2010), improving teacher commitment to reforms (Geijsel et al., 2004; Yu, Leithwood, & Jantzi, 2002), contributing to teacher commitment to the organization (Ibrahim, Ghavifekr, Ling, Siraj, & Azeez, 2014), changing teacher practice (Leithwood & Jantzi, 2005), and positively influencing organizational performance (Garcia-Morales et al., 2012).

Transformational leadership has some linkage to technology innovation as well. For example, Yuen, Law, and Wong (2003) describe the importance of engaging and empowering teachers in leading technology innovation, which are both key elements of transformational leadership. Similarly, a study of the impact of transformational leadership on teachers’ use of digital learning tools implies that two dimensions of transformational leadership (vision and intellectual stimulation) have indirect influence on teachers’ intentions to use digital learning tools (Vermeulen et al., 2015). Moolenaar et al. (2010) constructed a quantitative study across 51 schools, including questionnaires amongst 702 teachers and 51 principals, to investigate the relationship between transformational leadership, a principal’s position, and the school’s innovative climate. Their findings indicate that transformational leadership is positively associated with the schools’ innovative climate. For example, the more a principal engages in transformational leadership behaviors, such as developing a shared vision and goals, attending to the needs of individual staff members and providing intellectual stimulation through high expectations, the more likely teachers are to take risks in trying out new innovative practices.
They recommend that future studies in this area should provide a qualitative lens, in addition to the quantitative lens, because it would better capture more of the degrees of relationships between the principals and staff members.

A quantitative study by Ng (2008) sought to address the connections between transformational leadership and technology integration with the following research question: “Does transformational leadership positively influence teachers to integrate information and communications technology (ICT) into teaching?” A new survey instrument was constructed to measure teacher perspectives on the use of ICT in schools and influence of leadership. This survey, called the Perceived Influence of Transformational Leadership on ICT Integration into Teaching Questionnaire, was field-tested with 80 randomly selected secondary school teachers in Singapore. The results suggest that all dimensions of transformational leadership, which align to the eight categories in Table 10, positively support the integration of technology into teaching.

At first, most of the empirical studies of transformational leadership in non-school contexts used Bass’s (1985) multifactor leadership questionnaire. However, as researchers began to apply transformational leadership in a school setting, Leithwood and Jantzi (1999) revised Bass’s model to one they called the School Transformational Leadership Model, which divided behaviors into three categories: setting directions, developing people, and redesigning the organization. First, setting directions involves developing a shared vision and building a goal consensus, as well as holding high performance expectations. Second, developing people involves providing individualized support, intellectual stimulation, and modeling behaviors, beliefs, and values. Third, redesigning the organization includes strengthening school culture, building structures to enable collaboration, and engaging parents and the community. Table 10 provides a more detailed view of the transformational school leadership model components,
action steps, and measurable descriptors applied in a study by Yu et al. (2002) to explore how transformational leadership practices influence teachers’ commitment to change.
Table 10

**Transformational School Leadership (TSL) Model**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Sample Questionnaire Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Build a shared vision</strong></td>
<td>1. Excites us with visions of what we may be able to accomplish if we work together to change our practices/programs</td>
</tr>
<tr>
<td></td>
<td>2. Gives us a sense of overall purpose</td>
</tr>
<tr>
<td></td>
<td>3. Communicates school mission to staff and students</td>
</tr>
<tr>
<td></td>
<td>4. Helps us understand the relationship between our school’s vision and school sponsoring body or education department</td>
</tr>
<tr>
<td><strong>Develop consensus about goals and priorities</strong></td>
<td>1. Regularly encourages us to evaluate our progress toward achieving school goals</td>
</tr>
<tr>
<td></td>
<td>2. Provides staff with a process through which we generate school goals</td>
</tr>
<tr>
<td></td>
<td>3. Encourages us to develop/review individual professional goals consistent with school goals and priorities</td>
</tr>
<tr>
<td></td>
<td>4. Works toward whole staff consensus in establishing priorities for school goals</td>
</tr>
<tr>
<td><strong>Create High Expectations</strong></td>
<td>1. Has high expectations for us as professionals</td>
</tr>
<tr>
<td></td>
<td>2. Holds high expectations for students</td>
</tr>
<tr>
<td></td>
<td>3. Expects us to engage in ongoing professional growth</td>
</tr>
<tr>
<td></td>
<td>4. Expects us to be effective innovators</td>
</tr>
<tr>
<td><strong>Provide individualized support</strong></td>
<td>1. Provides resources to support my professional development</td>
</tr>
<tr>
<td></td>
<td>2. Takes my opinion into consideration when initiating actions that affect my work</td>
</tr>
<tr>
<td></td>
<td>3. Encourages me to try new practices consistent with my own interests</td>
</tr>
<tr>
<td></td>
<td>4. Provides moral support by making me feel appreciated for my contribution to the school</td>
</tr>
<tr>
<td><strong>Offer intellectual stimulation</strong></td>
<td>1. Stimulates me to think about what I am doing for my students</td>
</tr>
<tr>
<td></td>
<td>2. Encourages me to pursue my own goals for professional learning</td>
</tr>
<tr>
<td></td>
<td>3. Encourages us to evaluate our practices and refine them as needed</td>
</tr>
<tr>
<td></td>
<td>4. Facilitates opportunities for staff to learn from each other</td>
</tr>
<tr>
<td><strong>Model behavior</strong></td>
<td>1. Sets a respectful tone for interaction with students</td>
</tr>
<tr>
<td></td>
<td>2. Displays energy and enthusiasm for work</td>
</tr>
<tr>
<td></td>
<td>3. Demonstrates a willingness to change own practices in light of new understandings</td>
</tr>
<tr>
<td></td>
<td>4. Is open and genuine in dealings with staff and students</td>
</tr>
<tr>
<td><strong>Strengthening school culture</strong></td>
<td>1. Shows respect for staff by treating us as professionals</td>
</tr>
<tr>
<td></td>
<td>2. Makes an effort to know students</td>
</tr>
<tr>
<td></td>
<td>3. Encourages ongoing teacher collaboration for implementing new programs and practices</td>
</tr>
<tr>
<td></td>
<td>4. Encourages the development of school norms supporting openness to change</td>
</tr>
<tr>
<td><strong>Building collaborative structures</strong></td>
<td>1. Distributes leadership broadly among the staff, representing various viewpoints in leadership positions</td>
</tr>
<tr>
<td></td>
<td>2. Ensures that we have adequate involvement in decision making related to programs and instruction</td>
</tr>
<tr>
<td></td>
<td>3. Supports an effective committee structure for decision making</td>
</tr>
<tr>
<td></td>
<td>4. Provides an appropriate level of autonomy for us in our own decision making</td>
</tr>
</tbody>
</table>

*Note: The information in Table 10 includes descriptors and corresponding questionnaire items used in a study on transformational leadership by Yu, H., Leithwood, K. & Jantzi, D. (2002). The effects of transformational leadership on teachers’ commitment to change in Hong Kong. Journal of Educational Administration 40(4), 368-389.*
A number of research studies examine transformational leadership in school settings. Hauserman and Stick (2013) claim that teachers prefer that their principals display transformational leadership behaviors. In this study across 77 schools in Alberta, Canada, teachers completed the Multifactor Leadership Questionnaire (MLQ) for their principals. Teachers who worked with highly transformational principals had high praise for the leadership and culture in the buildings, while those teachers who worked with principals who displayed fewer transformational leadership behaviors shared frustration with the leadership and described negative impacts on the organizational culture. Not only are transformational behaviors preferred by teachers, they also have been found to have a positive impact on schools. A quantitative study by Griffith (2014) suggests that principal transformational leadership has an indirect effect on teachers’ job satisfaction and school student achievement. Alternatively, a quantitative study of over 1,000 teachers suggests that while a significant relationship exists between transformational leadership and teachers’ commitment to the teaching profession, it did not impact student learning (Ibrahim et al., 2014). Furthermore, Oterkiil and Ertesvag’s (2014) results confirm that transformational leadership correlates with innovative climates and collaborative activities within the schools. This further supports previous studies of transformational leadership in business settings, that transformational leaders perform better in environments described as innovative (Howell & Avolio, 1993).

Leithwood and Sun (2012) applied Leithwood’s transformational school leadership model to identify the extent of influence on teacher states and behaviors as well as achievement. They found that transformational school leadership behaviors had direct effects on teachers’ internal states and behaviors, which then influenced school conditions (p. 408). The most significant aspect of this study is how transformational school leadership overlaps with many
instructional leadership behaviors, similar to findings by Hallinger (2003) and Marks and Printy (2003). For example, both transformational school leadership and instructional leadership have leaders who display a shared sense of purpose or vision, a climate of high expectations, activities that promote intellectual stimulation, and visible modeling of values (Hallinger, 2003; Leithwood & Sun, 2012). Additional research results suggest that instructional leadership can sometimes be more effective than transformational leadership practices in areas such as student achievement (Shatzer, Caldarella, Hallam, & Brown, 2014). Due to the overlap, recommendations to take an “integrated leadership approach” of combining transformational leadership behaviors and instructional leadership behaviors (Marks & Printy, 2003), and since the context of one-to-one computing integration takes place in classrooms, a focus on the instructional leadership model will also be included in this review.

**Instructional Leadership**

School leadership demonstrates frequent linkages between transformational leadership and instructional leadership (Hallinger, 2003; Marks & Printy, 2003, Marzano et al., 2005). While there is not one, distinct model for studying instructional leadership, it is typically defined as leadership focused on the core of curriculum, instruction, and assessment in a school organization (Marks & Printy, 2003). Typically, it revolves around the practices that are directly impacting teaching and learning in the classroom (Bush, 2003; Gulcan, 2012). Bendikson et al. (2012) define it as, “strongly focused on the quality of instruction, but it attends to the underlying features of the school’s organizational effectiveness (routines, good appointments, solving problems) as well as the quality of teaching” (p. 7). According to Bush and Glover (2014), instructional leadership “is the longest established concept linking leadership and learning” and
has gone by other names such as “pedagogic leadership, curriculum leadership and leadership for learning” (p. 556).

The instructional leadership model surfaced during the 1980s as a result of a growing body of research that identified a correlation between strong principal leadership in curriculum, instruction, and effective schools (Hallinger, 2003). While the conventional view of instructional leadership describes the school organization as hierarchical with the principal tasked as the primary expert in instructional practices, responsible for supervising classroom instruction and curriculum implementation, this view has altered over time with studies that demonstrate instructional leadership is more productive when shared between principals and teachers and without reliance on hierarchical positioning (Marks & Printy, 2003).

Just as was the case with transformational leadership, instructional leadership models have developed over time. Hallinger and Murphy (1985) developed one of the earlier models of instructional leadership, dividing the instructional leadership behaviors into three dimensions: defining the school mission, managing the instructional program, and promoting a positive school climate. Table 11 describes these key instructional leadership dimensions and corresponding functions. To further develop this model, they used a Principal Instructional Management Rating Scale to collect data on the instructional leadership behaviors of all 10 elementary school principals in a suburban district near San Jose, California. The summary of their results suggests that consistent differences exist between the principals and their instructional leadership behaviors and that the context of where they work had an impact on the degree to which they implemented the behaviors. As a result, they recommend future research in this area, paying close attention to the role of contextual factors that influence principal behavior.
Recommendations also include incorporating qualitative methodologies in future research to provide a richer descriptive report about principal instructional leadership behaviors.

Table 11

*Instructional Leadership Dimensions and Functions*

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining the school’s mission</td>
<td>Framing the school’s goals</td>
</tr>
<tr>
<td></td>
<td>Communicating the school’s goals</td>
</tr>
<tr>
<td>Managing the instructional program</td>
<td>Supervising and evaluating instruction</td>
</tr>
<tr>
<td></td>
<td>Coordinating the curriculum</td>
</tr>
<tr>
<td></td>
<td>Managing student progress</td>
</tr>
<tr>
<td>Promoting a positive school-learning climate</td>
<td>Protecting instructional time</td>
</tr>
<tr>
<td></td>
<td>Promoting professional development</td>
</tr>
<tr>
<td></td>
<td>Maintaining high visibility</td>
</tr>
<tr>
<td></td>
<td>Developing and enforcing academic standards</td>
</tr>
<tr>
<td></td>
<td>Providing incentives for teachers</td>
</tr>
<tr>
<td></td>
<td>Providing incentives for learning</td>
</tr>
</tbody>
</table>


Smith and Andrews (1989) offer an alternative view of instructional leadership dimension in their book *Instructional Leadership: How principals make a difference.* They divide organized instructional leadership into four roles: (a) the principals as resource provider, (b) the principal as instructional resource, (c) the principal as communicator, and (d) the principal as a visible presence. According to their research, principals display instructional leadership by mobilizing available resources of materials, time, personnel and staff development to support improved instruction. When principals act as an instructional resource they supervise and evaluate staff in their instructional skills, share effective instructional strategies with staff, and assess student outcomes. Principals who display communication skills work cooperatively with staff in setting vision and goals, resolving conflicts, and facilitating collaborative
opportunities. Finally, when the principal is a visible presence, they are visible within classrooms, express a clear vision for the school and organize people and resources to accomplish school goals. Although this resource is an older description of instructional leadership, prior to the influx of technology in schools, the four roles they outline still hold true in schools today, even within a technology-rich context.

Blase and Blase (1999), in a qualitative study of over 800 U.S. teachers, identify that the key characteristics of the principals’ instructional leadership that positively influence classroom teaching involve incorporating a full-range of instructional practices. They describe the following characteristics of effective instructional leadership: focusing on the study of teaching and learning; fostering collaborative opportunities among teachers; providing coaching relationships among teachers; advocating for redesigns of programs; using research to inform decisions; and using principles of adult learning in staff development. They also contend that the “cornerstone of effective instructional leadership” was when principals talked directly with teachers in and outside of conferences on improving instruction (p. 359).

According to Reitzug et al. (2008), they found four conceptions of instructional leadership emerged from a grounded study of the experiences of principals: relational instructional leadership, linear instructional leadership, organic instructional leadership, and prophetic instructional leadership. Relational leadership falls into the category of indirect leadership, where increased learning occurs as an indirect result of principals’ skills in developing positive relationships with staff and students. Linear instructional leadership practices are more direct and focused on developing systems of structures, interventions, and monitoring, which lead to increased learning. Some examples of linear practices they outlined include the alignment of curriculum documents, pacing guides, and benchmark testing. Organic
instructional leadership “is based on the premise that the instructional dimension of schools is part of a larger whole—a living organism of sorts” (p. 702). Organic instructional leadership takes a systems approach, with a focus on developing a supportive environment that fosters collaborative learning and ongoing reflection. Prophetic instructional leadership behaviors that increase learning include creating a vision that the members of the school to work towards. Prophetic instructional leadership is very similar to elements of transformational leadership, such as providing intellectual stimulation or inspirational motivation.

As highlighted in some of the work from Reitzug et al. (2008), instructional leadership practices emerge either directly or indirectly. Indirect instructional practices focus on creating school conditions that support teaching and learning while direct instructional practices focus on improving classroom teaching. A study by Bendikson et al. (2012) analyzed the frequency of instructional leadership behaviors, along both direct and indirect dimensions. The direct instructional leadership behaviors they identify include actions such as setting goals, ensuring quality teaching, professional development, and developing a sense of collective responsibility. The indirect dimensions examined included ensuring a safe and orderly environment, resourcing strategically, and solving complex problems. The results suggest that principals are more involved in setting goals and recruiting teachers, but they share responsibility for maintaining an orderly environment with their middle level managers. The researchers argue, and the findings suggest, that secondary principals’ instructional leadership often occurs in more indirect ways because of additional layers of hierarchy that exist in larger secondary schools. For example, they suggest that middle leaders such as department heads enact a more direct form of instructional leadership as ensuring quality teaching than principals. Salo, Nylund, and Stjernstrom’s (2014) research findings further support the idea that instructional leadership by
principals tends to take place in more indirect actions than direct guidance to teachers within classrooms. In their study of narrative stories of over 100 principals from Nordic countries, they discover that effective instructional leadership happens through indirect measures such as planning and setting goals, engaging teachers in decision-making and conversations, sharing instructional leadership with teacher leaders, providing positive feedback, and having an open dialogue with teachers. Moreover, this concept of shared instructional leadership was prevalent in contexts supporting program innovation, where principals were not leading the innovation entirely on their own (Murphy, 1988).

Just as there was some overlap between transformational and instructional leadership practices, due to the complex natures of schools, some researchers propose that instructional leadership practices are not always limited to one individual, but may be shared with other leaders in the school (Bendikson et al., 2012; Marks & Printy, 2003; Murphy, 1988). Bush and Glover (2014) suggest that while instructional leadership is an essential element of successful schools, it is even more effective if it is widely shared. According to Flanagan and Jacobsen (2003) the influx of mobile learning devices changed the responsibilities of school principals. Levin and Schrum (2012) concur that a technology-rich environment is more complex and often needs leadership to be distributed to other members of the organization. Therefore, this study included the distributed leadership model as a lens for exploring school administrator leadership practices in a one-to-one computing environment.
Distributed Leadership

While the transactional, transformational, and instructional leadership models are typically about individual leaders or principals, an increasing number of studies suggest that leadership can also be shared or distributed among other leaders. As school organizations become more complex, it is likely that leadership will not lie solely in the control of one school leader. Bush and Glover (2014) declare, “distributed leadership has become the normatively preferred leadership model in the twenty-first century” (p. 566). Some researchers argue that the underlying concepts in distributed or shared leadership can be traced back in history (Gronn, 2008; Harris, Leithwood, Day, Sammons, & Hopkins, 2007). However, it was not until the year 2000 that the distributed leadership concept has had a notable increase in research (Bolden, 2011). Definitions of distributed leadership vary across the literature, with no one singular definition or construct. In fact, the concept of distributed leadership has some similarities to concepts such as shared, collective, collaborative, emergent, and co-leadership references (Bolden, 2011). Distributed leadership emphasizes the idea that leadership does not have to be with one individual in an organization, but there are multiple sources of leadership and influence that could exist (Spillane, 2006). Robinson (2008) claimed that distributed leadership is delineated as the distribution of tasks or as the distribution of influence processes. Harris (2013) argues that a distributive perspective places social interaction as a critical component of leadership practice and that it often involves facilitating and supporting the leadership of others.

The work of Jim Spillane resulted in one of the most developed models of distributed leadership (Harris et al., 2007). Instead of focusing on one leader, Spillane’s (2006) model of distributed leadership describes it as a practice where leaders, followers, and their situation interact with one another. In this model, leadership is “stretched over multiple leaders” who
have multiple responsibilities (p. 15). The essence of Spillane’s model of distributed leadership is that it is focused on the practices and interactions that take place, rather than a focus on the people. Leadership can occur in three ways: (a) in a collaborated distribution where two or more individuals work together to execute a leadership practice; (b) in collective distribution where two or more individuals work separately but interdependently to enact a leadership practice; or (c) in coordinated distribution where two or more individuals work in sequence in order to complete a leadership practice.

Similar to Spillane’s (2006) theory, Gronn (2002) describes distributed leadership as spreading across a group of interacting individuals. He describes distributed leadership as action that takes place through three types of engagement: spontaneous collaboration, intuitive working relationships, and institutionalized practiced. Spontaneous collaboration occurs when groups of individuals of differing skills and knowledge come together to complete a task. In this type of interaction, the practice of leadership is stretched over many leaders, rather than one. Intuitive working relationships exist where two or more individuals develop close working relationships over a period of time and until the leadership becomes shared within the relationship. An important element of intuitive working relationships is that it is works better when there is a high level of trust. Institutionalized practice takes place when enduring organizational structures are in places that facilitate collaboration between individuals.

MacBeath (2005) details six types of leadership distribution that could take place in distributed leadership: (a) formal distribution where leadership is intentionally delegated; (b) pragmatic distribution where leadership roles and responsibilities are negotiated and divided between different people; (c) strategic distribution where new people with unique skills and knowledge are brought in to meet a particular leadership need; (d) incremental distribution where
people acquire leadership responsibilities as they gain experience over time; (e) opportunistic
distribution where people willingly take on additional responsibilities over and above those
required for the job; and (f) cultural distribution where leadership is naturally assumed by
members of an organization and shared organically between individuals.

Limited studies of distributed leadership exist and they often display mixed results on the
effect of its practice. Heck and Hallinger (2010) studied the effects of distributed leadership on
school improvement and student math and reading achievement in 197 elementary schools over
four years. Their results suggest that distributed leadership has a direct impact on organizational
capacity, however it only has an indirect impact on student achievement in math and reading. A
study by Hulpia, Devos, Rosseel, and Vlerick (2012) examined distributed leadership along the
following dimensions: quality and distribution of support and supervision performed by the
leadership team; cooperation within this team; and participative decision-making. In their
analysis of data from 1,522 teachers in 46 secondary schools they establish that employees’
organizational commitment was attributable to differences between organizations, such as the
level of distributed leadership, but direct causal links between the two could not be made. Bush
and Glover’s (2012) study emphasizes that distribution of leadership was more likely when there
were high levels of trust and shared values and high-performing leadership teams often shared a
commitment to distributed leadership practice. In response to educational reform initiatives,
Hauge, Norenes and Vedoy’s (2014) findings support the idea that distributed leadership
practices developed as a necessary step to address the complexities of educational changes in
leadership in a school setting undergoing reforms, she discovers that when different
interpretations exist of the roles, boundaries, and responsibilities in a distributed leadership model, it can lead to a dynamic of competition between the leaders, rather than cooperation.

Despite the mixed reviews of the impacts of distributed leadership and the lack of one model for analyzing distributed leadership practices, evidence exists that as schools adapt to changing environments, multiple leaders will be needed to respond to the complex changes (Harris, 2012). With the complex organizational changes that occur with the influx of technology, (such as one-to-one computing) research studies include the model of distributed leadership as a new lens of study. For example, Seong and Ho (2011) find that distributed leadership was evident, alongside transformational leadership and instructional leadership in their study of leading technology change. Similarly, in a comprehensive study of bringing about change in schools through technology integration, Levin and Schrum (2012) examine the interactions and processes of leadership practices occurring in award-winning technical infused schools through the lens of distributed leadership.

Yuen, Chen, and Ng (2015) undertook the research question, “How is distributed leadership practiced in a school reform involving the use of ICT for instruction?” Through observations of meetings and interviews of leaders and teachers, they developed evidence on what leadership activities were enacted, who enacted the leadership activities, and what patterns existed in the distribution of leadership. Some common distributed leadership activities that took place to support the integration of technology in instruction were strategic planning by the leaders, modeling of lessons, and creating time for leaders to coach others.

Ng and Ho (2012) focused on the contextual dimensions that affected the distribution of leadership in their study of technology integration at an elementary school. They hypothesized that contextual dimensions would have an impact on supporting or constraining distributed
leadership. For example, they identified that structures need to be in place to provide the time and space for leaders to meet and collaborate on making decisions. Furthermore, they recognize that social and cultural norms such as a trusting and collaborative school culture will enable distributed leadership. Finally, they outlined factors that would constrain distributed leadership such as a rigid hierarchical structure, a school culture that does not accept peer leadership, or structures that promote isolation. The findings in their case study suggest that the lack of expertise and perceived lack of authority in one’s formal position, are key factors in influencing how leadership was distributed. Specifically, the lack of technology expertise can constrain the distribution of leadership, and hinders the leader’s ability to model the use of technology.

Section Summary

Overall, the research literature on distributed leadership suggests that it is a school leadership model that is here to stay, for the fundamental reason that school leadership and school organizations are increasingly becoming more complex (Gronn, 2008; Harris, 2012). The distributed perspective on leadership suggests that “leadership doesn’t reside in the principal’s office any more” and recognizes that schools require multiple leaders (Spillane, 2006, p. 12). Including distributed leadership in this study expands the study of leadership behaviors by the principal by offering an alternative view that the transactional, transformational, and instructional leadership behaviors may not reside solely in the leadership actions of the principal. Especially within the context of an organizational change of the implementation of one-to-one computing, there is previous research to support the possibility that a full range of school leadership behaviors will exist simultaneously. However, the one-to-one computing research emphasizes that the role of the principal has a significant impact on the successful implementation of a technology change. Therefore, while distributive leadership suggests that
leadership may be shared, the focus of this study remained with the school administrators (principals and assistant principals) to better understand their experiences.

Chapter Summary

This literature review has examined the history and growing impact of one-to-one computing in schools. Evidence suggests that one-to-one computing can have a positive impact on areas such as student motivation (Fleischer, 2012; Harris & Smith, 2004; Mouza, 2008), student engagement (Silvernail & Lane, 2004; Silvernail et al., 2011), 21st century skills (Corn, 2009; Lowther et al., 2012) and organizational and study skills (Lei & Zhou, 2008).

Additionally, research indicates that one-to-one computing has a positive impact on teacher pedagogy with benefits including individualized instruction (Silvernail & Lane, 2004), student collaboration (Mouza, 2008; Shapley et al., 2011) and project-based learning (Gulek & Demirtas, 2005).

Despite these potential benefits, research also suggests that successful implementation of one-to-one computing is a complex endeavor and involves overcoming both first-order barriers (time, scheduling, support) and second-order barriers (teacher beliefs and skills) (Yang & Huang, 2008). School leaders must have a complete understanding of the complexity of a one-to-one implementation and the various leadership roles they must take on, to create an effective one-to-one computing environment.

A shift to one-to-one computing has the potential of bringing about significant organizational change. Therefore, research highlighting organizational change processes, types, and strategies have been included in this review. The research literature included the various change processes that take place in an organizational change (Kotter, 1995; Lewin, 1958; Luecke, 2003; Schein, 1996). It also described the two divergent types of change that take place
in organizational change, which require very different leadership strategies. For example, 
continuous changes in an organization take place in small increments, while episodic changes are 
more dramatic and infrequent (Weick & Quinn, 1999). The literature suggests that the type of 
change will have a direct impact on the leadership strategies chosen. Therefore, potential change 
strategy models were described in this review (Chin & Benne, 1969; Porras & Silvers, 1991).

Organizational change literature also highlighted that change often occurs at the 
individual level; therefore, a leader must understand the possible reactions and resistance to 
change. With organizational changes, a wide range of reactions may occur ranging from 
acceptance to active resistance (Armenakis & Bedeian, 1999). Some suggested models for 
understanding these reactions included the Stages of Concern Model (Holloway, 2003) or the 
Diffusion of Innovation Model (Rogers, 2003). Moreover, not only did the research support the 
idea that leadership behaviors have the potential to impact resistance to change, but also the level 
of engagement of teacher in participation in the organizational change (Burnes & James, 1995).

Much of the research literature suggests that change agents are the important part of the 
change process. Therefore, this literature review outlined a wide range of school leadership 
strategies that may emerge in the study of leading a one-to-one computing initiative, such as 
transactional, transformational, instructional or distributed. The research literature concludes 
that transformational leadership has a strong link to bringing about change in schools (Smith & 
Bell, 2011) and promoting innovation (Garcia-Morales et al., 2012). Transactional leadership is 
linked closely to transformational leadership, because much of the research suggests that a 
balanced approach between the two will have greater impact in leading a technological 
environment (Oterkiil & Ertesvag, 2014). Further overlap in leadership strategies occurs 
between transformational leadership and instructional leadership (Marks & Printy, 2003). The
instructional leadership literature suggests that both direct and indirect instructional leadership behaviors have positive effects in changing classroom practice and introducing innovative practice (Salo et al., 2014). Finally, additional evidence indicates that leadership in complex environments such as one-to-one computing will often involve an expansion of leadership through distribution of leadership with others (Levin & Scrum, 2012). The next chapter will provide an overview of the methodologies that were used in this study to explore the leadership experiences of school administrators as they underwent the implementation of one-to-one computing.
CHAPTER THREE: RESEARCH METHODOLOGY

Purpose Statement and Research Questions

The purpose of this basic qualitative study was to identify and understand the leadership strategies used by Massachusetts high school administrators during the early implementation (first four years) of one-to-one computing.

Based on the conceptual framework and qualitative methodology of the study, the research questions that guided this study were as follows:

1. How do high school administrators describe their experience leading the implementation of one-to-one computing at their school?

2. What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing?

Research Tradition

The methodological design was a basic qualitative study. Qualitative research is focused on how people interpret and attribute meaning to their experiences (Merriam & Tisdell, 2016). Creswell (2007) contends that qualitative research is conducted to develop a detailed understanding of a topic, that can only be established by “talking directly with people, going to their homes or places of work, and allowing them to tell the stories unencumbered by what we expect to find, or what we have read in the literature” (p. 40). In this study, the qualitative approach was appropriate because the focus was on how school administrators attributed meaning to their experience in leading a one-to-one computing initiative. This study aligned with many of the characteristics of a qualitative research design. Creswell (2009) outlines eight key elements of a qualitative study: (1) data collection in a natural setting, (2) researchers as the
key instrument, (3) multiple data sources, (4) emergent design, (5) participants’ meanings, (6) theoretical lens, (7) interpretive inquiry, and (8) holistic accounts (pp. 175-176).

First, qualitative researchers collect data within the natural setting, through face-to-face interactions and data gathering that occurs out in the field, rather than in a lab setting (Creswell, 2009). Typically, qualitative researchers study a relatively small number of individuals or situations, so they are better able to understand how the events, actions, and meanings are shaped by the contexts (Maxwell, 2005). Using a protocol, the researcher is the key instrument that collects the data, examines documents, and interviews participants. The researcher does not rely upon a single data source, but instead uses multiple forms of data and then organizes it into themes and categories to help make sense of the information. The strength of qualitative data is it can provide “thick descriptions” that are detailed, provide context, and therefore provide a strong impact on the reader (Miles & Huberman, 1994).

In order to build these themes and patterns, the qualitative researcher uses an inductive approach. Maxwell (2005) argues that the inductive approach is the greatest strength of qualitative research. An inductive approach is built from the ground up in the study, whereby researchers develop themes, patterns, or categories by organizing data into more abstract forms (Creswell, 2009). This type of research is grounded in the theoretical orientation of interpretive research, which argues that reality is socially constructed, rather than a single, observable reality and developed through varied perspectives (Merriam & Tisdell, 2016). An interpretivist perspective looks at the world as “an ongoing story and refashioned by the particular individuals, groups and cultures involved” (Butin, 2010, p. 60). Key goals for interpretive research include searching for patterns of meaning that the participants have about the topic or issue, rather than the meaning the researcher brings to the study. In a qualitative study, the focus is on how the
participants make sense of their situation and how “their understandings influence their behavior” (Maxwell, 2005, p. 22). Additionally, qualitative data, which emphasizes people’s “lived experience,” has the potential to uncover meanings in phenomenon, actions, and events, and aims at gaining a deeper understanding of everyday experiences (van Manen, 1990, p. 9).

**Research Design**

A qualitative methodology was ideal for the purposes of this study, because the purpose was to gain a rich description from school administrators on their ‘lived experience’ in leading a one-to-one computing initiative. The research design that best aligned with the problem of practice, intellectual goals, and conceptual framework was a basic qualitative research approach (Merriam & Tisdell, 2016). Basic qualitative research is founded on the “belief that knowledge is constructed by people in an ongoing fashion as they engage in and make meaning of an activity, experience, or phenomenon” (p. 23). This design is appropriate when researchers are interested in understanding how people interpret their experiences and construct meaning about their experience. Since the purpose of this study was to better understand the experiences of school administrators from their perspectives and construction of meaning, the basic qualitative design was appropriate.

Using a general inductive analysis (Thomas, 2006) the qualitative data was collected and analyzed. During this process, the researcher was the primary research instrument that gathered the data through interviews and document analysis (Creswell, 2009). An inductive analysis is an approach when the researcher reads through raw data “to derive concepts, themes, or a model through interpretations made from the raw data” (Thomas, 2006, p. 238). Using quotes from participant interviews, aligned to themes found through the inductive process, the researcher was
able to develop a thick, rich description (Creswell, 2009) of the leadership experiences of the school administrators in the one-to-one implementation process.

Participants

Purposeful sampling was used to select participants for the study. Purposeful selection, often used in qualitative studies, is used to provide the researcher with the information needed in order to answer the research questions (Creswell, 2009). Merriam and Tisdell (2016) explain, “purposeful sampling is based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned” (p. 96). Furthermore, Patton (2015) argues that the substance of purposeful sampling is that the emphasis is on information-rich cases, where the researcher can gain in-depth understanding of the purpose of the inquiry.

The first step in purposeful selection is to define the criteria for the sites to be studied, otherwise known as “criterion-based selection” (LeCompte & Schensul, 2010). According to Merriam and Tisdell (2016), the criteria established should reflect the purpose of the study and help pinpoint information-rich cases. Since the purpose of the study was to understand the leadership strategies used by school administrators through their descriptions of their experiences, the key participants of the study were school administrators at the high schools undergoing implementation of one-to-one computing.

The first criterion for selection was that school administrators were defined as school principals and other school leaders (assistant principals, associate principals, headmasters, or dean of students) who were considered part of the school leadership team. Although other district administrators were often involved in the one-to-one initiative from the district level (superintendents, assistant superintendents, directors of curriculum, technology coordinators or
directors of technology), this sample excluded them, since the purpose of the study was to understand the leadership by school-based administrators.

The second criterion for selection was that the participating school administrator had an active leadership role in the implementation of one-to-one computing. These two criteria were determined through two questions on the questionnaire (Appendix A), which asked the participant to provide the title of their position as well as a question if they were involved in leadership decisions regarding the implementation of one-to-one computing.

The third criterion for selection was that the participants had been school-based administrators at the high school for the entire length of the one-to-one computing implementation, starting from the first year of implementation. The purpose of the study was to understand the leadership strategies used in the implementation process and therefore the participants needed to be part of the entire implementation process. If they were only there for part of the process, they would not have been able to offer a rich enough description of the leadership strategies. They also would not have been able to offer insight into the intricacies of the organizational change if they were not present for all of it. This information was ascertained through a question on the questionnaire (Appendix A) asking if they were in the current position as a school leader from the inception of the one-to-one computing initiative.

The fourth criterion for selection was that the participants were drawn from information-rich contexts and had consistent features that helped to inform the study. Therefore, participants were selected from high schools (grades 9-12) in Massachusetts, from rural or suburban areas, with school populations between 500-2000 students, in the early implementation phase of one-to-one computing.
First, the participants were selected from schools with populations ranging from 500-2000 students from either a rural or suburban setting. Larger school sizes and urban settings were excluded primarily because the larger the school, the more removed from the day-to-day operations the school administrators become. Since the focus was on understanding the administrators’ leadership strategies, this study sought to receive richer information from school administrators who were closer to the implementation process. Moreover, the school sizes were selected to minimize variables of context and culture resulting from a wide variation of school size.

Second, the participants came from school contexts that had one-to-one computing (iPads, laptops, tablets, or Chromebooks) for all students (grades 9-12). One-to-one computing can be described differently by organizations such as: computers/tablets for all students, grade level 1:1 initiatives, and bring your own device (B.Y.O.D.) initiatives. According to a 2014-2015 digital learning survey conducted by the Massachusetts Department of Elementary and Secondary Education, 77% of high schools reported they had computers/tablets for all students, 56% reported they had grade level 1:1 initiatives, and 93% reported that they had B.Y.O.D. initiatives in place. For the purposes of this study, within the context of a large-scale organizational change process, school administrators who could provide the most information-rich details were selected from locations where the entire school was one-to-one with the same device, rather than a mixture of devices in a B.Y.O.D. model, or in schools where pockets of implementation occurred at grade levels. In some of the schools there had been rolling implementation with one or two grade levels added at a time. This was acceptable for the study, as long as all four grades were one-to-one at the time of the study.
Third, the school administrators were selected only if they met the criteria of being in the early phase of one-to-one implementation of the first four years. Focusing on the first few years was intentional because typically, the further away from the initial time of implementation, the more entrenched the change becomes within the culture of the building, potentially requiring less leadership. Furthermore, a practical goal of this study was to provide future school administrators with a detailed understanding, from the experiences of their colleagues, of what it took to initially lead a one-to-one computing initiative. As a result, the information sought from this study was the experiences of school administrators in the beginning of the initiative process.

Beyond the contextual elements, other selection criteria included a willingness to participate in one 60-90-minute audio-recorded interviews, which would eventually be published in the dissertation and other publications. Additionally, the participants had to be willing to participate in member-checking activity (Creswell, 2009; Lincoln & Guba, 1985), in which they reviewed an executive summary of the findings to review for accuracy and to provide feedback. The executive summary provided specific themes and descriptions of the findings and the participants had an opportunity to comment on the findings. This executive summary was provided to the participants via e-mail and feedback was provided to the researcher via email, phone, or in person, as preferred by the participants. Finally, the participants were willing to be available for potential brief follow-up questions of clarification of information via email or phone call by the researcher. The researcher followed-up with two of the participants via phone for additional clarification on responses. This request was detailed as part of the informed consent process (Appendix B) and at the conclusion of the interview.

It was anticipated that eight to ten participants would be involved in the study. The final sample included 10 participants. Selection of a sample size met the criteria of sufficiency and
saturation (Seidman, 2013). A sufficient sample would indicate that there are “sufficient numbers to reflect the range of participants and sites that make up the population so that others outside the sample might have a chance to connect to the experiences of those in it” (p. 58).

Since there were examples of high schools that are one-to-one in numerous regions of Massachusetts, some variation of participants and sites did occur, which allowed for sufficiency in population variance. Saturation refers to the point at which the researcher begins to hear the same information, whereby no new information is presented. Since many of the high schools experienced the one-to-one implementation within the last five years, there was a tendency to see an overlap in implementation plans some of the districts used. Therefore, as anticipated, the interviews with the school administrators began to reach a point of saturation after the eighth interview, due to them experiencing similar preparations leading up to their implementation.

Recruitment Process.

The first step in the recruitment process was to identify high schools in Massachusetts that fit the following criteria: rural or suburban, grades 9-12, in years 1-4 of one-to-one computing, with school administrators that have been present all of the years of implementation. In a preliminary search online, the researcher was able to identify 12 potential high schools that fit the criteria for years, school size, and school administrators. While there was not a public listing of high schools that had one-to-one computing, the Massachusetts Department of Elementary and Secondary Education (D.E.S.E.) collected this data. To gain access to a larger potential list, the researcher contacted the D.E.S.E. department of digital learning twice, but received no response back on the inquiry of a master list of schools. However, the research into the state’s secondary administrator’s professional association inquiring what schools have one-to-one computing was more successful. A list of schools that had one-to-one computing was
provided to the researcher upon request. This initial list was narrowed down to rural and suburban schools based on D.E.S.E. school profile data posted publicly on their website. Through online research, the researcher determined what year they were in the implementation process. Most schools that moved to one-to-one computing readily posted materials online about this organizational change, which was easily accessible through their school websites. Of the potential locations that fit the criteria, they came from Eastern, Northern, Southern, and Central Massachusetts, but there were no participants drawn from Western Massachusetts locations, due to the criteria not fitting the study.

The second phase in the recruitment process was to secure permission by seeking approval of the gatekeepers, individuals at the research site that provide access to the site and allow research to take place (Creswell, 2009). Since the research sites were high schools, the informal gatekeepers were the principals at the buildings. Prior to the study, the researcher informally checked with four high schools that fit the site and participant criteria to ask what types of permissions would be needed from the school district to conduct a study at the high school. It was confirmed from all four high schools that the principals are the appropriate gatekeepers for seeking permission. No formal recruitment took place during these conversations; rather it was only information-seeking regarding the process of seeking permission. Therefore, during the recruitment process, permission was secured through reaching out directly to the high school principals using the recruitment letters.

The first step was to e-mail recruitment letters (Appendix D) and questionnaires (Appendix A) to the building principals. The recruitment letter included the following: a summary of the purpose of the study, why the participants were chosen, what activities will occur during the study and how much time they will require, potential risks and benefits,
assurances of confidentiality and how results will be reported. The letter also included the researcher’s contact information and a request to respond directly via email or by phone within two weeks (Appendix D). If there were not enough initial responses, a follow-up e-mail (Appendix C) was to be made to the principals. The questionnaires (Appendix A) included basic demographic information to confirm participant selection criteria such as: town demographics (rural, suburban, urban), grades of the school; student enrollment population; name and contact information of the potential participant and their school title; and whether they were decision-makers in the leadership of implementation of the one-to-one initiative.

Participants were selected based on meeting the selected individual participant criteria, and their willingness to participate in the study. Once the researcher received notice of interest, then a follow-up e-mail or call was made to the potential participants, based on their preference, to schedule a mutually agreeable time for the first interview. Principals from 10 different schools were contacted initially, and nine of the principals responded in the affirmative for participating. One principal never responded after two inquiries and one principal who responded in the affirmative cancelled the interview because of a scheduling conflict and never responded to reschedule. Therefore, the 10 participants (principals and assistant principals) ended up representing eight of the ten originally contacted schools.

During the pre-interview discussion, the researcher discussed with the participant the purpose of the questionnaire and the consent form was explained. After this explanation, the researcher sent via email the consent form for them to review in advance of the interview (Appendix B). This provided them time prior to the interview meeting to read the form and formulate questions in advance.
**Relationship to Participants**

The research relationship created with participants is an essential part of the research methods and design (Maxwell, 2005). In a study, this ongoing relationship can be complex, ever changing, but needs to be based on trust (Maxwell, 2005). Since the researcher was the instrument of the study, in order to gain the necessary rich information for analysis, the relationship built with participants was essential. This development of trust began by adhering to the strict protocols developed for recruiting participants at the sites, such as seeking approval of gatekeepers and providing details about why the site was chosen, what activities would occur, and the purposes of the study. Once the relationship with participants was initiated, the researcher continued to foster trust by taking actions that minimize disruption for the participant, providing opportunities for participants to ask questions about the process, and treating the participants professionally.

Multiple strategies were used to provide assurances of confidentiality and to ensure participation was voluntary. For example, participants were assured that all communications involving them, including notes during interviews, transcriptions, e-mails, and summaries were kept confidential and securely kept in a locked filing cabinet for the researcher’s reference only. As part of the informed consent process, the administrators were told in writing and verbally that participation was entirely voluntary and they could withdraw at any time without any repercussion. This was also explained when they signed the informed consent form. To ensure that they understood the consent form, it was sent to them in advance of the interview, so they had time to review it prior to the interview time.

One of the school sites that fit the criteria for purposeful selection was the high school in the district where the researcher was the curriculum director. In the curriculum director role, the
researcher does not evaluate or supervise the administrators at the high school. Most of the dealings with the school involve curriculum development, instructional observations, and providing professional development to staff members. The relationship with these participants is professional in nature. Interactions with the school administrators occur at district leadership meetings, on professional development days and during district committee work. As a member of the district leadership team, the researcher had been on district committees where decisions had been made about strategic planning and visioning for the district. In order to ensure that participation was voluntary and would not affect their standing in their employment, the emphasis was that the researcher’s key role in the study was as a doctoral researcher, not as a colleague, that their participation was entirely voluntary, and that all information would be kept confidential, including the superintendent, who is their evaluator and supervisor.

Maxwell (2005) offers the reflective question, “What can you do to make people feel that his has been a worthwhile experience and that they aren’t just being ‘used’?” (p. 85). One benefit for the participants was that their participation provided them with an opportunity to reflect on their experiences in leading a one-to-one computing initiative. In fact, a few of the participants mentioned that they enjoyed the time in the discussion and the opportunity to reflect on what they had accomplished. They also received a detailed executive summary, which provided them with insight into developing themes and findings. Upon receipt, a number of participants e-mailed that they appreciated the information provided in the executive summaries. Furthermore, their reflections offered important insight into leadership strategies, which will benefit administrative colleagues in other high schools, who are seeking information on what the experiences is like to lead a one-to-one computing initiative. Additionally, teachers and students in these schools may benefit from well-informed school administrators who enact effective
strategies in a large-scale technological change, such as one-to-one computing. Finally, the participants received a verbal thank you at the conclusion of the interview, as well as written thank you notes for participating in the study, along with the opportunity to receive the final dissertation if they requested. Most of the participants requested to see the final dissertation when it would be completed.

Data Collection

In many qualitative studies, researchers collect multiple forms of data from the natural setting of the study (Creswell, 2009). Data collection in this study came from multiple sources including questionnaires, interviews, observations, documents, and audio-visual materials. This section further describes the data collection process that occurred in this study.

Questionnaires

As part of the recruitment process, along with the recruitment letter (Appendix D), a brief questionnaire (Appendix A) was completed by the participants prior to the first interview. The first section of the questionnaire requested basic school demographic information such as town demographics (rural, suburban, urban), grades of the school, and student enrollment population. Additionally, the second section of the questionnaire requested basic information about the school leader’s role: how many years the school had one-to-one computing, whether they were a decision-maker in the leadership of the implementation of the one-to-one initiative, and whether they felt that one-to-one computing was a positive change for their school.

Interviews

The most substantive data collection format took the form of a 60 minute semi-structured, face-to-face, interview with each school leader participant. A 60-90-minute interview time was selected, because it was intended to be a more in-depth interview, rather than a “focused
interview,” in which a person was interviewed for a shorter amount of time (Yin, 2009). The in-depth nature of the interview allowed for more time for respondents to provide details, as well as opinions about their leadership experience. A semi-structured interview guide was used for all of the interviews (Appendix E). The semi-structured format was chosen because it allowed for inclusion of both open-ended questions and more structured questions. Open-ended questions allowed the participant to reflect and describe their experiences as leaders, bringing about emergent themes and patterns. Open-ended questions promoted exploration and therefore participants could take the answer in any direction they would like (Seidman, 2013). The more structured questions allowed the researcher to ask questions where more specific information was needed to better understand the leadership strategies employed aligning to the research literature. This format also followed the semi-structured interview format advocated by Merriam and Tisdell (2016), which permitted the questions to be used flexibly, included a mixture of types of interview questions, and focused the largest section of the interview on information being explored for the research questions.

Interviews were all conducted onsite, in a comfortable, private area convenient for the participant as determined in the pre-interview conversation. The first 10 minutes of the interview were spent on reviewing the consent form with the participant and answering any questions about the process, as well as establishing rapport with the participant. During this portion, the participants were informed that the purpose of the questions were to gain a detailed understanding of leadership strategies used in one-to-one computing implementation. They were reminded that the responses were completely anonymous and confidential, and the goal of the research was to secure honest, information rich descriptions to answer the research questions.
Interviews were audiotaped using both an iPad and an iPhone for back-up and professionally transcribed immediately after the interview using the online transcription service, Rev. The recordings were immediately downloaded after they were collected onto a flash-drive, which was kept in a locked file cabinet at the researcher’s home office. The data was also stored on a password-protected computer that was only accessible to the researcher. The participants’ identities were immediately coded to protect confidentiality. Any identifiable information from the transcripts was removed, including the names of people and locations, and any other identifiable information. The names of the participants were assigned pseudonyms to protect confidentiality.

An interview guide (Appendix E) was developed based on qualitative interviewing guidelines (Creswell, 2009; Lincoln & Guba, 1985; Merriam & Tisdell, 2016; Seidman, 2013). First, the participant had an opportunity to answer warm-up or introductory questions, which provided practice in talking to the researcher as well as an opportunity to “organize his or her head” by being asked general questions (Lincoln & Guba, 1985, p. 270). After these warm-up questions, a mixture of neutral open-ended and semi-structured questions were included, categorized by the research questions of the study. In order to improve the data collected in the interview, technical jargon or terms were avoided (Merriam & Tisdell, 2016). Furthermore, the interview guide was constructed to allow for opportunities to explore further, and ask individuals probing questions to elicit more details or elaboration on topics. Lincoln and Guba (1985) provide examples of probing questions: “Could you tell me more about that?” or to ask for illustrative examples (p. 271). Additionally, the interview guide was formatted to allow for enough space for the researcher to take notes and record responses. Taking notes during the interview is recommended, in the event that the recording equipment fails (Creswell, 2009) and it
helps to facilitate active listening and limit interviewers from interrupting the participant (Seidman, 2013). At the conclusion of the interview guide, the participant was thanked for their time and told that they had an opportunity to add any additional information they wanted to share.

**Pilot Interview.** Prior to formal data collection, the researcher conducted a pilot interview with a school administrator at a one-to-one computing school that fit some of the school site criteria, but not all to be a chosen site for the study. The pilot was with a school principal in a one-to-one school who was no longer in the early implementation of one-to-one, because they were in their fifth year. Typically, pilot-testing the interview guide helps the researcher to determine if the questions work as intended and determine what revisions are needed (Maxwell, 2005) and helps to assist in developing a “relevant line of questioning” (Yin, 2009, p. 92). The purpose of the pilot was three-fold: (a) to receive feedback on the wording of the questions for clarity and comprehension for the participant; (b) to review if the questions solicited the intended information; and (c) to allow the researcher the opportunity to practice with the interview protocol.

The researcher benefitted from practicing with the interview guide during the pilot interview and developed a few strategies to better prepare for latter interviews. First, the researcher learned that the iPhone and iPad had to be placed directly under the person being interviewed, rather than in the middle of the table in order to pick up all of the content of the interview. Second, in the pilot interview, the researcher jumped directly into the language of the informed consent form, rather than taking a few minutes to establish rapport with the interviewee. This made it more difficult to interview because the interviewee was not initially at ease. Therefore, in future interviews, the researcher made sure to spend enough time
establishing rapport prior to going over the informed consent form. Third, the school administrator in the pilot was not as involved in the leading of one-to-one computing initiative as others in the high school, so some of the initial answers were vague. This was in fact helpful for a pilot interview, because it helped the researcher gain more skills in asking more specific follow-up questions to probe further for details. Finally, a few questions in the interview guide were confusing to the participant when asked. This was helpful information, as it provided the researcher with information for future interviews on questions that might need further clarification for participants.

Observations

Although the qualitative interviews were the primary data collection strategy, direct observations of the school setting in school tours also provided the researcher with a richer context for the one-to-one computing environment and leadership practices. Observations provided more detail to the study because they happened directly in the natural setting and they provided a first-hand account, rather than a second-hand account of the phenomenon being studied (Merriam & Tisdell, 2016). Marshall and Rossman (2016) emphasize that “observation is a fundamental and highly important method in all qualitative inquiry” because it can provide more details about a setting (p. 143). For the purposes of this study, observations provided the researcher with an enhanced understanding of the context of the environment the school administrators led.

Creswell (2007) indicates that, similar to the interview process, observations also need to take a series of steps. The following are Creswell’s steps, which were included in this study: (a) selecting the setting to be observed; (b) identifying what will be observed and for how long; (c)
determining the role of the observer; (d) designing the observational protocol; (e) recording the information (p. 134).

**Setting and Length.** As part of the interview process the researcher asked if a brief school tour of no more than 30 minutes could be provided for the purposes of learning more of the context of the one-to-one computing environment and to potentially view elements of the implementation in action. To address the research questions of the study, a tour of the school provided some additional data from the physical setting of the school and commentary from the individual giving the tour about one-to-one computing. The majority of the interviews took place in the summer months, or afterschool, so one-to-one computing could not be observed in action, but the tours helped to gather contextual information and to better understand the physical setting.

**Observational Role and Process.** Lincoln and Guba (1985) describe two types of observational approaches such as participant observer or nonparticipant observer. Merriam and Tisdell (2016) describe observers as complete participant, participant as observer, observer as participant, and complete observer. Yin (2009) delineated two types of observations: direct observation and participant observation. Of the various descriptions of observational roles, the approach in this study was that of direct observation where the researcher was a nonparticipant and complete observer. This method allowed the researcher to focus solely on taking field notes and reflecting on the observations (Merriam & Tisdell, 2016). Using Merriam and Tisdell’s (2016) proposed checklist of observations, the following elements were included in the observational protocol (Appendix F): the physical setting (context, resources, physical environment), the participants (teachers, students, staff), activities and interactions (interactions between participants, routines, technology use), conversation (content of conversations), subtle
factors (nonverbal communications, symbolic meanings of words), and researcher behavior (statements and interactions) (p.141). All of this data was collected in field notes in the observational protocol. Marshall and Rossman (2016) describe field notes as notes that the observer takes “on-the-spot” during the observation and then turn into more detailed notes after the observation (p. 145). Therefore, the observational protocol for this study was formatted to assist with initial field notes, and then included a section for reflective notes after the observation. In the end, field notes were descriptive where a reader can get a feeling as if they were there themselves (Merriam & Tisdell, 2016). However, no identifying information or names were recorded within the field notes.

**Documents**

In addition to observations, a document review was held to help validate the interview information. One advantage of collecting documents is that it allows the researcher to review the language and words of participants and often represents information that can be significant because the participants have given attention to creating the documents (Creswell, 2009). A second advantage of document collection is that it is an unobtrusive form of data collection. Marshall and Rossman (2016) note that documents can provide both background information to support the rationale for selecting a research site, as well as information rich documentation to develop a better understanding of the research topic. According to Clarke and Dawson (2010), the use of documentary materials in a qualitative study can be highly valuable in understanding the formal goals of an initiative. In many schools implementing one-to-one technology, there are often online resources publicly accessible about the process including technology plans, principal blogs, and informational press releases. The documents were chosen based on additional information they provided on the school’s implementation of one-to-one computing, including
district and school goals, leadership messaging, and strategic planning. Therefore, some of the documents that were reviewed included the following: district and school memos, websites, blogs of school administrators, presentations, district strategic plans, school goals, district goals, twitter feeds of school leaders, and one-to-one implementation documentation.

**Data Analysis**

This section will describe the data analysis process that took place in this study, including the organization and tracking of data, the process for coding transcripts, and the inductive inquiry process. The researcher manually analyzed all data collected, such as transcribed interviews, interview notes, analytic memos, reflective journals and documents. Data was analyzed using a general inductive approach (Thomas, 2006). Maxwell (2005) recommends that data analysis occur concurrently with the data collection, rather than waiting until after all the data is collected. In qualitative studies, data collection and analysis is a dynamic process, which happens simultaneously (Merriam & Tisdell, 2016). Therefore, documents were reviewed as soon as they are collected and transcripts were analyzed once received.

**Data Tracking and Organization**

Prior to data analysis, a system of data tracking and organization was established. A variety of tracking methods was used including: note-taking, analytic memos, informal reflective journaling, and interim summaries. The research literature suggests that throughout the analytic process, ongoing writing promotes reflection, generates insights, and can be an invaluable tool for organizing thinking and developing interpretations (Marshall & Rossman, 2016; Maxwell, 2005; Merriam & Tisdell, 2016; Miles & Huberman, 1994; Saldaña, 2013).

**Analytic memos.** The researcher created analytic memos to capture ongoing reflective commentaries that emerged throughout the data collection, analysis, and interpretive process.
Miles and Huberman (1994) maintain that memos “are one of the most useful and powerful sense-making tools at hand” in understanding research data (p. 72). Similarly, Maxwell (2005) advocates the use of analytic memos because “memos not only capture your analytic thinking about your data, but also facilitate such thinking, stimulating analytic insights” (p. 96). The memos followed Miles and Huberman’s (1994) format that they should be dated, titled with key concepts, linked to relevant data, coded according to the conceptual framework, and kept separate from data files. Furthermore, the memos drew from Saldaña’s (2013) guidance that memos should reflect: the research questions, the researcher’s personal reflections, code choices, possible links and themes, emerging theories, future directions, and potential problems or ethical dilemmas with the emerging study.

**Interim summaries.** In addition to ongoing analytic memos, an interim summary was created one-third of the way through the analysis process. An interim summary provides a synthesis of what the researcher knows at that time about the research and provides an opportunity to reflect on any information that still needed to be discovered. The format for the interim summary can be found in Appendix F. Some key elements of the summary, include: (a) main themes, impressions, and summary statements about what is going on in the school site with the leadership team; (b) explanations, speculations, hypotheses about what is going on at the school site with the leadership team; (c) alternative explanations, minority reports, disagreements about what is going on in the school site with the leadership team; (d) next steps for data collection including follow up questions, actions, and general directions for future field work; and (e) implications for revision, updating of coding scheme (Miles & Huberman, 1994, p. 78). The interim summary provided an additional opportunity to develop a clearer sense of the data.
early on in the data collection process, which allowed enough time to address any gaps in information before final interpretations.

**Informal journal.** While an interim summary was a more formalized process for reflection, an informal journaling method was also employed to track the researcher’s thinking about the research process. Stake (1995) advocates that for many researchers, keeping a daily informal journal or log is one of the most important steps for managing information.

**Coding Process**

Multiple coding strategies were used in this study, including *in vivo* coding, descriptive coding, open coding, and axial coding. Coding is a process of assigning shorthand labels to the data, assigning descriptions for meanings, that can be easily sorted, retrieved, and interpreted (Merriam & Tisdell, 2016; Miles & Huberman, 1994; Saldaña, 2013).

The coding process in the study followed Thomas’ (2006) general inductive process, but also included some elements of other coding processes outlined by researchers (Creswell, 2009; Corbin & Strauss, 2006; Miles & Huberman, 1994; Saldaña, 2013). First, the inductive coding process began with a close reading of the transcribed interviews and documents until the researcher was familiar with its content and gained a general sense of the information to reflect on its overall meaning (Creswell, 2009). Next, the transcript was imported into a database spreadsheet to start the coding process. In this spreadsheet, the text data was segmented into sentences or paragraphs and labeled with an *in vivo* term, which was a term in the actual language of the participant (Saldaña, 2013). Lincoln and Guba (1985) emphasize that these segments of information need to capture information that is essential to the study and small enough segments of information that they can stand alone without other information. This first step has also been referred to as open coding, where data is initially broken apart into units of
meaning within phrases, sentences, or paragraphs and is exploratory in nature (Corbin & Strauss, 2015). It is called open coding because the researcher is “being open to anything possible at this point” (Merriam, 2009, p. 178). This open coding allowed the researcher to develop a more general theory about what was going on through a creation of descriptive categories, otherwise known as substantive categories (Maxwell, 2005), which drew from the participants’ ideas, rather than the researcher’s. Additionally, during the open coding, the researcher completed another round of coding, where emphasis words were coded, such as always, never, best where the participants made a point to emphasize their thoughts during the interviews.

In step three, the codes were assigned to these units of text to begin to create categories. During categorization, analysis moved away from descriptions to a more theoretical or analytic level (Gibbs, 2007). These categories ended up being a mixture between substantive categories, as well as organizational categories. While substantive categories were drawn from the participants’ language, the organizational categories came from the research literature. The categories (or themes) encompassed recurring patterns that emerged from the pieces of data and the process of building the categories was inductive (Merriam, 2009). For example, during the data collection process, data analysis took place simultaneously and as new data was analyzed and coded, new categories and themes emerged. According to Merriam, categories should have the following characteristics: (a) categories should answer the research questions; (b) categories should be exhaustive and include all relevant data to the study; (c) categories should be mutually exclusive where data can only fit into one category, not multiple categories; (d) categories should be sensitive to what is in the data and clearly communicate the concept; and (e) categories need to be conceptually at the same level of abstraction (pp. 186-188). Maxwell (2005) argues that the more data a researcher has, it is important to have data analysis strategies for developing a
balance of both types of coded categories. The categories and codes were organized in an Excel spreadsheet, which was easily sorted and searchable. The categories fit with some of Thomas (2006) criteria that they should have the following features: category label, category description, text associated with the category, links to other categories, and theory or model type.

In step four of the general inductive approach, the researcher identified any overlapping coding or un-coded text and, as a result, reduced the number of categories. This step also aligned to Corbis and Strauss (2015) axial coding, also called second-cycle coding (Saldaña, 2013) where categories were broken apart and then put back together in themes based on emerging patterns. During this step, the researcher identified relationships and connecting statements between the categories (Maxwell, 2005). Merriam (2009) recommends creating a visual model or diagram of the categories to reveal how the concepts may be linked. This takes place until the data reaches a theoretical saturation point, where data is redundant, no new information arises, and the data can be reduced into broad categories (Gall, Gall, & Borg, 2010). Finally, in the last step of this process, the researcher continued to revise the categories to generate seven categories, which became part of the major findings in the study. It was in this last phase that the inductive approach moved towards a more deductive one, where the findings were connected back to the research literature, especially for the second research question regarding leadership strategies. The analytic approach moved to a deductive approach at the end where the categories were aligned to the four leadership theories of transformational, transactional, instructional, and distributed as outlined in the conceptual framework. Table 13 provides a breakdown of the coding steps that took place in the study, from varied researcher perspectives.
### Table 12

**Coding Process in Inductive Analysis**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
</tr>
</thead>
</table>
| **Thomas**  
(2006) | Initial reading of text data | Identify segments of texts aligned to research objectives | Apply labels or tags to the text segments to create categories | Reduce overlap of categories, as well as redundancy | Create a model of most important themes and categories |
|        | Many pages of raw text | Many segments of text | 25-30 categories | 15-20 categories | 5-7 categories |
| **Miles & Huberman,**  
(1994) | Synopses of individual interviews | Trying out coding categories to find a set that fits | Searching for relationships within the data, writing analytic memos, identifying gaps | Cross-checking tentative findings | Synthesis of data into explanatory framework |
| **Creswell,**  
(2009) | Read the data and jot down initial ideas | Cluster together similar topics | Code the data by giving them categories and abbreviated codes | Interrelating descriptions and categories | Interpret the meanings of descriptions |
| **Corbin & Strauss**  
(2015)  
**Saldaña,**  
(2013) | Open coding | First cycle coding  
In vivo coding  
Descriptive coding | Axial coding | Second cycle coding |

**Notes:** Adapted from Burkhardt (2013); Corbin & Strauss (2015); Creswell (2009); Miles & Huberman (1994); Saldaña, (2013); Thomas (2006).

Throughout the data analysis process, a constant comparison method was used. Constant comparison is a process of comparing the codes across units of meanings to discover commonalities in the data (Gall et al., 2010). Beginning with the initial reading of the interview transcripts, the researcher employed the constant comparison approach during analysis, whereby
the information coded was checked and compared against previous segments of texts coded (Lincoln & Guba, 1985). During this checking, the researcher looked to identify similarities and differences in the data, which helped the researcher to check for consistency (Corbin & Strauss, 2015). The process of constant comparison is a critical step in data analysis because it helps the researcher “to reduce data to concepts, to develop concepts in terms of their properties and dimensions, and to differentiate one concept from another” (pp. 92-93). The constant comparison method was also used during the early peer review process. This method continued until the saturation point, when no new insights or information or emerged from the data (Merriam & Tisdell, 2016). The saturation point was reached at about the eighth interview in the data collection process.

For analyzing documents, the technique of content analysis was employed, which is the most common form of analysis used by qualitative researchers for documents (Merriam & Tisdell, 2016). Content analysis is the study of the information contained in documents or communications by developing categories to code the information for analysis (Gall et al., 2010). In this study, the documents were helpful to obtain more descriptive information about leadership strategies, to augment and corroborate information drawn from interviews, and to help formulate themes that help to make sense of the data.

**Data Storage and Destruction**

Interviews were recorded using the Rev application on an iPad and iPhone. These recordings could only be accessed through password-protected mobile devices. The recordings were transcribed by a third-party transcription service called Rev through www.rev.com. The digital files were immediately uploaded to Rev’s website to be transcribed. Rev takes precautions to secure the documents, transcriptionists are held to strict nondisclosure agreements,
and the files are transmitted using encryption. The turnaround for transcriptions was less than 24-hours and the transcripts were returned as Microsoft Word documents. Once the transcriptions were received, the researcher assigned pseudonyms for the participants’ names. The raw transcriptions were stored within the locked file cabinet in the researcher’s home office. Data was also stored on a password-protected computer that was only accessible by the researcher. Backup copies of the files were kept in a secured web-based Dropbox account that only the student researcher has access to through password protection. All identifiable information, except for the informed consent forms, will be shredded or destroyed within one year of the study. The informed consent forms will be kept and secured for three years after the study in a lockable file cabinet. Then, three years after the completion of the research, all copies of the consent forms will be destroyed.

**Reliability and Validity**

Issues of validity and reliability were considered and addressed throughout the research process. Qualitative validity exists when the researcher checks for accuracy of the findings by using various procedures, while qualitative reliability results from consistency of the researcher’s approach (Creswell, 2009). At the core of validity and reliability of research is the level of trustworthiness. Lincoln and Guba (1985) outlines four characteristics of trustworthiness in a qualitative research design: (a) credibility (the extent of which the findings are plausible); (b) transferability (the findings can be applied to other contexts); (c) dependability (the findings are consistent, reliable, and replicable); and (d) confirmability (findings are based objective, based on participant data, rather than researcher subjectivity). Following these four core principles of trustworthiness, various methods were employed throughout the study.
Pilot Interview

One method that was used to help ensure the reliability of the interview guide was to conduct an informal pilot interview with a school administrator who had been a leader in a one-to-one computing implementation. This pilot allowed the researcher to check if the questions had clarity, if words needed to be defined further, and if the questions were reliable in drawing out rich information from the participant. The pilot also allowed the researcher to practice asking questions, which led to more consistency in the interviews later.

Peer Review

To further enhance credibility of the study, peer reviewers were employed to provide ongoing input and insight into the data analysis process. Creswell (2009) notes that a peer reviewer (peer debriefer) is someone who reviews and asks questions about the qualitative study so that information and findings resonate with people other than the researcher. Debriefing provides an opportunity to test ideas emerging from the study, to keep the researcher “honest,” and to play the “devil’s advocate” (Lincoln & Guba, 1985, p. 308). An additional role of a peer reviewer initially was to code some of the transcripts collaboratively with the researcher to provide a different perspective on analyzing and interpreting the data (Saldaña, 2013). Two peer reviewers were used in this study to provide input into the coding process, as well as data analysis insights. The first peer review occurred in the beginning of the data analysis process with a peer coding of the third interview. The peer reviewer coded the interview separately and then a constant comparison process was used between the researcher’s results and the peer coder’s results for the purpose of minimizing researcher bias and to check the reliability of the coding process. The second peer review occurred later in the data analysis process with a second
peer review of the development and grouping of categories into themes in order to check the interpretations and enhance the accuracy of the reporting.

**Check for Researcher Effects**

One potential threat to the reliability of information was the potential for unintended researcher effects. For example, sometimes participants are impacted by what Butin (2010) describes as “response effect bias” where participants tend to tell the interviewer what they think the interviewer wants to hear. One step to minimize this threat was to create an interview guide that included neutral questions, which were open ended in nature. Furthermore, adhering to guidance by Seidman (2013), the researcher maintained awareness about possible effects of the researcher on the participant such as body language, tone, facial expressions, and verbal responses. Additionally, the following approaches suggested by Miles and Huberman (1994) were used to minimize other research effects on a site or participant: use unobtrusive measures, and do interviewing off-site to reduce potential threats when requested. The researcher also adhered to recommended actions by Miles and Huberman to reinforce the intentions of the study through clear communication of purpose, describing how information will be collected, and explaining what will be done with the information.

**Respondent Validation**

Member checking (Creswell, 2009) was employed as a means to validate the interpretation of responses. Member checking is when a researcher solicits feedback about the data and conclusions from the people who are being studied (Maxwell, 2005). In the study, at the conclusion of all of the data analysis, the researcher provided participants with a typed executive summary (approximately four pages long) of the findings via e-mail. The executive summary grouped the participants’ responses into tentative categories and themes and included
excerpts of participant quotes. The participants were encouraged to provide feedback on the accuracy, provide suggestions, and ask questions. This validation exercise provided the participants with opportunities to correct errors, volunteer additional information, summarize, or confirm the data (Lincoln & Guba, 1985). Only two of the participants provided minimal changes to information recorded and one participant shared additional information that they remembered after the interview.

**Triangulation of Data**

Another means for assuring credibility and trustworthiness was to triangulate the data. When triangulation of data is employed, the researcher collects data from multiple sources and uses various methods (Maxwell, 2005). Effective triangulation of data will help identify consistency in patterns of data across multiple sources, contributing to the credibility of the findings (Patton, 2015). As Miles and Huberman (1994) note “validity is enhanced when they are confirmed by more than one ‘instrument’ measuring the same thing” (p. 273). In this study, interview transcripts, analytic memos, reflective journals, document analysis, field notes, coding records, and constant comparison were used to help validate the data using multiple sources of data and various methods.

**Reflexivity**

One threat to the validity of the research is potential researcher bias or reflexivity, which is how the researcher affects and is affected by the research process (Merriam & Tisdell, 2016). Since the researcher was the primary research instrument in the study, it was important to identify potential subjectivity or bias brought to the study by the researcher prior to the research, with the purposes of minimizing its influence. For example, the researcher was once a school administrator who had led a one-to-one computing initiative in a previous school district and
may have preconceived notions about leadership strategies based on that experience. To minimize this threat, multiple reflexive activities were employed in the study such as informal reflective journaling, analytic memos, peer review, and interim summaries. These activities assisted the researcher in reflecting on personal thoughts and reactions during the data collection and analysis process, to help to minimize internal biases.

Another potential threat was that the researcher knew or previously had contact with many of the participants. As a former member of the state’s association for secondary school administrators, the researcher was a chair of a committee, and led many workshops with fellow secondary administrators. In fact, the researcher had previous contact through professional work with 8 of the 10 participants at some point in her career. Therefore, in order to minimize threats to the reliability of information provided by participants, while some participants were known to the researcher, guidance by Seidman (2013) was followed and participants who were interviewed were anyone the researcher supervises or was friends with outside of a professional setting. Furthermore, strict adherence to the interview protocol assisted with maintaining a safe, professional environment for the interviews and minimized researcher effects.

Limitations

The primary limitation to the study was a result of the purposeful sampling and limited number of participants. Since the participants were purposefully chosen, based on criterion such as school size, years within a one-to-one computing initiative, and time spent by the school administrators in that process, it limited the generalizability of the results. By using a limited sample of participants in Massachusetts, it also limited the breadth of information that could be collected about leading one-to-one computing from schools in other states. Additionally, the goal was to receive information from administrators in Massachusetts, but due to a lack of
alignment to the purposeful criteria, participants were drawn from all regions from Massachusetts, except for the Western region. Furthermore, by limiting the participants to the school administrators, it failed to incorporate a wider perspective on the leadership practices from other sources such as central office administrators, teachers, or students. However, for the purposes of the focused study, these limitations should not diminish the detailed descriptions received from the school administrator participants.

Protection of Human Subjects

Each participant signed an informed consent form, which will be stored in a locked file cabinet for three years after the completion of the study. These forms were also scanned and secured in a password-protected computer. The guidelines outlined by the Institutional Review Board were followed at all times; for example, participation was voluntary, participants could withdraw from the study at any point, participation was free of any researcher influence, data collected was monitored to ensure the safety of the participants, and risks to participants were minimized. The online research course on human subjects, offered by the NIH Office of Extramural Research was completed and the recruitment process and research took place after Institutional Review Board (IRB) approval was granted.

This study held minimal risk to the participating school administrators. However, ethical challenges were considered. For example, all of the relevant school administrators were interviewed at the research site. Typically, assistant principals or vice principals are evaluated by the principal at their school. Therefore, it was possible that concerns about the confidentiality of their statements might unduly influence their openness to respond. To minimize this risk, participants were reassured that their responses would be kept confidential and anonymous throughout the process, through both the consent form and at the interview. They also had an
opportunity to review an executive summary of the findings, which allowed for feedback on the accuracy of the researcher’s interpretation. Additionally, all identifiable information was removed from transcripts as soon as possible.

As a director of curriculum, who does not supervise or evaluate building administrators, and who has not been a school-based administrator now for three years, there are limited potential threats to validity in relation to the research problem. The potential benefits gained from this research study only included a richer understanding of the research problem of leading one-to-one computing strategies, and personal achievement of a degree conferral as a result of the doctoral thesis completion. Despite these potential benefits, the researcher’s focus throughout the research process was on the protection of the rights of the participants and ensuring their well-being in the process.

**Chapter Summary**

Using a qualitative approach, this study followed an interpretivist design to seek to understand the school leadership strategies used by high school administrators and their views on the leadership experience in a one-to-one computing setting. Using the general inductive analysis, the researcher searched for patterns of meaning that the participants had about leading one-to-one computing. Purposeful sampling was used to identify school administrator participants who had been present for all of the years of the one-to-one computing implementation at high schools and who were in the first four years of their implementation. This sampling method ensured that the administrators had the experience to answer the research questions for the study. Data collection derived from interviews, questionnaires, documents, and observations, and data analysis took the form of a general inductive approach. Data analysis also included data tracking through analytic memos and interim summaries and coding strategies used
included *in vivo* coding, descriptive coding, open coding, and constant comparison. Numerous methods were employed to ensure reliability and validity and the study adhered to all requirements for the protection of human subjects. This study sought to better understand the experience of leading a one-to-one computing initiative and has implications for school administrators who plan to undertake a one-to-one computing initiative in the future.
CHAPTER FOUR: RESEARCH FINDINGS

Purpose Statement and Research Questions

The purpose of this basic qualitative study was to identify and understand the leadership strategies used by Massachusetts high school administrators during the early implementation (first four years) of one-to-one computing.

Based on the conceptual framework and qualitative methodology of the study, the research questions that guided this study were as follows:

1. How do high school administrators describe their experience leading the implementation of one-to-one computing at their school?
2. What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing?

Reporting of the Findings and Analysis

Chapter four provides the findings and subsequent analysis of this qualitative study beginning with a description of the study’s participants and their contexts, followed by a presentation of the findings. Each research question section concludes with a summary of findings for that section. At the conclusion of the chapter, an overall chapter summary of the findings is provided.

Study Participants

Data collected in this study came from interviews of 10 participants, representing eight different schools in Massachusetts. All of the participants were either principals or assistant principals involved in leading a one-to-one computing initiative at their rural or suburban high schools. Additional data collection came from analysis of school documents and presentations, as well as observational tours of some of the school locations. The compilation of multiple data
sources added richer details about the context of the study as well as triangulation for better data analysis.

The criteria for sampling called for 8-10 participants, who were high school administrators (either principals or assistant principals), involved in leading the early implementation (first four years) of one-to-one computing in a Massachusetts high school (rural or suburban). The following participant profiles are organized based on the order in which participants were interviewed. Table 1 provides demographic information about the participants including gender, age, administrative position, number of years in the current position, school type, regional location, student enrollment, and number of full years as a one-to-one school. All of the participants have been assigned a pseudonym to protect confidentiality.

As part of the recruitment questionnaire, the participants responded to questions on leadership, such as, “Have you been a school leader for the entire time of the one-to-one implementation?” and “Are you one of the decision-makers for the implementation of the one-to-one initiative?” All of the participants identified themselves as active leaders and decision-makers in the implementation of one-to-one computing. An additional question included, “Do you feel that the one-to-one computing is a positive change for your school?” All of the participants responded that they felt that one-to-one computing was a positive change for their school.
Table 13

Participants’ Demographics

<table>
<thead>
<tr>
<th>Name</th>
<th>Sex</th>
<th>Age</th>
<th>Position</th>
<th># of years in position</th>
<th>School type</th>
<th>Location</th>
<th>Enrollment</th>
<th># of full years 1:1</th>
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<td>Suburban</td>
<td>Northern MA</td>
<td>630</td>
<td>3</td>
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<td>Central MA</td>
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<tr>
<td>Michael</td>
<td>M</td>
<td>30-39</td>
<td>Principal</td>
<td>6</td>
<td>Suburban/Rural</td>
<td>Central MA</td>
<td>596</td>
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<td>Suburban</td>
<td>Central MA</td>
<td>1115</td>
<td>4</td>
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Participant 1: Dave

Dave has been an assistant principal for 10 years. Two years were in a previous district. The last eight years have been as assistant principal in a suburban high school, grades 9-12, located in northern Massachusetts, with an enrollment of 630 students. When asked about what he liked best about being a school administrator, Dave did not hesitate, but answered quickly that he loved being in the midst of the students:

*I absolutely loved working with all kids. I’d tell you, at times, you needed to get into the positive realm…our Compass Program, which was really neat. It was our leadership*
program where I get to be more in the trenches with the kids...that was probably my favorite part.

The school has been one-to-one with Chromebooks/iPads for three full years. Initially they started the one-to-one computing with iPads, but then transitioned to Chromebooks because of factors such as device management and feedback from students and teachers. Dave was included in this study, because he was identified by his principal as being an instrumental leader of the one-to-one technology committee and bringing in one-to-one computing into the school. As a strong advocate for one-to-one computing, Dave described what he called a “pivotal moment” when the school committee questioned the move and he responded in favor of one-to-one with, “Why be satisfied with the status quo? There are proven outcomes here. Let’s make a leap.”

**Participant 2: Brian**

Brian has been a school administrator for 14 years, six years as assistant principal and eight as a principal, all in the same high school. The school is a suburban high school, grades 9-12, located in northern Massachusetts, with an enrollment of 630 students. Brian identified that what he most liked about being a high school administrator was keeping all the moving parts in the school working well together:

*I guess it’s just seeing how everything works. As a former coach, I guess it’s kind of the thrill of when everything works and all the parts are working, teachers are teaching, kids are learning and playing instruments and doing sports, just the whole feeling of the climate in the building when everything is going well. It’s kind of a cool place to be when it’s all working well.*
The school has been one-to-one with iPads and then Chromebooks for three years, with all students having Chromebooks at the time of the interview. Brian was the principal throughout that transition for the entire process and expressed that he was pleased that they had shifted to Chromebooks across the school as the core device. Throughout Brian’s interview, he kept coming back to what he referred to as his mantra regarding technology: “It’s an important tool in a toolbox. I don’t think it is the be-all and end-all.” He said he did not expect teachers to be using technology all the time, but to reach into their toolbox to use it as a tool when it will benefit student learning and allow for differentiated approaches to teaching.

**Participant 3: Paul**

Paul has been a school administrator for 18 years. Twelve of those years have been at the current school, six years as an assistant principal, and six in the current position of principal. This is a suburban high school, grades 9-12, located in central Massachusetts, with an enrollment of 1,783 students. Relationships were at the center of Paul’s leadership style, and the importance of building those relationships came up frequently in his interview:

*I guess part of what I like about being a high school administrator is the growth and development of seeing students grow from their freshman year all the way to their senior year, the intellectual development. I mean physical, emotional, social development, of course, but I think when you talk to a freshman when they arrive when they’re 14, and they graduate and they’re 18 and they’re going off, they’re so much more articulate. They’re so much more knowledgeable. Their intelligence has increased. Their brain activity is at the highest…it’s exponentially growing in terms of their capacity. They’re learning things. They’re applying things…Seeing the value of having families and students thank you for the work you’ve done with them, …I call it “fuel for the soul.”*
Paul’s school had just completed its first year as a one-to-one computing school with iPads. In this district, Paul noted that the implementation of one-to-one computing began with the fifth and sixth grade and then moved up through the grades, to a final full implementation in grades 9-12 at his school. He expressed the following keys to a successful one-to-one computing: “It’s about communications, it’s about relationships, it’s about transparency. That’s what it comes down to. You’ve got to develop really good relationships with constituents.”

Participant 4: Michael

Michael has been a school administrator for 13 years, six of which were in the role as principal of the current high school. He has spent his entire educational career at this high school, formerly as an English teacher and assistant principal, before becoming the principal. The school is a rural/suburban high school, grades 9-12, located in central Massachusetts with an enrollment of 596 students. Michael expressed great enthusiasm and energy in describing what he likes most about being a high school administrator:

*I like the connection to kids and the fact that every day is different, and every day is exciting. I like being part of a community of learning...where I get to learn either a new piece of curriculum or a new way to interact with people or something new to get excited about. When you’re working with high schoolers, there’s always a sense of idealism and hope and capacity, and to have a connection to 600 different students who manifest that in different ways is really exciting to me.*

Michael’s school just completed its second full-year as a one-to-one computing school with iPads, part of a larger-scale district initiative that began at the middle school (grades 5-8) and then expanded to the high school. Michael’s enjoyment about working with students also spilled over into his enthusiasm for leading one-to-one computing. Throughout his interview, he
expressed excitement about the potential of technology for students, but also the impact it has had on him as a leader:

*It is absolutely empowering. I feel like we’re at the very beginning of such tremendous change in teaching and learning and what it looks like. I feel our school is on the leading edge of that.*

**Participant 5: Jim**

Jim spent the last 20 years as a school administrator in four separate school districts, and four years in the role as principal at the current suburban high school, grades 9-12, located in northern Massachusetts, with an enrollment of 579 students. Jim communicated that what he most liked about being a school administrator was working with students and that every day and every year brings about new challenges.

*I like to see how kids and adults interact when education and instruction and curriculum all come together. It's fascinating. It's always different, and it's always changing. That intrigues me...You could do the same things to get ready for the year, but it’s going to be different from the last year. It keeps you on your toes, and you’re always moving, and days fly by, years fly by. It’s a fascinating job.*

Jim’s school just completed its first full-year of all grades being one-to-one with iPads. The school underwent a rolling implementation where they provided iPads to grades 9 and 10 first, and then added iPads to each grade 9 class subsequent year until they had all four grades with one-to-one computing. While Jim admitted that some of the initial planning for the transition occurred before he was in the school, he felt that he was brought in as a strong technology advocate himself to help lead the full transition to one-to-one computing in the school.
Throughout the interview, Jim kept returning to his vision for one-to-one computing:

*My vision for teaching and learning is wide open. Classrooms, five rows of five desks in a classroom; that doesn’t work for me. The world doesn’t work like that, so take advantage of every space you have...We try to create spaces to support that vision of, “Don’t get stuck in the classroom.”*

It was really important to Jim that he created an “open and trusting environment” where students and teachers could be “more mobile” and extend learning opportunities outside of the classroom. During a tour of the building, he presented areas in the building that included high-top tables, charging stations in hallways, projectors and whiteboards in the cafeteria; all of which were brought in to expand learning spaces in the building.

**Participant 6: Bill**

Bill was a school administrator for 12 years and in the position as principal for seven and a half years at the high school. At the time of the interview, he was in the first month of transitioning to a new role as a central office administrator in the same school district. The high school was a suburban school, located in the southern region of Massachusetts, grades 9-12, with an enrollment of 1,700 students. Bill remarked that he liked the balance of working with students and also managing change. He expressed this succinctly when he stated,

*“I would say working with students was always my top priority. Working with faculty, I like managing strategic change and I like the variety of things that would come across the desk and come into play at any moment.”*

Bill’s school has been one-to-one with Chromebooks for two full years, which coincided with a school building project where Bill acknowledged, *“We knew we would be heading into a one-to-one environment when we were designing our new school, and that we would open [the*
new building] with one-to-one. ” The school had invested heavily in a full transition to the
Google Apps for Education (GAFE) prior to going one-to-one, so Bill shared that, “the device
actually ended up just being simply a convenience on top of an existing platform.” Throughout
the interview, Bill mentioned how many other leaders and members of his team were
instrumental in the implementation of the one-to-one computing, often downplaying his own
role, sharing that it was a collaborative effort.

Participant 7: Nicole

Nicole has been a high school administrator for 13 years, the last three as principal, and
10 years as an assistant principal. The school was a suburban high school, grades 9-12, located
in eastern Massachusetts, with an enrollment of 830 students. When asked about what she liked
most about being a school administrator Nicole shared that she missed the personal connections
with students, but that the administrative role allowed for decisions to have a broader impact:

What I miss terribly is getting to know kids on a really personal level and feeling
connected to their learning. It's trading that personal connection with the greater good,
having the potential for influencing more kids. I love being able to think about as a
school institution, where are we headed, and how are we going to make that possible.

The school has been one-to-one with MacBooks for four full years. Nicole emphasized
that the school shifted to one-to-one computing in conjunction with a school building project,
noting that without the new building infrastructure, a one-to-one computing initiative could not
have taken place. In fact, Nicole believed that the building project “sped up some of the decision
making” to shift to a one-to-one computing model, rather than pursuing other options like Bring
Your Own Device (B.Y.O.D.) models. Throughout the interview, while Nicole discussed the
benefits of having one-to-one computing for her students, she conveyed that she also had a real
struggle at times. She lacked some technology skills and she also was “anti-technology” to some degree in her philosophy. Therefore, leading the initiative required a lot of “soul-searching” for her.

**Participant 8: Laura**

The eighth participant, Laura, has been a school administrator for six years, all in the same high school as an associate principal. Prior to this position, she was a math teacher in the same building for ten years, held the position as department chair, as well as having been a former graduate of the high school. The high school was a suburban/rural high school, grades 9-12, located in central Massachusetts, with an enrollment of 596 students. Laura shared that what she liked best about being a high school administrator was:

*I like the challenge of different problems every single day. Before I came into the role, I was told that I was going to be a problem solver. I would say that every single day is something different. It’s new challenges, new problems. It’s not a mundane position of every single day being the same thing over and over and over again. As a teacher, I hated teaching the same class twice. It drove me nuts, so to be able to do different things every day is probably the part I like the most.*

Laura’s school was in the beginning of its third year of one-to-one computing with iPads. It was part of a larger one-to-one model that also existed at the middle school for grades 5-8. Laura was included in the study because she was identified by her principal as being an instrumental co-leader with the principal in the implementation of one-to-one computing at the high school. Throughout the interview, Laura expressed that leading one-to-one computing has been “exciting.” and “fun,” but also a challenge because, “there’s a big commitment there as a
leader to learn all the new technologies and being able to model them. Use them enough to understand them, to then be able to model them before the faculty.”

**Participant 9: Tim**

Tim has been a school administrator at the same school for seven and a half years and of those, he has been a principal for five and a half years. The school was a suburban high school, grades 9-12, in the eastern region of Massachusetts, with an enrollment of 1,050 students. Tim expressed a strong connection with the community. He felt that his skillset in technology was a great match for the community’s goals:

*I like being an administrator, generally speaking, but I think I really love being an administrator here, in particular. With all the things about this community, dovetail with my interests and my strengths...I really do like the work. Every day’s really unique.*

Tim’s school’s transition to one-to-one computing began with a transition to the Google Suite of apps. Next, they purchased some laptop carts that were distributed throughout the building. After a few years, they decided to transition fully to a one-to-one school with Google Chromebooks. According to Tim, “Once the Google Chromebook came around, we ended up seeing that as our magic bullet for solving all these problems that we’d had that are problematic with carts.” At the time of the interview, the school had been one-to-one for four full years and was in the first month of its fifth year. Tim felt that the district had truly embraced technology and “we’re always finding some way to enhance what we do using technology,” which has made it “just a fun environment to be in as a kid, and as an adult.”

**Participant 10: Matt**

Matt has been in the position of principal for a total of four and a half years at a suburban high school, grades 9-12, located in central Massachusetts, with an enrollment of 1,115 students.
Prior to being principal, he held the role of assistant principal and interim principal in the same school. He began his educational career as a guidance counselor and noted that he has always like working with students on a day-to-day basis. When asked to describe what he liked most about being a high school administrator he shared,

*Every day is different as an administrator. Every day is challenging. It is not a job where you can sit back, and get bored with things. I think it is very engaging. It keeps you on your toes, which I really enjoy. There are so many opportunities that you can work with the kids...through student council or maybe it is through some discipline things, ...and get them to a place where you want them to be. I enjoy that aspect the most.*

The school has had one-to-one computing for four full years and at the time of the interview was entering its fifth year with laptop computers for all students, grades 9-12. Matt noted that at the initial implementation of the transition to laptops, his fellow assistant principal (now the Director of Technology) was the point person for the implementation. As principal, Matt became involved in the leadership and management of the program, although he noted that his leadership style was to tap other leaders and “to kind of distribute leadership.”

**Findings**

The findings for the study are summarized in Table 2 and are organized around the research questions. Seven themes have been identified to answer the research questions, with 17 sub themes. The findings have been divided into two sections, for each of the research questions, where summaries of the findings are described, along with specific quotes drawn directly from the participants. In each section, the subthemes or category titles are bolded in subsections, examples for each category are grouped and have bolded and italicized headings.
Table 14

*Summary of Findings*

1. **How do high school administrators describe their experience leading the implementation of one-to-one computing at their school?**

   - **The Goal was to Prepare Students for the World**
   - **The Implementation Process involved Strategic Planning, Communication, and Flexibility**

   **Change Dynamics Impacted Emotions, the Leader, and the School Environment**
   - Reactions to Change
   - Barriers to Change
   - Changing Leadership Role
   - Transformation of the School Environment

2. **What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing?**

   **Transformational Leadership Strategies**
   - Develop a Shared Vision
   - Model Technology Integration
   - Encourage Risk-Taking
   - Provide Individualized Support
   - Promote Cooperation

   **Transactional Leadership Strategies**
   - Offer Incentives and Rewards
   - Establish Expectations
   - Supervise and Monitor Use

   **Instructional Leadership Strategies**
   - Promote Professional Development
   - Employ Educator Evaluation System
   - Align Technology Integration to Curriculum, Instruction, Assessment

   **Distributed Leadership Strategies**
   - Share Leadership with Others
   - Use Collaborative Structures
The Experience of Leading a One-to-One Computing School

Three themes emerged to answer the first research question of how school administrators describe the experience of leading a one-to-one computing school: (a) The Goal was to Prepare Students for the World; (b) The Implementation Process Involved Strategic Planning, Communication, and Flexibility; and (c) Change Dynamics Impacted Emotions, the Leader, and the School Environment. These themes emerged primarily through an inductive data analysis process of the data to answer the first research question and to understand the depths of the school administrators’ experience. The following three sections further describe the experiences of the school administrators as one-to-one computing leaders and incorporate excerpts drawn from the interviews to further illustrate the emergent themes.

The Goal was to Prepare Students for the World

The first theme to emerge was The Goal was to Prepare Students for the World, which is defined as creating goals for one-to-one computing where students graduate more prepared for a digital world. The administrators began their descriptions of their leadership experience by identifying that they knew they had to make sense of why they were leading one-to-one computing and why it was important for their students. The data overwhelmingly exhibited that the school administrators believed that one-to-one computing would help better prepare their students in a post-secondary world. The purpose for one-to-one computing included characteristics such as preparing students for a changing world, providing 21st century skills to students, and assisting students to navigate the online world.

Many of the participants identified that they recognized that the world was shifting; therefore, the role of schools also needed to adapt and one-to-one computing was one approach to meeting new challenges. Eight participants made references to their goals as centered on
preparing students for the changing world or post-secondary education. Paul shared his awareness that the economics of employment must be addressed at the school level, so that students are prepared to compete locally and/or globally in a digital world:

*I think we realized the world’s changing…I think that we wanted to keep up with the times and prepare our students for post-secondary education…I think the why was more along the lines of, the whole game is changing around the economics around employment, the economics around school, how people navigated in that space, how they interact with each other.*

Matt similarly believed that one-to-one computing was essential because it was the world that our students are currently living in and schools need to stop putting up barriers to technology. Likewise, Brian explained that he and his leadership team encouraged teachers to recognize that technology was entering their school and it was important to meet students “where they were at” in terms of living in a digital world. The most common element of all of schools’ goals for one-to-one computing was the idea that it helped students to be prepared for a post-secondary education. Laura succinctly summed up this idea:

*The vision of the school is providing the kids the most relevant, authentic learning experiences and ensuring that they’re prepared for life beyond college. So, I think that, again, technology is just another tool that provides opportunities for our kids, connects them with resources, connects them with an audience beyond our school, and gives them the tools for collaboration.*

Many participants characterized the goals of preparing students for the world in terms of developing 21st century skills of collaboration, communication, creativity, critical thinking, and problem solving. The one-to-one computing initiatives were viewed as a catalyst for fostering a
wide range of 21\textsuperscript{st} century skills over time. For example, Laura felt that one-to-one computing, “starts to build all of our 21\textsuperscript{st} century skills that we have expectations that kids are achieving prior to leaving here.” Michael and Jim both indicated that the goals changed over the first few years, moving towards preparing students with 21\textsuperscript{st} century skills. For example, Jim described the goals in the beginning as focusing on helping students to be organized, but then shifted quickly to providing, “students with experiences, they’ll need, to develop skills of communication, collaboration, curation, and creation” and to also provide students with “authentic, meaningful learning experiences that prepare them for independence and success in the 21\textsuperscript{st} century.” Michael also portrayed the goals as a shifting process towards expanding 21\textsuperscript{st} century skills of creativity and critical thinking:

I think this is the natural arc of one-to-one in that you go from getting comfortable with hardware and software and seeing impact that being applied in the teacher’s practice, to now unleashing the potential for student product, creativity, and higher overall thinking in the classroom.

A few of the participants viewed the goals of one-to-one computing as a means to prepare students’ successful navigation of an online world. Matt and Paul specifically noted their schools had a strong emphasis on encouraging students to take online courses to better prepare them for a post-secondary world. For example, at Paul’s school, they surveyed alumni to determine the problems that students had when they went off to college, and one of the primary answers was that the students had difficulty navigating their courses in an online atmosphere. Therefore, as a result of this data, part of the one-to-one computing goals for Paul was to prepare students to work in an online world:
The more I talked to people including the United States Military recruiters, I found that a lot of the things that were happening, even in the military institutions were online. So, for me, it was kind of a no-brainer. We have to train our kids to live in this atmosphere of how to navigate education in an online world: how to access resources, how to post discussions, how to write appropriately, and how to respond appropriately.

After several interviews, it was evident that there was a need for students to work efficiently online as part of the goals for one-to-one computing. In fact, some participants made online courses a graduation requirement, while others looked for ways to increase opportunities for students to take online or blended learning courses. Some schools like Bill’s actually began with an online initiative prior to going one-to-one, where some online courses were created to “bring online learning into the school” in a gradual fashion, then grow to a full platform where all teachers used an online learning management system. Other schools looked at the one-to-one computing program as a means to facilitate future online opportunities that have not existed before for students. For example, Michael predicted,

*The development of a blended learning community is something that is just beginning for us, that we just took the initial steps with last year; but I think it’ll be a spring board for helping our teachers see how technology integration is going to impact instruction, assessment, and curriculum.*

Overall, the goal of introducing students to increased experience in online systems fit into the larger goals of providing them with 21st century skills and preparing them for post-secondary life. Matt further illuminated this point when he stated:

*We wanted to have our students be kind of competitive, so to speak, in the global market, and have them prepared for post-secondary education. We initially set a goal around*
having every student take at least one online course. We have a number of hybrid courses. Using technology in a variety of different ways is going to be part of these kids’ lives for as long as they live. So, we wanted to make sure that we equip them with those tools.

While the majority of the participants specified goals for one-to-one computing centered around preparing students for the world, a few expressed some individual goals for their students. Increasing teacher-student communications was part of Tim’s goals. For Nicole, the goal was expanding a diversity of thought amongst her student population. Additionally, opportunities to personalize learning was a priority for Michael, and Jim saw one-to-one computing as a method to provide equity of access for his students.

The Implementation Process Involved Strategic Planning, Communication, and Flexibility

The second theme to emerge was The Implementation Process Involved Strategic Planning, Communication, and Flexibility, which is defined as an implementation progression that took time to coordinate, involved engagement of stakeholders, and allowed for adaptation as needed. Once the school administrators identified why they were leading one-to-one computing, through their sense-making, they then described experiences of how they implemented one-to-one computing. They shared their experience from a systems approach on how they felt one should implement one-to-one computing successfully and what needs leaders would face. The participants all spoke about the various planning stages they experienced, as well as the need to communicate to and engage with many stakeholders throughout the implementation. The following section will outline the strategic planning, communication, and flexibility characteristics that emerged as part of the implementation process with representative quotes from participants.
Strategic planning. All of the participants relayed examples of various steps they felt were necessary and helpful in the planning processes for the one-to-one implementation. In their experiences, they believed that it was essential to have strategic plans for the beginning of the process. The two most dominant examples cited were visiting other one-to-one schools, (noted by 8 of the 10 participants) and piloting the devices prior to full implementation (noted by 7 of the 10 participants). Other strategic planning actions included seeking student input, inviting one-to-one schools to visit, and instituting a rolling implementation.

Pilots. More than half of the participants employed a pilot of the mobile device prior to one-to-one implementation. In some instances, the pilot was just with teachers, while in other cases it was with teachers and students. According to Tim, the pilot assisted greatly in a smooth transition for all, “We had done a pilot with a bunch of teachers with a whole bunch of Chromebooks, so by the time we handed a Chromebook to every kid, there wasn’t a lot of fanfare.” In other schools, the pilot was used to generate feedback to help prepare for a full implementation. For example, Jim had a cohort of about seven teachers and 30 students who piloted the iPads, “They were really the pioneers that also helped us to figure out issues with the network, …with the device, and … with the apps. It was really a good learning year.” Not all of the pilots were just with students. For example, some pilots were with teachers only to help with planning, such as in Matt’s school:

We took nine teachers. We kind of took them out of the regular PD that we did for the year. They got training on how to work with the laptops and things they could do throughout the course of the year...Kind of getting them prepared, which definitely set them up for success.
Many of the participants reported that the pilot was helpful because it tested the device, calmed nerves, and identified future needs.

**Site visits.** A common practice that most of the participants used as part of their preparation to become a one-to-one computing school was to research and visit other one-to-one computing schools. Overall, site visits were noted by participants as instrumental to their decision-making. For example, Dave strongly advocated, “I would say you got to get out there and see it. You can’t do it alone. Visit other schools. Elicit the support of [other] folks...All the schools we went to were super helpful.” Laura concurred that “visiting other schools was a key piece of that puzzle” to help teachers to understand the long-term plan for implementation.

When the participants visited other schools, they typically sent teams of teachers and administrators to search for best practices, and also to learn about how various devices worked in the different settings. Paul explained that he put together a team of 12 people to visit schools and determine what device would work best for his school, “We took a really deep dive in investigating one-to-one initiatives...We visited an iPad school...Maybe a couple of Chromebook schools and a couple of iPad schools.” He found that after the team visited one iPad school, in particular, the team returned and determined that iPads was the best path for them. Likewise, Dave indicated that their planning committee, upon returning from site visits, determined that having a student help desk would be an essential step to successful implementation. Some of the districts included students on their site visits as well to engage them in the process. Michael described the student input as integral to the implementation process, because students offered them a different perspective:

*One of the ways we approached that was by connecting directly with other schools that had gone one-to-one, specifically with iPads and bringing students along when we made*
visits to those schools, so they were part of the process. They were asking questions; they were helping us to identify questions that we hadn’t thought of yet.

**Student input.** Providing opportunities for students to give input into the implementation process emerged as a strategy shared by half of the participants. While some of the student input came during the planning stages, such as in visiting sites, some participants elicited student input in a more formalized structure. For example, Paul created a Tech Advisory Group (TAG Team), with whom he met every couple of weeks, and he asked students to share with him how the technology integration was working for them in their classes. Other formalized ways to solicit student input included surveying the students. According to Nicole, students “take a survey at the end of every year around their experiences with the technology here...then the technology committee analyzes and then reports back to the faculty.” Rather than use surveys, Jim shared that he continuously sought student input on a more informal basis, often by being visible throughout the building. Eventually the informal feedback filtered back to their building technology committee and often impacted decision-making. Jim detailed this process as follows:

That group tends to get the complaints, they’ll field...the complaints from there. The helpdesk kids will field the complaints from the kids. They funnel back to that group, and then we can sit and say, “All right, this isn’t working,” or, “This has got to change.”

**Bringing one-to-one schools in.** Both administrators from the same school, Michael and Laura, detailed one step in their planning process that was unique to their school alone of bringing other schools and students into their school to talk about one-to-one computing. They both conveyed that this was a significant step in their process because they could only bring a few students to see other schools on site visits, so they worked out an opportunity for
representatives to come to meet with all of their students. Michael summarized what took place on this visitation day:

_We also brought schools into our school in order to meet with our kids. We held a one-to-one learning fair where, along with the associate principal, we held an assembly where we talked about the vision for one-to-one, kept it at sort of a high level, answered some questions, and then the highlight of that event was sending them off into a common area where we had three other schools represented who brought kids with them to talk to our kids about one-to-one and the impact it made in their life and learning._

Michael believed bringing students from other schools to meet with his students was advantageous because the feedback about one-to-one computing was from peers, rather than only from adults.

**Rolling implementation.** A number of the schools implemented their one-to-one computing at the high school after their middle schools in a rolling implementation model, as was the case for Paul, Michael, and Laura. This was described by Paul, _“We kind of waterfalled the technology initiative up, starting at grades five-six when the building opened. Then we implemented at grade seven. Then we implemented in grade eight, and then last year we implemented in grades nine through twelve.”_

In other instances, the implementation of one-to-one computing was connected to either funds or timing of a new school building project, as was the case for Nicole and Bill. According to Nicole, although building project funds were not used for purchasing the devices, the successful implementation would not have been feasible without the new building infrastructure to support the increased Wi-Fi needs. Nicole elaborated, _“I think all along the fact that the building process was moving along and was incorporating all the latest bells and whistles, that_
also made the one-to-one implementation process possible. It sped up some of the decision-making.”

Some of the districts implemented the devices in one or two grades at a time over several years, as was the case for Jim, Matt, Dave, and Brian. Although the gradual implementation was helpful from a financial standpoint, it did bring with it some internal concerns from an equity standpoint because some grade levels had the devices, and others did not during this transition. Jim described the scenario that the underclassmen had received the iPads, but the upperclassmen did not and could use their own devices, so the upperclassmen,

*teased the younger kids a little bit and said, “You’ve got to use the iPads.” Once you graduate those kids out, then it becomes more of an everyday thing. I think that’s what we had to get through, those first couple of years.*

Matt shared a similar story, but from the underclassman’s perspective, where the underclassmen had the devices and used to chant, “*We have laptops!*” to the other grade levels at rallies.

When Michael’s district started planning for implementation, they discussed the possibility of a rolling implementation due to financial constraints, but in retrospect he shared that he was pleased with the district’s decision to support full implementation:

*The superintendent certainly played an important role in this in that just before we went one-to-one at the high school, there was discussion about maybe just going the 9th grade alone, that it was more practical from a financial standpoint and other districts had done that. He really listened to us when we expressed the need go 9 to 12 in one shot. He provided the funding necessary in order to get the Wi-Fi where it needed to be, in order to provide the projectors and the Apple TVs. If we did not have the infrastructure in place, we would have failed very quickly.*
Robust Infrastructure. Having a strong network and infrastructure was a common need emphasized by some of the participants. For example, Bill indicated, “I would advise them to start slow, to look at their infrastructure.” Likewise, Nicole shared that the successes of their program would not have been possible without the newly built school’s network capacity and Wi-Fi access points. Jim acknowledged,

Robustness of the infrastructure is super important. The easiest way to lose the development of a one-to-one program is to have people say, “I can’t get on the network. I can’t access this.” Or too much blocking, or something like that, so robust network.

Michael commented that the district’s financial support to upgrade the network bandwidth and ensuring all rooms have Apple TV’s and projectors was a significant step to ensure successful implementation starting on day one. Similarly, Paul indicated that in his school’s planning they were methodical about how they designed their back-end infrastructure to be prepared for all the devices.

Communication with all stakeholders. All of the participants mentioned the importance of communicating effectively with stakeholders as an essential part of the implementation process. While the most common communication approach was a presentation to the School Committee for budgetary approval, the participants also used a variety of methods to further communicate to parents, teachers, and students about their goals.

Parent and community communication. Communication to the community occurred through information forums, school council, school webpages, social media, automated messages, and community technology nights. Parent or community informational forums were the predominant method for messaging to the community for half of the participants. For example, Brian recounted that they had,
 informational nights or sessions that parents could come in and ask about it or we would talk to them about what we’re going to do, especially when it came to the implementation of how we’re going to get this out to you, here’s what you need to do.

Additionally, Paul indicated that during the decision-making process, he had night meetings where parents could come in and look at iPad cases, Bluetooth keyboards, and the devices to provide feedback. Then he shared that feedback later in his presentations to the school committee. Moreover, at Jim’s school, the parent information night presentations exhibited a similar focus on: (a) how their device (the iPad) would be used as a learning tool; (b) the implementation plans; and (c) required forms and processes. Many participants also reported that they engaged a few parents who were part of their monthly school council meetings to provide ongoing suggestions on the implementation planning and process.

In addition to informational meetings, a number of the participants created a one-to-one webpage, especially initially, where important information about the one-to-one computing implementation was listed, along with frequently asked questions for community members to access information. Brian reported “there was a lot of stuff that we put on our website, explaining why one-to-one. It was almost the FAQs kind of thing that we had put out.” Some participants also used the webpage as a venue to post presentations given to school committee or at the information nights about one-to-one computing. Others, like Bill, used the webpage to communicate policies and sign-offs: “Students had to go online with their parents beforehand and actually sign off on all of our policies saying they knew that they were responsible for the Chromebook.”

Beyond school webpages, social media venues like Twitter, Facebook, and principal blogs were a vehicle for communication that was evident for some of the schools. These social
media tools were employed to highlight successes with technology in the classroom, to communicate details about upcoming events, or to convey information. Tim expressed the importance he placed on social media:

I’m constantly trying to use our social media to communicate a message about critical information, or logistical, or important information, but also to shape a message and to try and uphold what’s going well and champion kids who are doing things we want them to do.

In addition to social media, a couple of the participants noted that they used other traditional means of communicating out to parents through newsletters, automated phone calls, or e-mails.

Only one school actively brought in parents, media, and community members to see the impact of technology on teaching and learning. Both Laura and Michael emphasized that their school district had a Community iFair that was hosted annually at the high school to “highlight some of the technology integration successes in the district.” At the event, teachers and students from across the district set up booths, displays, and mini-workshops where community members could come and learn more about technology application in the classrooms.

Teacher communication. In addition to communicating externally to parents, school committee members, and community members, some of the participants placed a high priority on keeping faculty and staff members informed throughout the implementation process. In some instances, teachers were at the center of the discussions. A prime example mentioned by Nicole was that “there was a lot of thoughtful dialogue among the staff” around the implementation of one-to-one computing at her school. Michael also shared that teachers were brought into the conversation from the beginning to provide insight into how one-to-one computing aligns to their school goals. Paul encapsulated the importance of engaging teacher stakeholders in the process
when he was asked what advice he would give a colleague about to embark on one-to-one implementation:

It’s relationships and transparent communications. It’s about developing really good relationships, but also communicating the heck out of it. Continue to stay on message. Be really focused about what the end game is. Provide them [teachers] the opportunity to provide feedback on the how.

Conversely, Dave expressed some regret that he did not communicate as frequently as he would have liked during the implementation process,

One thing that I felt that I could’ve done a better job of, is probably communicating more frequently with staff throughout the process…I think it’s one of those, where faculty wants to be in the loop as much as possible along the way.

Student communication. Students were the third group of stakeholders who were a communication priority. One purpose of communication with students was to help to create buy-in. Paul described that he spent the summer prior to full implementation writing individual letters to each of the student grade levels. For example, he wrote a letter to Seniors entitled “Leadership Legacy and Change,” which was a letter explaining the process for implementation and emphasized the importance of the seniors’ becoming role models with technology use. Paul described how the communications were key to creating buy-in:

To a certain extent, it’s like selling everything. In this position, you go to sell a lot of stuff. I’m selling the notion of this idea and convincing people it’s a solid idea, ...it’s going to benefit them, ...and it’s not going to impact their education negatively or their standing in getting into college or university.
Other participants mentioned that they kept their students updated throughout the implementation process via newsletters or student assemblies.

**Flexibility.** When the participants were asked what piece of advice they would give to others interested in leading a one-to-one computing initiative, a few of them mentioned a similar idea of taking it slow and being flexible throughout the process, noting that implementation takes time, and new needs will appear during the planning.

**Flexible process and adaptation.** Brian strongly believed in the importance of being flexible with the implementation process and to allow for things to evolve, rather than having a pre-conceived notion of what it might look like. His advice to others was:

> For us, and I think it helped us, it’s just a super fluid process, so you need to be very flexible with it. I certainly had ideas of what I wanted to see happen, but I wasn’t so regimented, “this has to happen,” kind of thing. It was a more a matter of, “Hey, let’s give this a shot and see what happens.” It was more of an exploratory kind of thing.

Furthermore, he felt that it was important to convey the message of being flexible with the process with his teachers. Instead of over-planning, he thought it was better to try things out, get feedback, then make changes throughout the process. Brian illustrated this thought, “I hate those people that over plan it. You spend three years planning on the thing, and then it doesn’t work anyway. In those three years, you could have been trying it.” Likewise, Bill had similar feelings about being flexible:

> I think the advice would be...there are going to be issues. Like, take a deep breath every once in a while, and realize, “Oh, this is not going as well as I thought it was going to go.” It is not going to be perfect. It is going to take time.
Additional personnel. As part of the flexible implementation process, some of the participants indicated that they ended up adding new personnel to help meet the growing needs of the one-to-one computing program. These additional staff were either technical support, technical integration specialists, or director of technology integration positions. For example, Bill shared that they needed to add a new position to support technology training and support for their teachers. Even in Nicole’s school, they found they had to hire additional technical support staff, however, “it has not kept pace with the needs.” Dave also mentioned how they hired additional staff into their technology department to assist them in their work:

At the time, we only had one full-time and one part-time, and since then we’ve added another full-time and another part-time, I believe. We’ve bolstered our tech support staff. We knew that the only way this is going to work is we need a tech integration specialist. We hired one at the time. Since then we’ve hired, we now have two.

Change Dynamics Impacted Emotions, the Leader, and the School Environment

The third theme to emerge was Change Dynamics Impacted Emotions, the Leader, and the School Environment, which encompasses the changes, both in emotions and practices, that occurred during the one-to-one computing implementation. It was evident in the data collected that a number of change dynamics transpired during the early implementation of one-to-one computing, which created reactions to the change from stakeholders and leaders, including resistance. The change dynamics also brought about positive transformative changes in the school and classrooms. The following section will outline the reactions, barriers, and changes that the participants identified took place in their experience of leading one-to-one computing.

Reactions to change. All of the participants in the study reported a wide range of responses to the changes that came with one-to-one computing, such as fear, nervousness,
uncertainty, intimidation, concern, and feeling overwhelmed. Laura summed this up eloquently when she outlined that these feelings came from multiple avenues such as lack of skills, comfort level, or being on a learning curve:

*I think one of the challenges is the...learning curve. Part of it is teachers’ feelings and students’ feelings about technology. There is a lot of concern about putting a device in every student’s hands. All the way from, “are they going to break the device, or are they going to be playing games in my class” to “how am I going to change everything I do to integrate technology?” I would say I don’t know if it is nerves. I don’t know if it’s resistance to change. Obviously, teachers comfort level with technology plays in. You have teachers that are very tech savvy. You have other teachers that don’t use technology on a regular basis, so there’s a huge learning curve there.*

**Fear and nervousness.** A common reaction of teachers that many participants identified was fear. Laura reported, “*I think that’s always a fear for the teacher. ‘The kids’ are going to know more than I know.’*” Likewise, Matt described it as “fear of the unknown.” Bill offered similar responses that the some of his teachers struggled with the change: “*They were traditionalist teachers, ‘I’m in charge,’ and kind of, ‘I don’t want to have to say I don’t know everything about everything at this point,’ so it’s a little unnerving to people in that respect.*” Michael further elaborated that because the educator evaluation system was relatively new, coinciding with the one-to-one implementation, it amplified teachers’ nervousness.

Part of the fear, also came from the changes occurring in the classroom as a result of the introduction of one-to-one computing. Laura illustrated this idea when she said, “*there [are] a lot of changes in what’s happening in the classroom, as far as the role of the student and the role of the teacher. I think that made the teachers a little nervous.*” Paul agreed that some of the
reactions resulted from significant change forces: “Teachers presented a significant challenge as well, because we were changing a lot of things. We gave them iPads, we gave them laptops, but we changed a lot of things on them.”

**Resistance.** In some cases, the reactions of teachers appeared in the form of resistance. Brian indicated,

> We had some resistant staff members. Some were resistors for different reasons. [For] some it was just a discomfort with technology. [For] others it was just [that] there were certain people who were just steadfast that technology was not the answer, and [they] were not willing to adapt or change.

Brian, who described them as “I love the feel of a good book people,” who had difficulty buying into the need to shift to one-to-one technology. Matt viewed these teachers as one of the larger barriers to implementation and that it was importance to help them understand the value of the device:

> I would say the biggest barrier is getting that kind of...whatever percentages at your school that is not buying in and hopefully they are not the loud people at your school, but they can be, is getting them to see the value of using the computer. I think that there are some people that never will. So, those are barriers.

Teachers were not the only stakeholders with a strong reaction to the change. Some of the participants reported that student resistance occurred initially, particularly at the upperclassmen levels. Laura shared, “I would say it was probably close to 50% of kids feeling like they were probably doing things the old way and not looking for a change.” In the beginning, both Michael and Jim assumed that the students would be on board with the shift to one-to-one computing. Jim identified that “we made the assumption that the students would
jump right onboard, and they were some of the pushback, initially. They fought through it with us.” Michael also was surprised by the student resistance that they initially faced, “The most surprising barrier for me was that the kids were not 100% excited to go one-to-one...It was especially our older students who were resistant to the idea of one-to-one learning.” He further explained that the students referred to themselves as “pencil and paper learners” and “that they had done it this way for a long time and now we were asking them to completely change the way they handled their learning.”

Parents were another group that in a few of the schools the school administrators had to work to overcome some initial resistance or concerns. Jim described a moment that happened at one of his parent meetings:

We spent tons of time with the parents. I’ll never forget, a guy, one of the parents stood up in the middle of the meeting and said...Pointed right to me and the assistant principal and he said, “You guys better be right.” Then we were like, “Okay, Thanks.” There were definitely some push backs from all avenues, parents, students, and teachers.

Paul also noted that parents had concerns about such a change occurring at the high school level, “You’re going to experiment with my kids around this, and they’re trying to get into college? Are you kidding me? What’s going to happen with their SAT scores?”

Only one of the participants, Tim, shared that there was little to no resistance from all stakeholders because, “It wasn’t a huge shift. A shift already was happening, and so the hardware just cemented where it was setting, and everybody understood the writing was on the wall that we were heading in that direction anyhow.”

**Barriers to implementation.** Since the implementation process was new to all of these schools, in some cases, the participants stated that they had to adapt to new and unanticipated
challenges as they arose. It took time to work through internal procedures and protocols that were being used for the first time. Bill described the process of constantly adapting processes during implementation as “building a plane while you’re flying it.”

**Weak infrastructure.** For Brian, unanticipated challenges they had to work through in the beginning year of implementation related to problems with the infrastructure:

*The wireless wasn’t working the way we thought or hoped it would. We did a lot of revamping...consistent connectivity would probably be the biggest barrier to start with because you had people who are eager and they move all their stuff over, were ready to go and then it wasn’t working. They were so frustrated.*

Nicole indicated that the infrastructure was not the core issue, because it was a new school, instead the management and maintenance of the devices was a larger hurdle to overcome, “*the screens are going to crack or the space button’s going to stop working,*” which require time and technical support.

**Financial costs.** Another challenge identified by a couple of participants was financial in nature. Dave summarized the financial needs as, “*we needed additional staffing and money for staffing*” to fully support implementation. Bill described the difficulty of creating a financially sustainable program, especially when dealing with potential cost issues like lost or broken devices, “*I think dealing with lost and damaged Chromebooks coming in was kind of a learning curve for us as well, because we didn’t really know how many we should anticipate.*” Laura also reported that the initial financial planning for the one-to-one implementation brought with it challenges for parents and students, because it originally began as a “*bring-your-own device or lease-to-own school, and I think it caused a lot of stress at the beginning of the programming.*”
**Student distraction.** Another barrier to implementation that some of the participants identified was an ongoing challenge was with classroom management and student distraction with the devices. Half of the participants mentioned this as a concern that came up and had to be worked through. For example, Matt also shared “I think we still run into, ‘The kids are on the laptop doing something else when they should be doing...’ it is a distraction.” According to Bill, there were issues that they had with students using Twitter for non-educational uses as well when “kids were streaming music all day on their Chromebooks, so now you’re killing your network bandwidth with streaming.” For Nicole, she articulated a deep concern about keeping students safe online both at school and at home:

> How do you really instill in the kids this is a learning tool? It’s not for social media purposes. It’s not for social connectedness. It’s not for wasting your time in study hall watching Mad Men. It’s for learning.... As a leader, giving the kids the means to make bad decisions at any one moment of the day has required a lot of soul searching and a lot of discussions about preempting some of that behavior about keeping kids educated about the dangers of social media.

**Changing leadership.** When the participants were asked if the one-to-one computing impacted their roles as leaders, all of them initially reacted that it had no change, minimal change, or that their core leadership practices stayed the same. However, with further inquiry, some of them noted that one-to-one computing allowed them to lead their schools differently than before. For example, a couple of participants, Dave and Jim, identified that one-to-one computing allowed them to be more mobile, active, and visible as leaders, where they could leave their office and be out in the hallways and classrooms more frequently. For others, one-to-
one computing forced them to stay current with technology to stay a bit ahead of their staff, so they can support them in their classroom implementation.

According to Laura, one way that technology has changed her leadership is that it increased efficiencies, “It’s made me more efficient in the work that I do” and improved data collection, “It’s bringing people’s ideas to life, I would say, more. You’re able to collect data and use that data as far as teachers having devices in their hands.” Bill identified almost identical positive changes that Laura shared such as:

*It made it easier and more efficient with people. I guess it made it easier because we did a lot more during faculty meetings with collaborative documents. It was much easier to get feedback from teachers, because we could send out a quick survey, get information back from them.*

Tim and Jim both shared that the one-to-one computing was in complete alignment with their current beliefs about technology. For Jim, he said he was brought into the role as principal to help lead the initiative: “I’m a tech guy, and that is one of the reasons I was brought in here, because that was my background: technology.” Similarly, Tim indicated,

*I really enjoy technology. I really enjoy how it can expand all kinds of areas of education. The expansion of one-to-one has just been in my wheelhouse for what I enjoy and the things I like to do and how I like to communicate.*

It was Michael and Laura, both from the same school, who voiced the most enthusiasm for their changing roles as a result of one-to-one computing. Michael expressed, “In some ways I feel like I’m an ambassador for one-to-one, in talking with people and with other educational leaders” and Laura portrayed it as follows, “It’s really exciting. It’s been a neat process to be part of...Leading it has been fun.”
Not all of the school administrators were initially eager to lead the one-to-one computing. In fact, Michael went through a significant change in his perspective from how he felt prior to implementation, to how he felt now as an ambassador of one-to-one. He described his initial thoughts about the change as follows:

*It was kind of a dark cloud on the horizon. It was this big change that was coming to my school that people knew was coming, but didn’t really know how to handle it and I was in the position of leading this change, so it was a little overwhelming and scary more than it was exciting at the offset.*

One participant, Nicole, expressed that the one-to-one computing initiative was a real struggle for her as a leader, because her own values and skills were not in concert with the one-to-one program:

*I’m not the most technologically savvy person. I’m anti-technology in some ways, and so yes, it’s changed things in that I’m deliberately thinking about ways to support the teachers who don’t necessarily share those values, who are gung ho about using technology in the classroom, which is awesome. I can’t actually talk their language at all, but I can support their work...It’s turned me into a learner, which is great.*

**Transformed the school environment.** Despite the various barriers and reactions to change that the various participants had to overcome, more than half of the participants recounted that they experienced a transformed school environment as a result of the one-to-one computing implementation. Dave, Laura, and Jim all stated that it, “*transformed*” or “*changed*” their school drastically:

1.) “*It’s transformed what we do.*” (Dave)
2.) “I don’t think I’ve ever seen the amount of change that has taken place in 2 years over the entire course of my 16 years in education...Our teachers are rethinking about every single thing that they’re doing.” (Laura)

3.) “We’ve come a long way in a short period of time. If you come into our classrooms and see...You don’t even have to come to classrooms, because kids are all in the building now. The building’s transformed...I think it’s important for people to know how much it changed the environment, the teaching and learning environment. It has nothing to do with apps. It’s just that mobility, to give people opportunity to go anywhere, anytime, that’s not normal in school.” (Jim)

Change in teaching and learning. Michael, Laura, Matt, and Paul all provided details of how teaching and learning has changed significantly as a result of the one-to-one programming. Matt described a changing dynamic in the classroom where teachers and students are shifting roles:

Now you walk in, and sometimes you don’t even know where the teacher is, because they are sitting in a group or they are letting the students run the lesson or a student is at the front of the class.

Laura noted the changes she had seen in classrooms include assessments, engagement, and creativity, but the most powerful change is how teachers are approaching the technology, “I would say the greatest impact is the fact that they’re being reflective about all of their practices across the board and asking themselves, ‘how can technology impact this aspect of teaching and learning?’” Paul agreed that instruction had “fundamentally changed” as a result of going one-to-one. Michael expounded on the changes he was seeing in the classroom:
I see the capacity of technology to really enhance kids’ abilities to find what they’re passionate about and who learning in new ways that are exciting and creative. It’s expanded their capacity, it’s amplified their voice, it’s allowed them to connect with people beyond our school community, and it’s just getting started.

**Embedded change.** In some of the schools, the participants described the change as one that was embedded fully into their school environment, even to the point where they could not imagine going back to what school was like prior to being one-to-one. In one school, who has been one-to-one for many years, the students view the devices as an expected part of their experience. For example, after four years of implementation, Tim summarized the change as follows:

*It’s a little bit like they don’t know high school without it, so we, as adults, feel like it’s a little bit novel, but I think our kids look at the Chromebooks as being the refrigerator in their home. They don’t walk by it and think, “Thank goodness that’s keeping my food cold.” It’s their everyday reality. Their entire high school experience has been this thing.*

In a very similar fashion, Bill discussed in-depth how one-to-one computing was so deeply embedded in their culture; they could not imagine how school functioned prior:

*I think we probably got to a point where I can’t really envision how our school would function if we didn’t have a one-to-one environment. I talked with our faculty at length over the last year about that, and almost to every person I talked to, no one could imagine what it would be like if we had to go back into our old building, and try and function even for a day. The world would literally stop running to a halt.*
Section Summary

This section provided an overview of the themes that emerged to answer the first research question about how school administrators describe their experience in leading the early implementation of one-to-one computing. The three themes outlined included (a) The Goal was to Prepare Students for the World; (b) The Implementation Process Involved Strategic Planning, Communication, and Flexibility; and (c) Change Dynamics Impacted Emotions, the Leader, and the School Environment. A common goal of preparing students to be successful in a post-secondary and online world, using various 21st century skills was reported by all the participants. Participants mentioned successful facets of their implementation like pilots, getting input, and visiting other sites. They also felt that engagement of all stakeholders was an essential implementation step. Since implementation of one-to-one computing was a complex change, the school leaders emphasized the need for flexibility, as the change will bring about various reactions from stakeholders, including resistance. However, despite the challenges, they all overwhelmingly shared that the changes were positive for teaching, learning, and in some cases transformed the school environment.

Leadership Strategies used in a One-to-One School

Four themes were identified to answer the second research question regarding the nature of leadership strategies high school administrators describe using in the early implementation of one-to-one computing. Using the conceptual framework as guidance, a deductive approach was used at the end of the data analysis to organize the leadership strategies that emerged into the following four themes: (a) Transformational Leadership Strategies; (b) Transactional Leadership Strategies; (c) Instructional Leadership Strategies; and (d) Distributed Leadership Strategies. The following four thematic sections detail the leadership strategies the school administrators
used during the one-to-one computing implementation and include excerpts drawn from the interviews to provide rich descriptions of their experience.

**Transformational Leadership Strategies**

The first theme to emerge was Transformational Leadership Strategies, aligned to transformational leadership theory, whereby leaders use approaches to increase an organization’s capacity to innovate and to inspire commitment by teachers. The data revealed strong indications that transformational leadership strategies were the most predominant method of leadership used by the participants during the one-to-one implementation. The five subthemes that emerged included: (a) developing a shared vision; (b) modeling technology integration; (c) encouraging risk-taking; (d) providing individualized support; and (e) promoting cooperation. Therefore, this section includes the five subthemes that will further illustrate the depth to which the participants explored transformational leadership tendencies.

**Develop a shared vision.** It was at Laura and Michael’s school, where the most strategic steps took place in the development of the shared vision. Michael’s uppermost piece of advice was, “I would advise them not to skip the visioning step.” Jim concurred and emphasized that no matter the vision, it must be a well-developed shared vision to bring success:

*The first thing I would say is know why you want to do it. Why do you want to do it? Because that’s what everybody’s going to ask you, and you’ve got to have a good answer. You can’t just say, “Well, because [School A] is doing it, or [School B] is doing it.” You have to really have a well thought out answer before you take a step.*

The first step in the visioning involved the purposeful involvement of many stakeholders to craft a shared vision for one-to-one learning. Laura spoke about bringing ideas from other schools, parents, teachers, and students, made a significant difference in creating a shared vision:
“I think the visioning process was critical in helping teachers understand why we were putting devices in student’s hands and for the students as well to understand that.” Paul identified that in his district, “the person who did the vision and articulated the vision was probably the assistant superintendent.” However, the means for implementing the vision came from the building level. However, Paul believed strongly that the vision development should involve ongoing feedback from stakeholders, “We articulated the vision of what we wanted to do, and then we put it out for everybody and for feedback.”

Second, aligning that vision to their current beliefs about teaching and learning was a significant step to a successful vision development mentioned by a few of the participants. For example, Laura described this alignment process as follows:

That’s where we sat down with parents. We sat down with kids. We sat down with teachers and talked about our core values and who we were, and then how was technology going to fit into that puzzle, that it wasn’t just an add-on. It was a tool that was going to allow us to bring that vision to life and allow the kids to start living different pieces of that vision that weren’t possible before to a different level we hadn’t seen before.

While alignment to the school’s core values and beliefs was the most common approach mentioned by participants, Tim felt that schools should look at developing the vision around the question: “What needs in their building does the technology solve?”

The third step in the process involved creating a vision statement that could be remembered and communicated easily. Laura shared that they wanted to create a vision in the form of a tagline so it was something “that was catchy, that people could remember.” Similarly, Michael described these directions he gave for vision development:
We came to a meeting with kids and teachers who participated in the visioning process and our only requirement was that we were hoping to have verbs. We didn’t want to have something that was a long, drawn out mission that people would have to memorize. We wanted it to be something people would remember.

The fourth step was when Michael and Laura used a digital process to engage the stakeholders through use of a Google document, which included the school’s beliefs about teaching and learning. Then the stakeholders met and shared digitally and through conversations how those beliefs aligned best with the one-to-one computing. Michael felt that embedding technology into the process was essential: “We used a digital process for that, which I felt was really important. I think if you’re going to talk about technology integration, you should be using technology tools in order to begin that process of visioning.”

The final recommendation for developing a shared vision was to convey that the vision was more than a passing initiative, but rather would become embedded in supporting teaching and learning. Michael was adamant about the importance of dropping the word “initiative” from the conversation, “This shouldn’t be an initiative. We dropped that term initiative from one-to-one learning very, very early because we felt like it had a connotation of something that’s here today and gone tomorrow.”

**Model technology integration.** A transformational leadership strategy that half of the participants described using was the modeling of technology integration. Many of the participants identified modeling as an essential strategy for furthering their one-to-one computing goals. Tim succinctly stated that, “I think it’s important to model that if you’re a one-to-one school. The principal should be strong with their ability to use technology.” Laura felt that it was important “to model the things you’re expecting of your teachers.” Jim similarly
believed that in order to support the staff’s transition, the school administration has to be able to lead them through modeling:

*They have to be willing to lead the way, model. I find it fascinating when I’ve gone to a couple of schools that are one-to-one, and the administrators don’t use the devices.*

*That’s fascinating to me. What kind of conversations can you have with your teaching staff, when the teacher says, “I want to use it, but I don’t know how?” I better be able to say, “Here [are] 10 ways you can use it in your classroom.”*

Participants reported that they modeled technology in many different ways, including at meetings, sharing of information, and through social media. Six of the participants used faculty meetings as an avenue to model technology. In fact, Jim explained that technology allowed him to reduce the number of meetings, because he shared the information through Google Classroom, which often meant either a reduction of meeting time, or that meetings could be used for other purposes. For Michael, faculty meetings were used purposefully to model technology for staff:

*Faculty meetings are a way for me to really model tech integration, so rather than post an agenda in a traditional format, I share a blog post that has all the resources for our meeting at the beginning of the faculty meeting...We model new tools and ways they can use technology. The modeling has been really important in helping teachers to see technology as a user, rather than as a person who is just facilitating the use of technology.*

Laura confirmed that faculty meetings were useful for modeling best practices in technology. She was proud of the fact that, “we’ve worked with best practices at a faculty meeting” to show teachers different tools that they can embed into their practice. Additionally, Brian testified that he used technology at faculty meetings and he was “trying to use it at a faculty meeting, kind of
role model some of that stuff,” but he also tried to model it for other stakeholders as well at “open house, faculty meetings, department meetings, and leadership team meetings.” On a personal level, Brian loved the shift he went through from once using only paper at meetings to embedding technology in a professional way:

I didn’t feel like the bumbling professor flipping pages on my yellow pad of paper, I felt a little more professional. I guess the idea of this should be the feeling we get is that we’re comfortable, we’re professional, we’re technologically savvy, and we can use it appropriately.

In addition to faculty meetings, some of the participants noted that modeling technology helped to increase efficiencies in their interactions with staff and running school operations. For example, Tim detailed that “I model the value of technology, and I use technology as a tool for being efficient and communicating to staff, and being organized…I think modeling is really critical.” Similarly, Dave described that they used Google documents for almost all of their administrative tasks such as faculty meetings and trainings.

Another approach to modeling technology was through the use of social media. Jim detailed that the use of Twitter had been a helpful strategy to model the sharing of information, “When I first got here, there were maybe three Twitter users, and we immediately went to sixty in one year, because again, it’s modeling, and if you want information from me, here’s how you’re going to get it.” Tim also communicated that he used social media a lot within his practice and that he anticipated that his teachers would “equate me in my leadership with social media in some way” as a result of his frequent use.

In order for the school administrators to model technology, they found that it required them to research new tools and learn from others. Michael spoke about his experience in
modeling technology for others: “I definitely felt I needed to walk the walk and so there’s a little bit of fake it ‘til you make it. You spend a lot of time reading and talking to people and stealing some tips and tricks.”

**Encourage risk-taking.** The next transformational leadership strategy that was reflected by the practices of half of the participants was that they encouraged their staff to take risks with technology. Creating a culture of risk-taking or innovation was mentioned frequently by four of the participants, who all felt that it was important to explicitly communicate that failure is okay. Brian was the strongest advocate of this strategy of giving teachers permission to fail was something he communicated to teachers frequently. Similarly, Michael reported that, “delivering the message that it’s okay to fail was really important for us.” Dave told teachers, “You know what? I don’t care if you fall down with the technology. Take a risk.” Laura concurred that sometimes she would purposefully praise teachers’ efforts around taking risks with technology, “Whenever teachers are using technology, I make sure to give them credit...even if it doesn’t go well.”

Additional methods the participants used to encourage risk-taking was to emphasize that it was a multi-year process of learning, promoting a growth mindset culture, and encouraging teachers to experiment. One participant stated, “that was a relief for our teachers to hear that we didn’t expect them to become experts overnight and in one year.” Fostering a growth mindset culture, also assisted with setting the stage for an innovative and risk-taking environment for faculty. Michael indicated that the growth mindset culture coincided nicely with supporting growth in technology use:

*There’s been a great deal of emphasis in our district over the past year or so on the growth mindset. I think part of the reason teachers were excited about the growth*
mindset in using that to work with their kids is because they’ve understood the value of the growth mindset from their own professional work and that it’s been a lot of failure in order to lead to success.

Other participants used strategies such as creating a culture of experimentation and exploration. For example, Brian encouraged his teachers directly, “Hey, guys. Let’s give this a shot. Let’s be experimenters in this...Let’s not be afraid of it.”

Provide individualized support. Another transformational leadership strategy that nine of the participants used was providing individualized support for their staff. Only one of the participants identified that they did not feel that they personally provided individualized support to teachers. The four ways that they most frequently provided individual support included: (a) providing on the spot technical support; (b) creating time and removing obstacles; (c) praising and encouraging staff; and (d) being visible.

Provide technical support. Three of the participants shared that they supported teachers individually by providing as-needed, on-the-spot technical support when problems arose. Laura felt that it was important to provide this support, especially initially,

I felt like I played this role of jumping to everyone’s needs for a little bit, because at any first concern, there was a major shutdown. For example, they couldn’t get their airplay to work when they needed something in the lesson. I would run down to the classroom and make that happen. Although not my goal, I felt that’s what they needed at that moment to continue to build their confidence towards implementing technology.

Michael took a similar approach to Laura in addressing technical problems immediately. He felt that teachers would say, “whenever they had a problem, we were quick to drop whatever we were working on in order to come give them a hand.”
Create time. Some of the participants identified that the creation of time for teachers to meet and collaborate was another way to individually support them. One approach to creating time was to reduce duties for teachers. Paul described his thinking on this approach when he said, “I don’t want to have teachers have duties every single period. I want to build in some... duty-free time.” Another approach that was identified as a successful model was to have time established in the schedule where teachers could meet with one another. Laura indicated,

It was about providing the time to collaborate with department members or it was about providing the support in order for them to gain those skills. In providing those two areas of support, I wouldn’t say that we have anyone who is not meeting the expectations of implementing technology.

For Matt, one way they provided additional time for staff to develop technology skills was to give back some of their faculty meeting time for staff to work together in professional learning communities. He noted that since they do not have common planning time, reducing staff meetings is an approach where they “really try to commit to giving that hour and a half back to the staff members to work together.”

Remove obstacles. Michael, Brian, Nicole and Tim noted that removing obstacles and providing autonomy was important for providing individualized support. Michael expressed that removing obstacles to teachers’ learning was an essential feature of his job: “My job...is finding out what the obstacle to learning is and finding the right strategy in order to help someone.” Brian believed that sometimes the leader should ensure that they are not obstacles themselves, rather that it was important to provide teachers with the space and autonomy they needed to be successful with technology integration. He felt that it was “my job to get out of your way and then give you what you need so you can do your job better.” Nicole also indicated that it was
important to stay out of the way of teachers in this process and growth. Similarly, Tim took the approach that sometimes teachers need autonomy and time. He expressed that it was important to give “people room to embrace it as they need to...I think people appreciate it if you give them a little bit of space, and then the people came to technology at their own speed, and pretty much everybody’s there.”

**Praise.** Praising staff was another approach that participants noted was a way to support teachers individually. Four of the participants reported either providing praise or encouragement as a technique to individually support teachers. Paul viewed his role as a coach, “It’s like you got to coach them up and make them feel good about what they’re doing, acknowledge that they’ve done a good job and continue to pat them on the back.” He summed it up well when he said it was a balance of being “part-cheerleader” and another “part-support.” Similarly, Laura reported that “praising people for their efforts is huge” and she indicated that she did this through informal conversations, as well as noting successes when she saw them in her classroom walkthroughs.

**Visibility.** The final technique used to provide individualized support was being visible and available to teachers. Laura talked about “lobby hours,” which were set times when she and the principal were in the lobby to answer questions and collaborate with teachers and students. This increased visibility and access encouraged conversations where teachers and students will “stop down to share new learning, ask questions, or to get tech support.” Similarly, Jim identified that being visible and available was the prime way he was able to meet the individual needs of his teachers:

*Because of the devices, we spend more time outside in the hall. I’m in the classrooms...Probably eight to ten classrooms a day. You’ll find me during the school*
day in the hallways and the classrooms. Everybody knows that... They can walk in here... My door is open, come on in. I’ll stop what I’m doing. I think that approachability is a big one for our teachers.

**Promote cooperation.** Only a few participants, (Michael, Brian, and Tim) noted specific strategies where they encouraged cooperation or collaboration amongst staff to achieve technology related goals. The techniques used to encourage cooperation included: (a) sharing best practices; (b) supporting peer observations; and (c) collaboration with online tools.

**Best practices.** Michael and Laura identified that one way that they promoted cooperation was through the sharing of best practices among the staff. The primary means they shared best practices was through a digital database created by their teachers. Laura further elaborated on this process:

*Through collaborative time during a faculty meeting, teachers submit a best practice through a digital Google form.... These best practices were curated in a website, tagged according to the teacher evaluation rubric as well as best practice category, and then added to a database that allows teachers to search by teacher, department, category, or best practice title. Teachers have access to the website at all times.*

**Peer observations.** A second strategy for encouraging cooperation was supporting peer observations. One technique used to promote peer observations was described by Brian as instructional rounds. Instructional rounds are a practice when teams of teachers and administrators do walkthroughs of classrooms to learn from their peers. Brian found that it was a useful practice to highlight excellent technology integration taking place in the classrooms:
Good things were happening with technology in the classroom. Making sure that the more we talk about it and the more we allow teachers to see each other, and support that. That’s another thing that’s really taken off.

**Collaboration with online tools.** The third technique used to foster cooperation was embedding online collaboration tools into daily practice with staff, which encourages staff cooperation on common goals. Tim described this as a common practice in his school:

*We use Google Docs, not just a lot with kids, we use them, internally, a huge amount...Our child study team for example. I just open an empty agenda on Wednesday. Between Wednesday and Tuesday at the meeting, the people who are at the meeting fill in the agenda with the information in there. There’s a lot of examples of that where the staff are collaborating remotely on the platform that would’ve been impossible to do before. We do that all the time for all kinds of committees and curriculum development work. It’s enhanced our ability to collaborate in a way that’s been really great.*

A number of the participants shared similar examples where the increased online access to collaboration tools, especially through Google Apps for Education has enhanced their ability to encourage cooperation among the staff using technology tools. Dave reported, “going to a Google school was, as you know, that was a game changer. I’d say collaboration is probably the biggest it has been.” Similarly, instead of having people meet in small groups and then report back in e-mails on common planning goals, Michael described they used online tools to enhance their work by purposefully “integrating Google tools into that process, so that as they were working together in small groups, they were in a Google doc together.”
Transactional Leadership Strategies

The second theme to emerge was Transactional Leadership Strategies, grounded in transactional leadership theory, which is defined as strategies leaders use that are based on contingent reinforcement of rewards and punishment based on performance. The data indicated that transactional leadership was a method of leadership that fewer participants used than transformational leadership. However, of those who displayed transactional leadership, the most common technique used was to offer incentives and rewards. This section will outline the various methods used to provide incentives and rewards with illustrative quotes and examples reported by the participants.

Offer incentives and rewards. While three of the participants initially responded that the one-to-one program was not as Bill stated, an “incentive-based program,” in fact, all of the participants shared at least one example of how they offered incentives or reward for teacher participation in the one-to-one computing program. The types of incentives mentioned included: receiving a device, acquiring professional development points for certification, public and private recognition, opportunities to visit other schools or receive extra training, reduction in duties, stipends, hand-written notes, gift cards, and compensatory time.

Provide a device. The most common incentive mentioned by four of the participants was that teachers were provided a mobile device to use personally and professionally. When asked if they could describe any incentives that were provided to reward the teachers for active participation in one-to-one, Brian answered, “First of all, they got a device... every teacher got an iPad... Use it, bring it home, use it wherever you can to get comfortable with it.” Laura described how they tried to make the provision of a device special for the teachers as an added incentive for embracing the shift to one-to-one: “When we handed out the iPads, we put a big red
bow on them as a Christmas present.” While not everyone noted that the purpose was to provide a device as an incentive, they realized that they had fully equipped their teachers with the devices they needed to be successful:

In our district, we have a lot of resources, and we make sure teachers have good computers of their own. They all have a Chromebook for however they want to use it, but they also have an up-to-date laptop. For most of them, it’s a Mac laptop. We give them everything they need to be successful, but we don’t do it to incentivize them so much because our people are pretty self-motivated.

**Tangible incentives.** Besides receiving a device, other tangible incentives for teachers included professional development points for licensure, salary credits, stipends, gift cards, and compensated (comp) time. Nicole noted that “there are PD points that teachers can earn” and “teachers have gotten salary credit for teaching their colleagues” about technology. Paul identified that teachers could get in-district salary credit for participating in additional professional development opportunities, and only Matt indicated that teachers might get actual tangible rewards like gift cards or compensated time:

Any of the teachers that would participate or lead these workshops, we have got anything from gift cards for them, or comp time for them. The comp time is not something that was formal, but...if they are going to dedicate a whole PD day to help other staff members, then they could probably just take a day.

On the other hand, some of the participants were adamantly opposed to providing tangible incentives. Michael summed up his philosophy on tangible incentives:

We have not incentivized it from a tangible standpoint where I have a raffle at a faculty meeting or enticing people with gift cards. I see it as part of the practice. I think it’s
what’s happened with our profession and the job has changed...I don’t feel it’s something they should be rewarded for in a tangible way...The reward is knowing that you’re doing better things for kids and you’re a more effective educator.

Additional opportunities. Some of the participants indicated that if their teachers volunteered to become teacher leaders, there were additional rewards and incentives offered as a result such as extra time or reduced duties. For example, Dave reported that:

We would reward those folks by providing them their own professional development. If they presented, we would then maybe get a substitute teacher for a morning and let them work with our tech specialist on something they really wanted to do...lessening the duties. Your people take notice of these things.

Four of the participants mentioned an incentive was the participation in additional training opportunities either internally or externally. For example, Matt indicated that they provided additional trainings like getting teachers Apple Certified. Paul also shared that they even took their teachers to visit innovative schools in other states like California and Maine, “Our innovation team traveled all over the country last year. We went out to California...we’ve sent them to Maine. We’ve sent them...to five or six places.”

Public and private recognition. Some of the techniques used to publicly or privately acknowledge teachers to support one-to-one computing included public recognition in faculty meetings and in blog highlights, but also through private acknowledged with hand-written notes. Jim shared that sometimes they would recognize successes in faculty meetings and when possible he would write about successes in his blog that goes out to parents. Similarly, Michael recognized teachers in his blog:
I acknowledge best practices in my memo or in my blog, and I’ll acknowledge it individually...I think we’ve also tried to incentivize it, if you will, by encouraging teachers to look at the work they’re doing as a best practice.

Both Michael and Paul indicated that they frequently wrote notes of thanks to their teachers. Michael expressed the importance of private recognition when he said, “I think the best incentive you can give to the teachers is positive feedback.” Furthermore, Paul reported, “Hand-written notes I would do. [When] I see something good and I write a hand-written note and put it in an envelope...and say, ‘Hey great job.’”

Establish expectations. Another aspect of transactional leadership is to establish expectations for followers, which are then either actively or passively monitored. One sub-theme that emerged was that many of the participants felt strongly that there were no mandates or expectations communicated regarding the use of the technology by the staff. Laura reported “We haven’t mandated anything...I think not mandating is probably a good action.” Similarly, Bill stated “there were not a lot of mandates” and Tim indicated “we don’t have any expectations on how much or how little they use the machines.” Matt described his school environment as one with no articulated expectation of use and if some did not use the technology, there would not be negative consequences: “So, there is no expectation. There is no, ‘if you don’t do it then this,’ environment.”

While many participants identified that there was no mandate for use of technology, half of the participants did suggest they expected teachers would use technology, but for the right purposes, not for technology’s sake alone. Tim described this philosophy on use:
We don’t ask them to use them more if we don’t feel like they’re using them enough. If they help you in your lesson, in our lesson planning, in something in your classroom, great. If they don’t, then don’t use them.

Similarly, Matt felt it was important not to pressure teachers to use technology when they do not need to or if it does not fit into their lesson:

From my perspective in my role here, there has never been this pressure to have to use the computers just for the sake of using the computers. I think people feel like ‘I will use the computers when I see fit, and how it fits into this class.’

Paul reported that they did not have an expectation established for use: “I was very clear about this. I said, ‘I don’t you expect you to use the iPad every single minute of every single day.’ That is an unreasonable objective. That's just not going to happen.” Bill and Tim, among others, reported that over time they realized that some minimum requirements were needed for posting information with consistently online or through learning management systems.

**Supervise and monitor use.** None of the participants identified that they actively supervised and monitored use of technology. Tim and Bill both responded that they did not directly supervise or monitor use of technology, but in fact supervision was “minimal.” However, three of the participants suggested that some supervision was done through informal classroom walkthroughs. Brian viewed this supervision through the lens of checking in and getting feedback from the teachers, rather than in any formal way. Only Matt identified that his school kept track of technology use and it was the technology specialist’s role to do so and to report outcomes:

He takes one period a day, and tries to get into five or six different classrooms in a period. He is just looking for how teachers are utilizing technology, and each month he
puts together...a report for myself and the two assistant principals...We share that out with the department heads in our bi-weekly department head meeting. Then, if there are some significant things that we want to address, we will bring it up at a faculty meeting. That is probably a best way to kind of get a sense of who is implementing and how we are implementing it.

Instructional Leadership Strategies

The third theme to emerge to answer the second research question was Instructional Leadership Strategies, aligned to instructional leadership theory, which is defined as strategies leaders use that directly impact teaching and learning and are focused on curriculum, instruction, and assessment in a school. The data indicated that the instructional leadership strategies frequently implemented included promoting professional development, employing the educator evaluation system, and aligning technology integration to curriculum, instruction, and assessment. This section will describe the ways in which the school administrators used instructional leadership strategies and includes excerpts from the interview transcripts to provide deeper insight into the results.

Promote professional development. Hallinger and Murphy (1985) define promoting professional development as a primary function of their instructional leadership in that it directly supports teachers’ efforts to improve instruction. Supporting teachers by providing various types of professional development was identified by all of the participants as one way they exhibited instructional leadership. The most common techniques used for professional development included providing tiered or differentiated options, peer-to-peer sharing, using teacher leaders, front-loading professional development and Edcamps. Some additional professional
development examples included afterschool sessions, content-focused options, and station rotations at faculty meetings.

**Differentiation.** Seven of the ten participants identified differentiating professional development based on the ability levels of the teachers as an effective strategy to support the one-to-one computing transition. Some participants referred to this as “tiered PD” or “scaffolded.” Tim felt that it in providing professional development it was really important to “recognize the fact that everybody was on a continuum of early adopters and really strong, going to be really strong users, and people who don’t know anything about anything.” In some cases, like in Nicole’s school, the professional development was customized to meet the individual needs of departments. Matt expressed the importance of offering differentiating professional development when he stated, “We often did workshops that were kind of beginner, intermediate, advanced. I don’t think you could ever do technology PD as one-size-fits-all. We learned that pretty quickly.” One strategy that Matt’s school used, which no other participant mentioned, was checklists of skills for the teachers to complete in advance of professional development to help identify the skill levels of teachers and better target their needs.

**Peer-to-peer sharing and teacher leaders.** Other than differentiating professional development, the most common method used was through peer-to-peer sharing opportunities and workshops by teacher leaders. Matt described this process as follows:

*We had staff members, who would probably be at the higher end of their knowledge around utilizing technology. [who ran] workshops which some of our other teachers would sign up for...[Additionally,] anytime we had building-based time, staff members would share our practices on what they were doing, and answer any questions.*
Paul tried to capture the talent of his teacher leaders and have them offer workshops for other staff members in “mini-sharing sessions” where “people were an expert in one thing, and then my faculty would sign up and go meet with them, do a round-robin.” Tim reported that they did not have a big investment in formal professional development, but rather captured the strengths and enthusiasm of their teacher leaders to share with their peers:

We did a lot of teacher’s leading PD and saying, “Hey, I’m doing this really exciting thing using this platform that works really well for me. I’m going to tell you about it.”

We had a lot of people like that.

One strategy that Brian shared was that he set up stations at his faculty meetings for the staff to rotate through and learn from one another:

We did a lot of staff sharing. We really took advantage of those super users, the people that were comfortable with it and had been experimenting with it already before we went to one-to-one... We almost talk about drill stations. This person will be talking about Google docs, somebody else will be talking about using video or using different things. Then it was, okay for the first 20 minutes, everyone would sign-up, but then at 20 minutes, we rotate.

One suggestion that Laura described was when her teachers did participate in professional development, they wanted time to practice using the technology as well, “Teachers were sharing with other teachers, which increases buy-in, along with the time to use the tools. What was always announced to them is, ‘Don’t just tell us what to do. Give us time to try it.’”

**Front-loading.** Three of the participants identified that it was important to schedule professional development at the beginning of the one-to-one computing implementation. As Paul described, “You had the PDs really kind of front-loaded towards September, to make sure
that we’re supporting the diverse needs of 130-odd teachers.” Matt viewed their approach as front-loading professional development, where they took about nine teachers out of their regular professional development for a year and focused on technology training. Then the following year, with full implementation, the majority of the professional development the first year was on technology integration. Others indicated that they offered a lot of summer professional development and courses in the summer months to provide teachers with skills prior to the beginning of the school year.

**Edcamps.** Four of the participants (Jim, Michael, Paul, and Matt), described using Edcamp models for professional development. Edcamps are participant-driven learning experiences where teachers volunteer to facilitate a conversation on a topic of their choice and educators can move in and out of the facilitated workshops as they wish. According to Jim, “Our Edcamps were huge. We were able to get the superintendent to let us do our own PD.” Similarly, Michael described his district’s first Edcamp:

> We’ve also had an Edcamp in the district, which again isn’t a formal presentation of a workshop, but is a facilitation of conversation and after we had Alan November visit our school at the beginning of last school year, he threw out 10-12 tech tools that teachers could use and immediately, within an hour after that presentation was over, teachers were organizing Edcamp sessions around these tools.

**Employ educator evaluation system.** A second aspect of instructional leadership is evaluating teacher practice through educator evaluation systems. In order to manage the instructional program, instructional leaders will incorporate the educator evaluation system to provide feedback to teachers on their practice. In the Massachusetts educator evaluation system, this process includes classroom observations, classroom walkthrough forms, verbal and written
feedback to teachers, professional practice and student learning goals, and formative and summative evaluations.

**Minimal evaluation.** When the participants were asked if they used the educator evaluation system to support one-to-one computing, half of them replied that they used it minimally or did not evaluate their teachers at all in their use of technology integration, especially through written feedback. The participants who responded that they were not using the educator evaluation system expressed strong feelings in opposition. Bill reported, “I’d never comment on it in an eval.” Jim described that teachers had concerns about the evaluation system and that “initially, several teachers kept saying, ‘Is this going to be in our evaluation?’ I was like, ‘Nope. I will not include anything related to the iPad in your evaluation this year.’” Similarly, Brian shared that he would not use the educator evaluation system in the early implementation because he did not want teachers to be afraid to use technology. He would explicitly state to his teachers, “I’m not going to write a negative evaluation of you, if you don’t use it a lot. Don’t be fearful of how it’s going to affect your evaluation.” In regard to the evaluation walkthrough form, Tim felt that technology was not an important aspect in what they look for when observing classes: “We don’t judge our teachers on their usefulness on it or how they use it. Technology integration would never rise to the level of high leverage things we would look for in any given classroom.”

**S.M.A.R.T. goals.** As part of the educator evaluation system, educators are required to write professional practice goals and student learning goals. The goals are written in a format called S.M.A.R.T. goals, which stands for (Specific, Measurable, Attainable, Realistic, and Time-based). Six of the participants identified the development of S.M.A.R.T. goals in the
educator evaluation system was one approach one-to-one computing was reflected in evaluations.

Matt identified that they “have started to encourage staff members to have goals around technology.” Likewise, Dave reported “I think it’s really encouraging them to, as far as their S.M.A.R.T. goals, developing goals around technology.” When teachers have been slower to implement the technology, Nicole indicated that the goal setting process has been helpful in moving their practice: “Teachers who are slow for whatever reason to incorporate or integrate technology…it’s great to have that goal setting process.” Michael shared that one strategy they used was to take advantage of the S.M.A.R.T. goal process to promote technology integration. He stated, “We tried to leverage the educator evaluation process and build it into tech integration by creating a professional practice goal that our teachers could choose to adopt.”

Feedback. Four of the participants specified that they did provide written feedback, especially when celebrating successes, during their classroom walkthroughs. Matt affirmed this practice, “We have encouraged them through the evaluation to kind of show us all the great things they are doing with technology, to highlight them through the evaluation system.” Dave found that the evaluation system was a means to highlight best practices by staff by awarding them with exemplary ratings for modeling technology.

Three of the participants, (Dave, Laura, and Michael), also used the classroom walkthroughs to provide feedback for improvement. Dave suggested that he would give positive feedback “and highlighting those positive moments with technology,” but if teachers were not where they need to be with technology integration, “it needs to be acknowledged if we feel that teachers are not adjusting to the times…that’s noted through the evaluation process.” Laura also viewed the classroom walkthroughs as an opportunity to validate best practices, “I offer a lot
of validation and some feedback to people through the teacher evaluation system...If there’s a lack of tech integration where I see this is an area that could really improve...I always give that as feedback.” Michael indicated that his school leadership team agreed and noted, “when there’s an opportunity for a teacher to improve with tech integration, we’ll make a tangible suggestion of a way to change their instruction.”

Michael, in particular, was excited about the possibilities in the future of adding technology integration in a more detailed way into the walkthrough form. He wanted to use the Substitution Augmentation Modification Redefinition (S.A.M.R.) Model, developed by Dr. Ruben Puentedura, as part of their walkthrough process. The S.A.M.R. Model is a method of analyzing how technology can impact teaching and learning. Michael expressed his ideas as follows:

We haven’t gone there yet, but it’s on my list of things and it’s in the district technology plan to incorporate the S.A.M.R. model into the classroom walk-through form, so that there’s a formal place for us to comment on teacher’s technology integration.

Align technology integration to curriculum, instruction, and assessment. Since instructional leadership revolves around practices that directly impact teaching and learning in the classroom, the participants were asked to provide examples of ways in which they purposefully linked the one-to-one computing into curriculum, instruction, and assessment. The most common methods mentioned included: (a) communicating that technology is just a tool; (b) adjusting materials and practices; and (c) planning for enhanced teaching and learning.

Communicating that technology is just a tool. More than half of the participants reported that it was important to communicate to staff that technology was a tool for teachers to
use when needed, rather than an end unto itself. Dave noted that they communicated to staff that technology should be integrated into what they were already doing with teaching and learning:

Making sure that it’s not just about technology, but when we talk about other curriculum initiatives, it’s still a part of it, but it’s not everything. It’s still integrated into whatever we’re doing, but it’s not just about the technology.

Laura also described technology using a toolkit analogy: “Technology is a piece of who they are and what they’re doing, but I think more importantly, it’s about just another tool. Having another tool in their toolkit, kids and teachers alike to bring learning to life.” Brian reiterated the same philosophy on technology, “Again, that personal philosophy on it of…it’s an important tool in a toolbox. I don’t think it is the be-all and end-all.” At the core of the toolkit analogy was that educators should be trusted to use the right tools, including technology, to “enhance teaching and learning” or provide differentiated experiences for students.

Adjusting materials and practices. Four of the participants described how some of their school’s practices and materials had to be adapted as a result of the one-to-one computing in the areas of instructional materials, grading practices, and curriculum documents. First, Nicole detailed how they have shifted away from textbooks and moved their curricular resources to e-books because of the numerous benefits that they bring students. She described this shift as follows:

These e-books, I’m thinking about our biology classes right now, are interactive, so we have learners in there who may struggle with abstract concepts or being able to retain all this crazy vocabulary that they need to learn in biology and DNA. Now they’re on their textbooks and they push a button and it plays, and it’s active, it’s animated. Then it’s going to check their understanding before they turn to the next page.
Second, Brian described how he had his teachers go back and change their syllabus and grading expectations, to fit better in a one-to-one computing environment. For example, since the transition to one-to-one computing, students collaborated on a shared Google document; however, the way the grading policies were written prior did not allow for working together on a document, so they had to be changed. Therefore, Brian identified that teachers had “to rewrite the syllabus and [had] to rethink their philosophies on grading and homework policies.” Third, Jim identified that he is going to push his teachers to look for ways to develop curriculum that integrates technology. He reported that “we want you to purposefully develop around technology, and we want to see it.” He detailed that teachers working on this integration of technology with curriculum, instruction, and assessment:

*We deliberately link it with all those areas [and] we deliberately link it to our curriculum. There are teams that are developing curriculum over this summer, part of their job is to figure out ways to integrate the technology.*

**Planning for enhanced teaching and learning.** Planning for future enhancements in teaching and learning as a result of one-to-one computing was at the forefront of Michael’s mind. He was the only participant to dive deeply into describing significant plans for future shifts in instructional practice at his school. He described how he is working on designing new opportunities for increasing passion-driven projects and connecting students with people beyond the school. He also indicated that one area for intentional planning for integrating technology and instructional practice was to personalize learning opportunities for students:

*I think as we get ready for year three of one-to-one, the emphasis is really going to be on student learning and personalizing learning, and to show learning in a creative way with*
more opportunities to adjust their pace and more opportunities for kids to learn at a time in a situation that works for them.

Michael elaborated on how technology can provide new opportunities for student learning and how he planned to implement actionable steps for reimagining classroom instruction. He was the one participant who discussed in-depth the potential opportunities a one-to-one computing environment could bring for teaching and learning:

_We can reimagine the use of class time, we can reimagine when kids are working and what they’re working on. We don’t have to have kids working in lock-step anymore, they can have more options about pursuing their passions...It’s coming up with actionable strategies that people can use in order to change the way their classroom looks and what learning looks like._

**Distributed Leadership Strategies**

The fourth theme to emerge was Distributed Leadership Strategies, which is based off of distributed leadership theory, and is defined as strategies leaders use to share or distribute leadership among other leaders. Distributed leadership can include the distribution of tasks and responsibilities, but it can also occur in a shared or collaborative nature as well. The data confirms that the participants displayed distributed leadership through sharing leadership with others and using collaborative structures. This section will provide more details of the distributed leadership strategies applied, along with corresponding quotes from the data collection.

**Share leadership with others.** All of the participants indicated that there were other individuals who were also instrumental in the leading of the one-to-one computing implementation. Seven of the participants stated that they had a technology or one-to-one committee in place which made decisions about one-to-one computing. Six of the participants
reported that the technology director played a key role in leading the one-to-one computing. Additionally, department heads were also listed by six of the participants as leaders in the initiative. Half of the participants identified either teacher leaders or assistant principals as key leaders in the process. Assistant Superintendents and Curriculum Directors were mentioned by four of the participants and three of the participants felt that the superintendent was an important leader in the process. Three of the participants listed the district leadership team as supportive. Other people referenced were library/media specialists, secretaries, building committee chairs, and pilot teachers.

**Technology committee.** Seven of the participants referenced the leadership role of either a technology committee or a one-to-one committee. For example, Michael said the committee played an important role in the planning phases: “*We had a one-to-one learning committee that was in place prior to the first year and that was really in charge of visioning and visiting other schools.*” Moreover, Nicole’s technology committee was building-based and it included members from each department who met frequently with their technology integration specialist to work on the technology plan and address issues as they arose. Similarly, Dave was a chairperson of their school’s one-to-one committee, which was part of the initial decision-making and research leading up to the implementation.

**Technology director, technology department, and technology integration specialists.** Six of the participants spoke about the importance of their technology director, technology department, and technology integration specialists, particularly in supporting the hardware and infrastructure needed to have a successful one-to-one computing program. Brian summed it up: “*When you look at our IT Department, the entire department was dynamite with it!*” Michael reported that the role of the technology director was important for managing the various devices:
The job changed quite a bit for him. It went from having probably 200 pieces of equipment in this building to now every kid having an iPad, every teacher having an iPad. With that comes a whole myriad of problems and without the support in order to make that run smoothly, it would have been in a lot of trouble.

Tim described the role of his Director of Technology Innovation in Learning and Instructional Technology Coaches (I.T.C.s) as significant leaders in the one-to-one computing. I’d say those two guys...were highly impactful when it came to developing this. Without those two guys, it would probably look very different, or we wouldn’t be having it at all. I think they are the ones who are the linchpins of getting this thing done.

**Department chairs.** Department chairs had leadership roles in the development of goals in one of the schools. Paul identified that he has tried to distribute his leadership to the department chairs when possible: “I think what I’ve tried to do is really look at the distributed leadership model and rely on my directors or department chair people.” Similarly, Laura commented that she “spent a lot of time with department chairs, talking about one-to-one needs and what that would look like in the construction of the sample smart goals.”

**Teacher leaders.** Teachers and teacher leaders were mentioned by four of the participants as sharing in the leadership of the one-to-one computing. Laura indicated, “all teachers were instrumental in being leaders...It was really about everyone moving in one direction. I think that teachers feel ownership of it.” Nicole, Paul, and Brian all echoed Laura’s thoughts that teacher leaders offer credibility, increase departmental access, and serve as models for leading one-to-one computing. Michael shared the following about the role of his teacher leaders:
We had a great deal of support from teacher leaders, people who early on recognized the capacity of it and went for it, gave it a shot as opposed to fighting it, and in the process of giving it a solid effort convinced some of their peers that this was something worthwhile. Some leaders mentioned how they reached out to teacher leaders directly. For example, Matt described that he often tried to get others involved in leading one-to-one computing by distributing leadership:

I guess it is just my style to begin with is to kind of distribute leadership. Not that I try to push things out, but try to get people involved. Technology has certainly been an area that I have used to tap some potential and some good resources when it comes from staff to help share back to the group.

Assistant principals. Four of the participants highlighted assistant principals as influential leaders in the implementation of one-to-one computing. In some instances, the assistant principals were identified as the point person for the one-to-one computing. Brian described his assistant principal as, “the go to person from an administrative standpoint” for the one-to-one computing transition. Similarly, Jim noted, “the assistant principal drove this before I got here, so I can’t take credit for it. It’s definitely been his ball. He’s definitely in it, in the middle of it, too.” Michael described his assistant principal as a partner with him in the leadership:

She took a lead role and really shared the work with me in common planning time activities during the year prior to going one-to-one...She played an integral role. She also played an integral role in really sharing every aspect of the leadership of the visioning process and working with kids and working with parents.
Matt described his current Director of Technology, who was a former assistant principal, as being the lead on the one-to-one computing in the beginning, which led him to his current role as the Director of Technology. Matt noted that with the transition to one-to-one computing, the assistant principal became immersed in implementation: “I would say that almost became his full-time job.”

**Assistant superintendents and curriculum directors.** Four of the participants identified the assistant superintendents or curriculum directors as helping to lead the one-to-one computing implementation. Nicole quickly identified her assistant superintendent as an influential leader in the one-to-one computing initiative:

> I would definitely have to give props to our assistant superintendent...who is just a risk taker himself. He comes to mind, by just keeping it rooted in the teaching and learning on how all these fancy gizmos are actually going to help kids learn.

Paul identified the assistant superintendent in his district as being “visionary in terms of her thinking. She kind of pushed the initiative.” Additionally, Laura shared that her district’s curriculum director had a strong understanding of one-to-one, which was helpful in being able to support the school’s implementation and aid in communication of their goals.

**Superintendent and district leadership team.** Three of the participants identified the superintendent or district leadership team as supportive of the one-to-one computing. Paul indicated that the superintendent was supportive behind the development of the one-to-one vision developed by the assistant superintendent. Michael shared that the superintendent was supportive by letting administrator voices be heard: “He allowed our voice to be heard in the development of the five-year strategic plan, which included one-to-one learning as an essential piece of it.”
District leadership teams were also referenced as part of the leadership process. Jim felt that the business manager played a key role,

*We could not have done it without him, because you need somebody managing the money, when you’re dealing with, in our case Apple, ridiculousness. That was huge, because he said, “I’m going to take this ball,” and he’s part of our team.*

Michael commented that the district leadership team also played a supportive role, particularly in “...conversations around our table about one-to-one learning and technology integration and a lot of different perspectives on that.”

**Use collaborative structures.** The most common collaborative structure utilized to foster collaboration and shared leadership was common planning time, noted by several participants in the study. Collaborative structures came in the form of common planning times, departmental spaces, and professional learning communities. Nicole detailed that departmental collaboration was a formal structure she used, which was scheduled every Wednesday from 1:05-2:45 where they meet as a department on common goals. Similarly, Tim described his common planning time structure:

*We have common planning time for teachers in the same content area. Teachers who teach, who are course partners, will be linked in together as much as we can. It’s usually one or twice per 8-day cycle. We’re on an 8-day rotation. One to 2 blocks per 8 days, they have a chance to sit with the person who teaches the same course as then. There’s a lot of, I think, professional collaboration using technology. Most of that happens during common planning time.*

Bill described their collaborative structure as departmental spaces: “*Having the department offices in all honestly helped a lot. That was something that was new when we opened the*
school, because all the teachers saw each other now on a regular basis during the day.”

Additionally, two of the schools had either professional learning communities or collaborative learning projects established where teachers could collaborate on technology integration goals. Bill detailed the professional learning community development as follows:

*The year we went one-to-one we actually let our teachers form professional learning communities, where they could propose any area that they wanted to study. We allocated eight of our faculty meetings over the course of the year, for time professional learning community-wise and they would set their own goals, they would set targets of what they wanted to accomplish, and then they had a product at the end of it that got shared out.*

**Section Summary**

This section discussed four themes that answer the second research question regarding the nature of leadership strategies high school administrators described using in the early implementation of one-to-one computing: (a) Transformational Leadership Strategies; (b) Transactional Leadership Strategies; (c) Instructional Leadership Strategies; and (d) Distributed Leadership Strategies. Findings revealed that the most prevalent strategy used to lead one-to-one computing was transformational leadership, however, all of the four types of leadership strategies were used throughout the implementation in varying degrees. School administrators who used transformational leadership strategies, spent time developing a shared vision for one-to-one computing, as well as modeling technology integration at meetings or embedding it into their daily practice. Transformational leadership included encouraging cooperation amongst staff to work on collective goals or collaborate online. Transformational leadership encouraged environments where teachers could take risks, but also provided individualized support for success. When employing transactional leadership, the most commonly used practice was
through incentives or rewards such as handwritten notes, professional development opportunities, public acknowledgement, or salary credits. Most leaders did not have mandated expectations of use, but still spent some time through informal walkthroughs to monitor implementation. Instructional leadership included a focus on the educator evaluation system, in particular the goal setting process. It also involved communicating that technology is a means to enhance teaching and learning, rather than an outcome on its own. Some changes were made in instructional or curricular practices such as increasing e-book use, or re-writing grading policies. Finally, when the school administrators used distributed leadership practices, they took advantage of collaborative structures such common planning times or departmental spaces. Furthermore, other leaders were empowered such as teacher leaders, alongside a team effort in many instances that included district leadership teams, committees, department chairs, and technology staff.

**Chapter Summary**

This chapter presented findings for the two research questions used to guide this basic qualitative study. The first question focused on how high school administrators described their experience in leading the early implementation of one-to-one computing. The three themes described were: (a) The Goal was to Prepare Students for the World; (b) The Implementation Process Involved Strategic Planning, Communication, and Flexibility; and (c) Change Dynamics Impacted Emotions, the Leader, and the School Environment. When developing goals for a one-to-one computing, preparing students to be successful in a post-secondary and online world, as well as exposing students to 21st century skills were common priorities. Strategies recommended for successful implementation included piloting devices in advance, gathering input from constituents, and visiting other one-to-one schools. Engaging multiple stakeholders in the
planning also helped with implementation. During the implementation, school administrators often were faced with barriers to change, including resistance, so there was a need to remain flexible and open to new ideas. Although school administrators were faced with some hurdles, they identified that overall changes were positive for teaching, learning, and in some cases transformed the school environment.

The second research question focused on the nature of leadership strategies high school administrators described using in the early implementation of one-to-one computing. Four themes emerged to answer the second research question regarding what leadership strategies high school administrators used: (a) Transformational Leadership Strategies; (b) Transactional Leadership Strategies; (c) Instructional Leadership Strategies; and (d) Distributed Leadership Strategies. Transformational leadership was the most predominant strategy used to lead one-to-one computing, however, it was often used in conjunction with the other three strategies as well.

Transformational leadership included the widest range of techniques used, including vision development, technology modeling, individualized support, encouraging risk-taking, and fostering cooperation around common goals. When in the process of vision development for one-to-one computing, administrators looked to align the vision to their school beliefs about learning, as well as create a vision that was easily communicated. School administrators modeled technology through the use of social media, during meetings, as well as throughout their day-to-day operations with staff. When staff struggled with implementation and needed more support, school administrators would provide on-the-spot assistance as well as positive feedback. School administrators also encouraged cooperation around common goals by providing time for teachers to meet with one another and promoting the sharing of best practices. Finally, school
administrators tried to encourage risk-taking by creating a safe environment where teachers would be able to explore and experiment with technology integration.

Transactional leadership strategies were used by all of the participants, particularly in the area of providing incentives, and used less often for establishing expectations or monitoring implementation. When school administrators used incentives, a few would provide minimal tangible rewards such as gift cards, salary credits, comp time, or professional development points. Other incentives included opportunities to attend professional development or visit other schools, public and private acknowledgement at meetings or through handwritten notes. There was a minimal focus on expectations of use, other than to use the devices when it fit best into teaching and learning. A few school administrators informally monitored technology use through surveys or informal walkthroughs.

The most prevalent method for displaying instructional leadership was by providing professional development around technology integration to staff. Professional development was often differentiated to meet staff needs, provided in the beginning of an implementation process, as well as used in various formats such as on professional development days, in Edcamps, or at faculty meetings. When the educator evaluation system was used as an instructional leadership strategy, the goal-setting process was the most frequently used. Some school administrators tried not to link the evaluation system to the one-to-one computing, while others embraced it as a leverage point for change. The third technique to link instructional leadership to one-to-one computing was by adapting curriculum and instructional practices. As a result, some schools saw changes to materials they used for instruction, while others noted changes in policies around grading.
Transitioning to one-to-one computing was a complex process, which often involved many other individuals aside from the school administrators, and therefore distributed leadership emerged. In some cases, teacher leaders and department chairs were empowered by school administrators to take on new roles. In other schools, the leadership was more hierarchical in nature with the district leadership team of the superintendent, assistant superintendent, and business manager involved in the planning and implementation. Technology staff also were integral to the implementation process and distribution of leadership. The relationship between the experience of leading one-to-one computing and the various leadership strategies used to facilitate implementation and to overcome barriers and resistance are illustrated in Figure 2.
Figure 2

*Relationship of Findings for the Research Questions*

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<thead>
<tr>
<th>Goals</th>
<th>Implementation Process</th>
<th>Change Dynamics</th>
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<tbody>
<tr>
<td>Post-Secondary World</td>
<td>Strategic Planning</td>
<td>Reactions</td>
</tr>
<tr>
<td>21st Century Skills</td>
<td>Communication</td>
<td>Barriers</td>
</tr>
<tr>
<td>Digital World</td>
<td>Flexibility</td>
<td>Changing Roles</td>
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<tr>
<td></td>
<td></td>
<td>Transformed School</td>
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![Experiences in Leading One-to-One Computing](image)

<table>
<thead>
<tr>
<th>Transformational</th>
<th>Transactional</th>
<th>Instructional</th>
<th>Distributed</th>
</tr>
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<tbody>
<tr>
<td>Develop Vision</td>
<td>Incentives/Rewards</td>
<td>Professional Development</td>
<td>Shared Leadership</td>
</tr>
<tr>
<td>Model Technology</td>
<td>Expectations</td>
<td>Educator Evaluation</td>
<td>Collaborative</td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>Supervise/Monitor</td>
<td>Curriculum/Instruction/</td>
<td>Structures</td>
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<td>Individual Support</td>
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<td>Assessment</td>
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<td>Cooperation</td>
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Figure 2 illustrates the complexities involved in experiencing the leadership of one-to-one computing implementation. The top of the figure demonstrates how one-to-one computing begins with clear goals around outcomes for students. The implementation process involves strategic planning and communication with many stakeholders who often provide feedback into the goals for the program. As the implementation process evolves, leaders need to remain flexible and adapt to the changing environment. As frequent change dynamics occur, the implementation process is influenced. For example, there are various reactions to change from...
all stakeholders, sometimes even resistance. These reactions can become barriers alongside other barriers such as financial constraints or technology infrastructure. Throughout the change process, the leaders often see a shift in their own leadership role, as well as changes in the environment, which affect implementation.

The school leader and their experience in this implementation process is at the center of this study. While they are experiencing the implementation process and changes, they are also using and adapting school-based leadership strategies such as transformational, transactional, instructional, and distributed in response to the change dynamics they are experiencing. The circular arrows indicate that the school-based leadership strategies used have an impact on the implementation process, change dynamics, and goals as well.

Overall, the findings from the school administrators involved in the study indicate that a multitude of leadership strategies can foster an environment for successful one-to-one implementation. The following chapter explores the conclusions of the study, which will provide guidance to other school or district administrators seeking methods for leading a one-to-one computing initiative.
CHAPTER FIVE: CONCLUSIONS AND DISCUSSION, IMPLICATIONS FOR PRACTICE, RECOMMENDATIONS FOR FUTURE RESEARCH

The purpose of this basic qualitative study was to identify and understand the leadership strategies used by Massachusetts high school administrators during the early implementation (first four years) of one-to-one computing.

Based on the conceptual framework and qualitative methodology of the study, the research questions that guided this study were as follows:

1. How do high school administrators describe their experience leading the implementation of one-to-one computing at their school?
2. What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing?

This study explored the experiences of high school administrators in leading one-to-one computing in Massachusetts and sought to understand the nature of leadership strategies employed by these administrators. All of the participants were principals or assistant principals at rural or suburban high schools in Massachusetts who were involved in leading the early implementation (first four years) of one-to-one computing. Data was collected primarily from in-depth and semi-structured interviews with each participant. Some data also emanated from tours of the schools and analysis of presentations and documents about the one-to-one computing implementation. Through an inductive process, using a constant comparison method, seven themes emerged to answer the two research questions.

The purpose of this chapter is to discuss the four research conclusions, implications for practice and recommendations for future research. Conclusions drawn from the findings will be shared, along with corresponding discussion, which relate the conclusions back to research and
the conceptual framework for the study. In other words, the focus of this chapter involves communicating conclusions about the experience and nature of leading one-to-one computing. It will further provide discussions on how the conclusions connect to the theoretical framework and prior research, as well as outline suggestions for future research. The chapter includes four sections: (a) Conclusions and Discussion; (b) Implications for Practice; (c) Recommendations for Future Research; and (d) Concluding Thoughts.

**Conclusions and Discussion**

This section details the conclusions and subsequent discussion for this basic qualitative study. As a result of the analysis of data, four conclusions emerged from the findings: (a) strategic planning and a well-articulated vision were essential to the early implementation of one-to-one computing; (b) the implementation of one-to-one computing was an organizational change, which affected all aspects of the school environment, resulting in various reactions from stakeholders; (c) one-to-one computing required distributed leadership; and (d) transformational leadership practices were the most numerous strategies used in one-to-one computing, but were used in conjunction with transactional, instructional, and distributed leadership practices.

**Conclusion One: Strategic planning and a well-articulated vision were essential to the early implementation of one-to-one computing.**

The first conclusion drawn from the study was that strategic planning and well-articulated vision development were essential steps in the early implementation of one-to-one computing. The findings convey that strategic planning was multi-faceted, but a necessary stage in the implementation of one-to-one computing. Strategic planning involved many steps, such as the formation of committees, seeking information from other schools, piloting devices, hiring new staff, and securing infrastructure.
Due to the long-term planning needed, technology committees were formed, which often included numerous stakeholders such as school and district leaders, teacher leaders, department representatives, and in some cases students. These committees helped in the initial research and planning, as well as served as a sounding board when issues arose. Prior to implementation, teams of teachers and administrators would research other one-to-one schools and then participate in site-visits. Site visits provided the teams with insight into what types of devices would work in their school, other technology infrastructure they needed, as well as the need for resources such as help desks or new staff. While not all of the schools involved students in this process, the ones who did include students, found that bringing in student perspective in the planning process was extremely helpful, especially with getting future buy-in from all the students. Additional strategies to include students in the decision-making process were surveys, creating a student technology advisory group, and having students visit from other schools.

One aspect of strategic planning included resource management, such as device deployment, finances, infrastructure, and personnel. The majority of the participants initiated a pilot of the device prior to full implementation for the purposes of testing out the devices, problem-solving, and getting feedback. In some instances, the implementation was either a rolling implementation over time or one that began at the middle school level, then expanded to the high school level. Additionally, a few of the implementations coincided with building projects where either the increased capacity of infrastructure or the additional funds allowed for the one-to-one computing to occur from a financial standpoint. Having a well-established infrastructure with enough bandwidth and Wi-Fi capacity were noted as essential criteria for successful implementation. Access to learning management systems like Google Apps for Education, projection systems like Apple TVs, cases to protect devices, and movable furniture
for collaborative activities were additional resources mentioned by participants. The findings also indicated a need for additional personnel for technical support, help desk operations, and technology integration.

The research on technology support confirms this study’s findings that providing adequate resources, especially for technical support and infrastructure will assist in successful one-to-one implementation (Grant et al., 2015; Hew & Brush, 2007). The research supported the idea that if teachers face unreliable technology, due to lack of bandwidth or unreliable Wi-Fi, then they start to lose confidence and will use technology less frequently (Cuban, Kirkpatrick, & Peck, 2001). To address this potential problem, some of the participants indicated that they invested in a robust infrastructure to mitigate this. Furthermore, Hew and Brush (2007) found that if schools do not have adequate technical support personnel, then teachers were not able to fully integrate technology into their lessons. Reliable access to technical support can help to resolve technical issues in a timely fashion (Grant et al., 2015). In alignment with the research, many of this study’s participants reported that they hired further technical staff, especially in the area of technology integration, so that the teachers received ongoing assistance in the classrooms.

In addition to strategic planning, establishing a well-articulated vision around the goals of the one-to-one computing had long-lasting impact on the implementation of the program. As indicated in the findings for the study, the study participants mentioned that their vision of one-to-one computing was to prepare students for a post-secondary world, to provide them with 21st century skills, and to assist students in operating in an online learning format. The goals of enhancing 21st century skills of creation, communication, collaboration and critical thinking align with the research of one-to-one computing outcomes. The literature suggests that when
students have one-to-one technology, collaboration increases (Leigh & Zhou, 2008), problem-based activities are integrated (Greaves et al., 2010), and 21st century skills are enhanced (Lowther et al., 2012; Topper & Lancaster, 2013).

While there was some alignment with the literature on the goals for one-to-one computing, there were some goals that appeared in the literature, but not in the study. For example, the research conveyed that some schools implement one-to-one computing to close the digital divide between students who have access to mobile devices and those who do not (Argueta et al., 2011); however, only one of the participants included this as a reason for their implementation. Additionally, while other studies concluded that one-to-one computing brought positive outcomes in student engagement, participation, and motivation, (Corn, Huff, Halstead, & Patel, 2011b), this study’s participants did not mention these as primary goals of their implementation. It is possible that issues of equity, as well as issues around student motivation were not mentioned, because of the nature of the communities where the interviews took place, which were high achieving upper-middle class communities where these issues were less of a priority.

Although the vision statements and goals in this study were narrowly focused on preparing students with 21st century skills to navigate a post-secondary digital world, the participants did share some unexpected student outcomes, which do align with the literature. For example, research reveals that one outcome of one-to-one computing includes increased organizational skills (Harris & Smith, 2004; Lei & Zhou, 2008). Although only one of the participants mentioned this specifically in their vision and goals, a couple of the participants did report that they saw increased efficiencies and organization for their students after implementation. Furthermore, in this study, two of the participants from one-to-one laptop
schools shared that they saw improvements in writing instruction and student writing outcomes, although they did not know if it was because of the introduction of one-to-one computing or because of newly implemented Massachusetts standards. This outcome aligns with the research, where writing is one academic area that consistently demonstrates improvement after one-to-one computing implementation (Grimes & Warschauer, 2008; Gulek & Demirtas, 2005; Mouza, 2008; Silvernail et al., 2011). Therefore, although the participants had clearly articulated goals and vision, some found that additional student outcomes, like writing improvement or organization, appeared and were not part of their initial goals for the implementation.

**Conclusion Two:** The implementation of one-to-one computing was an organizational change, which affected all aspects of the school environment, resulting in various reactions from stakeholders.

The second conclusion related to the study was the implementation of one-to-one computing was an organizational change which affected all aspects of the school environment, resulting in various reactions from members of the school community. References to change dynamics appeared throughout the entire study including a transformed school environment, changes in pedagogy, and varied emotional and behavioral responses ranging from resistance to early adoption.

The study participants provided several examples of how increased access to technology brought about tremendous changes in teaching and learning in the schools. An increase in collaboration between students, as well as students and teachers, resulted from the shift to one-to-one computing. As Brian summarized this change, “Collaboration has gone to a whole new world. This is the most collaborative this school in the district has been since I’ve been here.”
Research supports these findings as increases in student collaboration have been found in previous studies of one-to-one learning outcomes (Shapley et al., 2011).

Another instance where schools saw transformative changes was in classroom instruction. Research demonstrates that the infusion of technology can sometimes be a catalyst from traditional teaching environments to more student-centered environments (Cavanaugh, Dawson, & Ritzhaupt, 2011). Some of the school administrators reported that they saw shifts away from teacher-directed instruction from the front of the room, to a classroom where it was sometimes difficult to know where the teacher was when one walked in the room because students were leading instruction. Even some of the lesson design shifted as a result of one-to-one computing where some teachers were incorporating project-based lessons or personalized lessons where students could follow their own passions. Oliver and Corn (2008) found similar results in their study of increased project-based learning opportunities within one year of implementing one-to-one computing. Furthermore, school administrators in the study identified that one-to-one computing allowed for increased mobility, where instruction does not have to remain within a classroom, but instead teachers and students were able to move throughout the building for “anywhere, anytime” learning or to connect with audiences beyond their school walls. For example, because of the increased mobility, Jim described how he ended up purchasing screens and apple TVs for hallways, mobile furniture for the library, and high-top tables and charging stations to promote a more mobile learning environment.

The implementation of one-to-one computing is a complex organizational change resulting in a wide range of reactions from teachers and students including fear, uncertainty, concern, and nervousness. In some cases, these feelings of uncertainty stemmed from either teachers’ lack of comfort with the new technology or nervousness with integrating technology
into their classroom lessons. Moreover, some teachers were afraid to break the devices or afraid that the students might know more than them, which was a shift in roles, which made some teachers uncomfortable. In fact, the participants mentioned how teachers that were more traditionalist in their style of teaching found the drastic changes “unnerving” at times.

Furthermore, concerns about the distractibility of technology and negative effects on classroom management were experienced across many of the schools in this study. In a few rare cases, the concerns turned into open resistance by the teachers where they would not use technology in the classroom.

Based on the literature on barriers to technology integration, these teacher concerns and resistance that appeared in this study were not surprising. For example, Inan and Lowther (2010) found that technology proficiency of the teacher was one of the most influential factors that affected technology integration in the classroom. In this study, Laura shared that some of her teachers were on a steep “learning curve” with using technology, which brought about feelings of incompetence and nervousness. According to Silvernail et al. (2011), if teachers feel competent in integrating technology, they are three times more likely to use it than teachers who feel less competent. Moreover, research indicates that when teachers fail to see the relevance of technology to student learning (Robinson, 2005), or do not see how the integration enhances their curricular area (Franklin et al., 2001), they will not use it. Brian shared that his teachers who were resistant were either not willing to adapt to the change, or firmly “believed technology was not the answer.” In the study, Nicole summed up why one of her teachers did not use technology:

*Teachers have different comfort levels, philosophies, etc...just thinking about one person off the top of my head. He’s not anti-technology. It’s just that he doesn’t want to use it. I*
Teachers were not the only ones who expressed nervousness, fear, or resistance. Since this was an organizational change that affected also affected students, parents, and administrators, other individuals in the community conveyed unease about the change. The participants in this study were most surprised by the fact that they faced resistance from students, especially upperclassmen. The common reason why students were resistant was because they had been learning one way for such a long time, they were uncomfortable changing how they learned. For example, it was described that students were used to learning with paper and pencil and the shift to digital resources, digital notetaking, and digital organization was a drastic shift for them. The introduction of technology was also a challenge for a few of the school administrators, especially the ones whose philosophies about technology did not match the goals of the initiative, as well as for those who were not as tech-savvy. For example, Nicole shared, “the struggle has been...my own personal beliefs around technology. I’m not the most technologically savvy person. I’m anti-technology in some ways.” The literature describes these feelings as cognitive dissonance, where people sense an inconsistency between what they think or believe and the values and beliefs in an organizational change (Burnes, 2015). When people are faced with an organizational change that brings about cognitive dissonance, they sometimes become resistant.

Not all of the teachers expressed a fear or nervousness around the technology implementation. In fact, all the school administrators described how some teachers took on leadership roles. School administrators referred to these teacher leaders as “super-users,” or “pioneers,” or “early adopters”. The varied reactions of teachers align to Rogers (2003)
diffusion of innovation model where he classifies members of an organization falling into five categories: innovators, early adopters, early majority, late majority, and laggards. The teacher leaders mentioned by all of the participants fit into the descriptions of innovators and early adopters. Innovators are members of an organization who are risk-takers and willing to try innovations immediately. Early adopters are people considered to be leaders of opinion in the organization and are aware of the need to change and willing to adopt new ideas. All of the participants noted the importance of capturing the enthusiasm and willingness of these teacher leaders in order to further the implementation of the one-to-one computing.

**Conclusion Three: One-to-one computing required distributed leadership.**

The third conclusion in this study is that due to the complexity of one-to-one computing, leadership was shared with other members of the school community and required distributed leadership. Distributed leadership was one of the core leadership strategies exhibited in the study. Bush and Glover (2014) determined that 21st century leadership would tend to be distributed in nature as institutions become more integrated and complex. The findings indicate that all of the participants reported that other members of their school were instrumental in leading the one-to-one computing implementation. Research by Spillane (2006) supports the idea that leadership does not have to be with one individual in the organization, but multiple sources of leadership can exist at the same time. In this study, it is apparent that the school-based leadership does not always fall on the principal alone, but assistant principals often play an influential role in leading technological initiatives, as was the case in this study. Second, due to the technological needs, directors of technology, technology support staff, and technology integration specialists are also critical in the leadership and success of a one-to-one computing program. Many of the directors of technology were active leaders in the planning phase of the
one-to-one computing, supporting the increased number of devices, and ensuring adequate infrastructure was available. Technology integration specialists, in particular, supported the active integration of technology in the classrooms by modeling technology for staff, co-planning lessons, and providing on-the-spot support.

Interestingly, the larger the school size, the more the school administrator conveyed how they purposefully distributed leadership to others or relied on others. For example, the participants that came from the schools where the student populations were the largest at 1,783, 1,700, and 1,115 students respectively, all explicitly stated in their interviews that they used a “distributed leadership” model or tried to “distribute” or “empower” other leaders. In one instance, a principal of a larger school of 1,700 students reported that they felt that everyone else but himself had a role in leading the one-to-one computing. Furthermore, another one of the principals stated that he was “not an expert” in technology, so he relied on his curriculum directors and department chairs to lead the work. This distribution of leadership aligns with findings from Bendikson et al. (2012) who suggested that middle level leaders such as department heads often play a larger leadership role in larger secondary schools, which are more hierarchical in structure.

In addition to multiple sources of leadership, research also illustrates that having structures in place to provide time and space for collaboration and shared decision-making can facilitate distributed leadership practices in a technology-rich school (Ng & Ho, 2012). Findings in this study confirm that establishing collaborative structures were helpful in distributing leadership. For example, many of the participants used structures such as common planning times, professional learning communities, faculty meetings, and professional development days
to structure time for departments to meet and collaborate on goals and decision-making related to technology integration.

The distribution of leadership did not appear explicitly at the building level. The findings suggest that in many of the school districts, members of the district leadership team also assisted in leading the one-to-one implementation. For example, assistant superintendents were described as providing instructional leadership and vision for the one-to-one computing. The participants also mentioned that their superintendents supported the initiative from a strategic planning or financial standpoint. Finally, principals from other schools and other members of the leadership team such as curriculum directors or business managers were included in the decision-making process.

Findings by Macbeath (2005) provide a relevant typology of six methods of leadership distribution that could take place in an organization, many of which appeared within this study. The six types include: (a) formal distribution—where leadership is intentionally delegated; (b) pragmatic distribution—where leadership roles and responsibilities are negotiated and divided between different people; (c) strategic distribution—where new people with unique skills and knowledge are brought in to meet a particular leadership need; (d) incremental distribution—where people acquire leadership responsibilities as they gain experience over time; (e) opportunistic distribution—where people willingly take on additional responsibilities over and above those required for the job; and (f) cultural distribution—where leadership is naturally assumed by members of an organization and shared organically between individuals.

The findings suggest that when assistant principals took on the leadership role, it was primarily because of pragmatic distribution or strategic distribution. For example, in some instances, the assistant principals were viewed as more technologically savvy by their principal,
so the principal deferred to them to take the lead because of their increased skills or interest in using technology. In the schools where department chairs had a significant role in leading their departments, cultural distribution was likely, as the school administrators frequently relied on their department chairs for school leadership. In the schools where they brought on new technology integration staff, they were exhibiting strategic distribution, where they were trying to meet the growing need of technical support and leadership. Finally, in the schools where teachers took on additional leadership roles that went above and beyond their day-to-day teaching requirements, opportunistic distribution was evident.

**Conclusion Four:** Transformational leadership practices were the most numerous strategies used in one-to-one computing, but were used in conjunction with transactional, instructional, and distributed leadership practices.

The fourth conclusion of the study is that transformational leadership practices were the most numerous, but were not used in isolation. In fact, they were often used in conjunction with transactional, instructional, and distributed leadership practices. Interestingly, the schools where the school administrators exhibited the most transformational leadership practices (typically the smaller sized schools of under 700 students), also used the widest variety of other leadership practices as well. Alternatively, in the larger schools where distributed leadership practices prevailed, there was less of a focus on transformational leadership.

It was not surprising that transformational leadership practices emerged as a theme in this study. Research indicates that transformational leadership is positively associated with a school’s innovative climate (Moolenaar et al., 2010) and there are positive correlations between leadership practices and the integration of technology (Ng, 2008). In the Bass (1985) transformational leadership model, leaders display the following characteristics: idealized
influence, inspirational motivation, intellectual stimulation, and individualized consideration. Another model by Leithwood and Jantzi (1996), identifies six transformational leadership behaviors: (a) providing vision; (b) fostering commitment to goals; (c) providing individualized support; (d) providing intellectual stimulation; (e) modeling appropriate behavior; and (f) holding high performance expectations. Although not all of these transformational leadership strategies appeared in the study, there still were a number that did emerge and align to the research including: (a) developing a shared vision; (b) modeling technology integration; (c) encouraging risk-taking; (d) providing individualized support; and (e) encouraging cooperation.

The first transformational leadership strategy identified by participants as the most important one to begin with was to develop a shared vision for the one-to-one computing program. In this study, the participants who had a well-established vision statement and were able to articulate it clearly, were found to have been very intentional in their vision development process. In fact, these participants took specific steps to include multiple stakeholders in the visioning process, to align the vision to already established school beliefs, and to create a vision that was easily communicated. Research supports this vision development process outlined by Yu, Leithwood and Jantzi (2002), where they identified the potential outcomes of building a shared vision and developing consensus about goals: (a) gives a sense of overall purpose; (b) communicates school mission to staff and students; (c) provides excitement with visions of what might be accomplished; (d) works toward whole staff consensus on priorities; and (e) encourages review of individual goals consistent with school goals.

Interestingly, two of this study’s participants, spoke about how they created a vision statement in the form of a tagline, which would then have been easily remembered and communicated by staff and students. Creating a shared vision that can be easily communicated
has been found to be an effective approach to overcoming potential resistance from stakeholders. Corn et al. (2011a) found that when school leaders clearly articulated a one-to-one vision, teacher attitudes towards one-to-one computing improved. Furthermore, research suggests that the most ubiquitous strategy for overcoming barriers to technology integration is the development and communication of a shared vision with all stakeholders of the purpose of one-to-one computing (Anderson & Dexter, 2005; Yang & Huang, 2008). Consistent communication with and to all stakeholders was deemed essential by the study’s participants. Communication took place through a myriad of methods such as presentations to School Committees, parent informational nights, e-mails, websites, social media, blogs, and technology fairs. The development and communication of a shared vision aligns with research by Leithwood and Jantzi (1999) that identified a core transformational leadership strategy as developing a shared vision and building a goal consensus.

According to Bass (1985), another aspect of transformational leadership is idealized influence where a leader is viewed as a model for others in the organization to follow. Idealized influence is when leaders are admired, respected, and act as role models; often when leaders show idealized influence, followers want to emulate them (Bass & Riggio, 2006). In this study, many of the participants who exhibited transformational leadership participated in active modeling of technology. The modeling of technology most often transpired at faculty meetings through the sharing of resources digitally, or integrating activities such as surveys and collaborative work through digital tools. Other modes for modeling technology included digital communications, increased use of social media, and leading professional development. Some of the school administrators who modeled technology reported that they had to keep current with technology if they were going to be effective in modeling it for others. Their behaviors were in
agreement with the model behavior category outlined in research by Yu, Leithwood and Jantzi (2002). In their study, they identified a transformational leadership practice of modeling to include characteristics such as displaying energy and enthusiasm for work and demonstrating a willingness to change practices in light of new understandings.

Another transformational leadership behavior described by Bass (1985) is individualized consideration, which is when the leader shows appreciation, gives personal attention to members, and provides individuals with personalized support. This behavior was evident throughout the study when leaders provided as-needed technical support to staff, created time in the schedule for teachers to collaborate, praised teachers, and increased accessibility. The school administrators who demonstrated individualized consideration conveyed goals of providing personal support to help teachers build their skills and confidence toward implementing technology. This was achieved by making oneself available to answer questions, solving technical issues, and offering words of praise or encouragement. Moreover, when teachers communicated that they needed time to work on their skills, time was carved out at faculty meetings or duties were reduced. The literature concurs that providing resources of time to staff, as well as displaying appreciation to staff, are common behaviors found in the transformational leadership category of providing individualized support (Yu, Leithwood, & Jantzi, 2002).

It was not surprising that the transformational leadership strategy of encouraging risk-taking was one that emerged from the study, because of the nature of the large-scale organizational change one-to-one computing fosters. In fact, transformational leadership has been found to be closely tied to organizational changes which involve increased school innovation (Hallinger & Heck, 1998; Hallinger, 2003; Marks & Printy, 2003). Furthermore, Moolenaar et al. (2010) indicated that transformational leadership can be positively associated
with the school’s innovative climate. The leaders who exhibited transformational leadership behaviors spoke about the importance of creating a school environment where teachers were encouraged to take risks and to innovate. For example, Bass (1985) identified that the transformational leadership behavior of intellectual stimulation was often demonstrated through encouraging followers to be creative, to be innovative by taking risks and to try new approaches out. Similarly, participants in this study created a risk-taking environment by communicating to teachers that it was okay to fail, recognizing that learning new technology integration skills take time, and encouraging staff to experiment with the technology.

Although, not as prevalent as transformational leadership strategies, some instructional leadership and transactional leadership strategies did also appear in this study. Prior leadership research illustrates that transformational leadership often appears in conjunction with transactional leadership, along a continuum (Burns, 1978), or where transformational leadership augments transactional leadership actions (Bass, 1985). Additionally, Oberfield (2012) found in a longitudinal study that a combination of transformational and transactional leadership practices led to positive effects on followers. Moreover, research demonstrates that there are often frequent linkages between transformational leadership and instructional leadership (Hallinger, 2003; Marks & Printy, 2003, Marzano et al., 2005).

In this study, the most commonly used transactional leadership strategy was contingent rewards or incentives. Bass (1985) defines contingent rewards as an exchange where followers are rewarded for their efforts and receive positive reinforcement for achieving expected performances. Interestingly, the participants in the study initially responded that their one-to-one computing implementation was not incentivized, but with further questioning they all shared at least one example of incentives or rewards. The incentives ranged from tangible ones like gift
cards, reduced duties, stipends, or compensation time to intangible positive reinforcement like opportunities for extra training and positive recognition.

Other types of transactional leadership strategies include active management-by-exception when leaders actively monitor their followers’ actions and intervene and passive management-by exception where leaders do not actively monitor their followers’ actions, but only respond when an issue occurs (Bass & Riggio, 2006). The participants in this study displayed minimal to no active management-by-exception behaviors. For example, none of the participants identified that they actively supervised and monitored the use of technology. However, some passive management-by-exception behaviors emerged for a few participants who said they might talk to individuals who would out-right refuse to integrate technology. The choice of the participants in this study to offer some contingent rewards, rather than using management-by exception, aligns with the research. For example, Judge and Piccolo (2004) found that contingent rewards have a more positive effect than using management-by-exception.

In addition to some transactional leadership examples, a few examples of instructional leadership practices also emerged from the study in the areas of promoting professional development and the goal-setting process of the educator evaluation system. According to Bendikson et al. (2012), instructional leadership can fall into two categories: direct instructional practices focused on improving classroom teaching and indirect practices that create school conditions to support teaching and learning. In this study, the school administrators primarily used direct instructional practices when they supported professional development opportunities for their teachers and encouraged teachers to create common goals related to technology integration. The most significant conclusion drawn from the implementation of professional development in the study was that it was determined to be essential to differentiate or tier
professional development offerings to meet the varied needs of the teachers. Those participants who did not initially tier their professional development found that they quickly learned their lesson that a “one-size-fits all” professional development did not work. Furthermore, another surprising finding was that even though a few of the participants identified the educator evaluation system as a “leverage” point for leading the one-to-one computing, most did not actively use the walkthrough and feedback forms as leverage. Instead, the goal-setting process focused on developing common S.M.A.R.T. goals prevailed as the method for furthering the school’s vision about one-to-one computing. These choices of instructional leadership practices make sense, when put into context of transformational leadership. For example, building a shared vision was a priority for many of the participants, so embracing the aspect of the educator evaluation system aligned best with shared visioning. Yu, Leithwood and Jantzi (2002) listed the questionnaire item, “encourages us to develop/review individual professional goals consistent with school goals and priorities,” in their transformational school leadership model, which clearly aligns with the instructional leadership practice of common goal setting (pp. 368-389). Likewise, individual consideration was a key transformational leadership strategy identified in this study. When participants find out the individual needs of their teachers, they then use instructional leadership practices of providing professional development to meet the determined needs.

Implications for Practice

This study provided many practical implications for school administrators looking to lead a one-to-one computing initiative in their school. Implications for practice are discussed in this section to further support future one-to-one computing implementations.
The first implication of this study is that the most important first step in the process is to develop a shared vision about the purposes of one-to-one computing. If this vision is well-articulated, easy to communicate, and aligns with the school’s established beliefs about learning, it has the potential to drive all of the subsequent decision-making, professional development, and outcomes. It is essential that the vision is shared and developed with input from all stakeholders such as teachers, parents, community members, and especially students. Including all of the constituents in the process helps to increase buy-in and reduces potential resistance experienced later. Through the process of conducting this study, it was apparent that those who had a clearly articulated vision reported significant transformations in their classrooms connected to those goals.

The second implication for school administrators considering one-to-one computing implementation is that the development of a strategic implementation plan can help to mitigate potential barriers. Important steps in strategic plan should include visiting other one-to-one computing sites, piloting devices, providing frontloaded professional development, and establishing an online learning management system. Initially time must be spent on logistical issues such as decisions about what device, development of acceptable use policies, distribution of devices, and other administrative protocols. Technology committees with broad representation are best suited for logistical decision-making; however, advice from participants in this study was to try not to get “too bogged down in logistical details.”

Strategic planning should also include increased financial investments. For example, financial investments should be made in establishing a robust infrastructure that will meet the demands of increased mobile devices. It also must include investments in instructional hardware or software to facilitate technology integration into lessons. The study findings indicate that in
all cases investment also included hiring new technology personnel either in both technology integration and technical support. Technology integration specialists play an important role in assisting teachers in their lesson design and using technology to enhance instruction. Furthermore, investing in time for teachers to meet and collaborate on technology goals should be part of the strategic planning. Method for adding time include reducing teacher duties, handing over building meetings to teacher collaboration, or changing district schedules to increase more professional development time.

The third recommendation for school administrators is to empower other leaders to assist in leading one-to-one computing through distributed leadership practices. A complex organizational change like implementing a one-to-one computing initiative requires distributed leadership. First, school administrators should look for other leaders who are passionate about one-to-one computing, are innovative, and have technological skills. In many cases, assistant principals take on this role in co-leading the one-to-one computing. In other instances, technology integration specialists and teacher leaders are empowered to lead professional development, share best practices, and contribute to decision-making. Second, students are a valuable resource for ongoing input and feedback about the one-to-one computing initiative. School administrators should seek their input through surveys, participation in student help desk support, as well as in developing student technology advisory groups. Third, in secondary schools, especially larger schools, department chairs are critical leaders who can help establish common department goals around technology, monitor technology needs in their departments, and provide instructional leadership support to department members. Fourth, school administrators should look to establish collaborative structures that support ongoing cooperation and collaboration around one-to-one computing goals. Suggestions for structures include
departmental common planning time, shared departmental spaces, online collaboration, professional learning communities, and opportunities for collaborative learning projects. Finally, school administrators should seek the support and input from members of the district leadership team including principals in other schools who have one-to-one computing, as well as superintendents, assistant superintendents, technology directors, curriculum directors, and business managers. All of these members offer important perspectives and resources that can further the goals of the one-to-one computing initiative.

The final and perhaps the most important implication for school leaders is that they do have the power to influence the successful implementation of the one-to-one computing and transform their school environment as a result. This study illustrates that in addition to strategic planning and distributing leadership to others, a mixture of transformational, transactional, and instructional leadership practices can help to foster a transformed school environment. First, school administrators should stay current in technology themselves, so they are able to communicate the vision, support teachers as needed, and model technology for staff. Second, school administrators should foster a culture of risk-taking and innovation where staff are encouraged to experiment safely with the technology, with no fear of repercussions if they make mistakes. Third, a wide range of professional development opportunities should be made available to staff that is differentiated, aligned to content, and responsive to staff needs. Whenever possible, teachers should learn from other teachers through professional development workshops, peer observations, and sharing of best practices. Fourth, when appropriate, school administrators should look for opportunities to recognize successful implementation through praise, public or private acknowledgement, or tangible incentives. Finally, school administrators should look to promote cooperation of staff around collective goals aligned to the vision. This
can be accomplished through providing sample goals for staff, leveraging the educator evaluation goal-setting process, and providing time for teachers to meet with one another.

**Recommendations for Future Research**

The results of the study assist in gaining a better understanding of the experience of leading a one-to-one computing implementation, as well as the nature of leadership practices that are used throughout the implementation process. While the findings of this study may be helpful for school administrators who are looking to better understand what it is like to lead a one-to-one computing implementation, there are several recommendations for future research in leading one-to-one computing that will offer some alternative perspectives on leading technological change.

1. This study was focused on public high schools located in Massachusetts which provided a perspective of the leadership practices taking place at the state level. However, one limitation from this study was that the smaller state and close network of school administrators within the state, may lead to similar approaches to leading one-to-one computing. For example, many of the participants noted visiting other one-to-one schools, which in most cases would have been the same schools that informed their own implementation. Future studies conducted in various states would likely yield a wider variety of findings and bring in diverse regional perspectives.

2. Since the focus of the study was to better understand the leadership practices and experiences of the school administrators in leading a one-to-one computing school, the data was only collected from the leader’s perspective. Therefore, future studies should consider also including focus group interviews of teachers and/or students, which offer more triangulation of data collection and increase reliability of results.
3. This study was conducted over a period four months with one interview collected per participant. Although all of the participants were in the first four years of implementation, some of them did reference that their responses might be resulting from the timing of their implementation of being in the first year or entering the fifth year. This suggests that if a longitudinal study was conducted in a future study, the leadership experiences may possibly change over time. As schools are continuing to implement one-to-one computing, it would be a helpful perspective to share with future leaders the leadership changes that take place over time.

4. In this study the participants were purposefully selected from rural and suburban high schools. As the school size increased, references to distributed leadership practices and reliance on other leaders also increased. In order to learn more about the specific distributed leadership practices exhibited in one-to-one computing, future studies should consider collecting data from participants in larger suburban and urban school districts.

5. This study did not yield an abundance of specific information about instructional leadership strategies beyond professional development, educator evaluation, and some curricular changes. Research indicates that instructional leadership often occurs at various levels beyond the building principal, especially in schools that have department or curricular leaders. Therefore, a future study that would further explore instructional leadership practices in a one-to-one computing setting, should include department chairs or other curricular leaders in their data collection.

6. Although not a focus of the current study, in many of the interviews it was apparent that the personal views or philosophies about technology impacted the degree of modeling and engagement in leading the technological change. While quantitative
studies exist on the relationship between a principal’s beliefs or skills about technology and their leadership, it is recommended that a qualitative study could add richer and more in-depth perspective of the impact of philosophy on technological leadership.

**Concluding Thoughts**

My journey through the research on leading a one-to-one computing implementation resulted from a practice-based problem beginning a number of years prior. At the time, I was a high school assistant principal involved in the planning of a new building project. I remember the moment when my superintendent at the time asked me if I was willing to “own” the one-to-one computing initiative that was going to take place at my high school in the next school year. In order to “own” and lead the initiative I sought out any information I could find on the benefits of one-to-one computing, how to implement a program successfully, and potential barriers that would need to be overcome. At that time, there were many quantitative studies available measuring the student outcomes of one-to-one computing, but limited resources on how to lead implementation or what the experience of leading a technological change was like. As a result of that gap in practice-based research, this study attempts to provide school administrators information from their colleagues on the experience of leading one-to-one computing.

Overall, the study demonstrates that leading technological change is complex, bringing with it challenges and sometimes resistance. However, when implemented successfully, one-to-one computing has the potential to transform the school environment, shift instruction to be student-centered and collaborative, and prepare students for a post-secondary digital world. Successful implementation happens rapidly when school administrators adopt a wide range of strategies including transformational, transactional, instructional, and distributed leadership practices.
References


leadership: Shaping administrators’ knowledge and skills through an online professional development course. In D. Willis et al. (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2002 (pp. 482-486). Chesapeake, VA: AACE. Retrieved November 3, 2013 from http://www.editlib.org/p/10561.


LEADING TECHNOLOGICAL CHANGE


Donovan, L., Green, T., & Hartley, K. (2010). An examination of one-to-one computing in the
middle school: Does increased access bring about increased student engagement?

*Journal of Educational Computing Research, 42*(4), 423-441. doi:10.2190/EC.42.4.d


doi:10.1108/09578230310464648


doi:10.1016/j.edurev.2011.11.004


Howell, J.M. & Avolio, B.J. (1993). Transformational leadership, transactional leadership, locus of control, and support for innovation: Key predictors of consolidated-business-unit


doi:10.1080/15700760500233769


Lowther, D., Inan, F., Ross, St., & Strahl, D. (2012). Do one-to-one initiatives bridge the way to


Miles, M.B. & Huberman, A.M. (1994). *Qualitative data analysis: A sourcebook of new...


Silvernail, D.L. & Lane, D.M. (2004). The impact of Maine's one-to-one laptop program on


Appendix A

Confidential Informational Questionnaire

Section 1: School Information

Would you describe your city/town as rural, suburban, or urban? __________

Does your school consist of grades 9-12? Yes_____ No_____

What is your current school enrollment number? ___________

How many years has the school been entirely one-to-one? _______

What is the type of technology used in the one-to-one computing model?

Ipads _____ Laptops _____ Chromebooks _____ Other, please specify_______

Section 2: Participant Information

Name: _______________________

Preferred contact information:

☐ E-mail _______________________

☐ Phone ______________________ Mobile/Home/Work?

What is your current school leadership position?

Principal _____ Assistant Principal _____ Vice-Principal _____

Dean of Students______ Other, please specify ________________________

Have you been a school leader for the entire time of the one-to-one implementation?

Yes_____ No_____

Are you one of the decision-makers for the implementation of the one-to-one initiative?

Yes_____ No_____

Do you feel that the one-to-one computing is a positive change for your school?

Yes_____ No_____

Please return to Maureen Cohen, mccallion.m@husky.neu.edu if you are interested in participating in this study. Thank you for your time!
Appendix B: Informed Consent Document

Northeastern University
College of Professional Studies

Name of Investigator(s): Principal Investigator, Dr. Elizabeth Mahler, Student Researcher, Maureen Cohen


Dear Participant,

You are invited to take part in a research study that I am conducting under the direction of my doctoral dissertation advisor, Dr. Elizabeth Mahler. This form will tell you about the study, but I will explain it to you first. You may ask me any questions that you have. When you are ready to make a decision, you may tell me if you want to participate or not. You do not have to participate if you do not want to. If you decide to participate, I will ask you to sign this statement and will give you a copy to keep.

You are being asked to participate in this study because you are a high school administrator at a school that is in the early implementation phase (1-4 years) of one-to-one computing. There will be 8-10 school administrators from high schools in Massachusetts in this study. The purpose of this research is to understand the leadership strategies used by Massachusetts high school administrators during the early implementation (first four years) of one-to-one computing. If you decide to participate in this study, you will be asked to take part in one interview that should last 60-90 minutes. Ten of those minutes will be spent going over this informed consent form. You will be interviewed in a location and time that is convenient for you. Interviews will be audio recorded and transcribed. Once all of the participant interviews are finished, I will e-mail you a copy of my findings to review. You will be asked to provide feedback if you wish via e-mail or telephone. When possible, you will be asked to provide a brief tour of the school to provide a general context to the school environment.

There are no expected risks and/or discomforts related with this study. I will keep interviews at ninety minutes or under in order to avoid inconvenience to you. There will be no direct benefit for taking part in this study. However, I am a highly-interested listener who cares deeply about your experiences. Participation will provide you with an opportunity to reflect on your experiences. Information learned from this study may help other school leaders to better understand the leadership strategies needed in a one-to-one computing.

Your part in this study will be confidential. Only I will see the information about you. No reports or publications will use information that will identify you in any way. I will review interview transcripts. I will remove all identifying information, including the names of people and places. I will replace these identifiers with code names. All data will be kept in a locked file...
cabinet. This consent form will be kept in a locked drawer for three years after completion of this study. All other identifiable data will be destroyed within one year of completion of this study. In rare cases, authorized people may request to see research information about you and other people in this study. This is done to make sure the research is done properly. I will only permit people who are authorized by the Northeastern University Institutional Review Board to see this information.

There is no compensation for participation. Your participation in this research is entirely voluntary. You do not have to participate if you do not want to. Even if you start the study, you may quit at any time. If you do not participate or if you decide to quit, you will not lose any rights or benefits that you would otherwise have as a school leader in your school district.

If you have any questions or problems, please contact me at 617-759-5309 (mobile) or via email at mccallion.m@husky.neu.edu. You may also contact Dr. Elizabeth Mahler at e.mahler@neu.edu.

**If you have any questions about your rights in this research** you may contact Nan C. Regina, Director, Human Subject Research Protection, 960 Renaissance Park, Northeastern University, Boston, MA 02115. Tel: 617-373-4588, email: irb@neu.edu. You may call anonymously if you wish.

I agree to take part in this research.

____________________________________  ______________________________
Signature of person agreeing to take part  Date

Printed name of person above

____________________________________  ______________________________
Signature of person who explained the study to the participant above and obtained consent  Date

Maureen Cohen

Printed name of person above
Appendix C: Participant Reminder Recruitment E-mail
(Sent with attached recruitment letter in Appendix D and attached questionnaire in Appendix A)

Text of Reminder Recruitment Email

Dear [First Name],

I am writing to follow-up on an email I sent a few weeks ago inviting you to participate in my doctoral thesis study through Northeastern University. As a reminder, the purpose of my study is to understand the leadership strategies used by high school administrators during the early implementation (first four years) of one-to-one computing.

I would greatly value your thoughts about your experience and I hope that you will consider participating. Please see the attached recruitment letter for more details on the process and a brief questionnaire for contact information. Your participation would be kept confidential; however, your insights will add value to providing comprehensive results of leadership strategies used in one-to-one implementation that other school leaders could benefit from.

Please fill out the attached questionnaire and email it to me at my student address mccallion.m@husky.neu.edu only if you wish to volunteer to participate.

Thank you in advance for your consideration in participation in my study. I look forward to your response.

Sincerely,

Maureen Cohen
[DATE]

Dear [Potential Participant Name],

My name is Maureen Cohen and I am a doctoral student at Northeastern University and preparing to conduct research for my dissertation. In order to answer my research questions, I am recruiting high school administrators who have been leaders during an implementation of one-to-one computing. The purpose of my study is to understand the leadership strategies used by Massachusetts high school administrators during the early implementation (first four years) of one-to-one computing.

Selected participants will engage in one audio-recorded interview, approximately 60-90 minutes in length. Identities will be kept completely confidential. Participation in this study is voluntary and participation or non-participation will not affect your status in any way. If you decide to participate, you may withdraw at any time without penalty. When possible, a brief tour of the school would be helpful to provide a greater context to the one-to-one computing environment.

Once all interviews are concluded and findings have been prepared, an executive summary of findings will be emailed to participants for their review for accuracy and to provide feedback. Participants will be asked to e-mail comments or concerns to the researcher no later than one week after receipt of the summary. Findings, including interview excerpts and field notes (without identifying information), will be published in my dissertation and other publications.

Participants must feel comfortable communicating and participating in the informed consent process. I have also attached a basic questionnaire that will provide me with your contact information if you choose to participate. If you are comfortable with the nature and purpose of this study, are interested in reflecting on your experiences, and would like to participate in research that hopes to inform the work of school administrators in leading a one-to-one computing initiative, please respond to me using my e-mail: mccallion.m@husky.neu.edu by [DATE].

Thank you in advance for your interest!

Maureen Cohen
617-759-5309
Appendix E: Interview Guide

Demographic Information

Name_________________________ School Position_________________

# of years in this position________ # of years of the 1:1 program_____

Pseudonym_____________________

Introduction/Warm-Up:
Thank you so much for being part of this research. The purpose of this study is to understand the leadership strategies used by high school administrators during the early implementation (first four years) of one-to-one computing. I plan to ask you several questions that answer my research questions from an interview guide. I will be using this recording device to capture your responses to my questions. Before we move on, do you agree to be recorded?

I may also take written notes during the interview. All of the responses will be kept confidential and a pseudonym will be used when quoting from the notes or transcript. To meet our human subjects requirements, I have emailed you an informed consent document regarding the research, which indicates that all of the information is kept confidential, your participation is voluntary and you may withdraw participation at anytime, and I do not intend to inflict any harm. Do you have any questions about the interview process or the consent document that was sent to you?

I have planned for the interview to last between 60-90 minutes. If it is okay with you, I would like to begin with a few introductory questions and then move into my research. Do you have any questions at this time?

Warm-up questions:
1. How many years you have been a school administrator and how long you have been in your current position?

2. Tell me what you most like about being a high school administrator.

3. Please provide some details on the initial process and transition to one-to-one computing.
RQ1: How do high school leaders describe their experience leading the implementation of one-to-one computing at their school?

4. Please describe the greatest successes you have seen as a result of the one-to-one computing initiative.

5. Please describe some of the challenges or barriers in the implementation of one-to-one computing.

Follow Up: What was done to overcome these challenges or barriers?

6. How has your role as a school leader changed or remained the same since the implementation of the one-to-one computing initiative?

7. If you were to give advice to a colleague who was about to lead a one-to-one initiative, how would you advise them?
RQ2: What is the nature of school-based leadership strategies high school administrators describe using in the early implementation of one-to-one computing?
Now I’d like to ask some questions about the nature of the leadership strategies used during one-to-one implementation.

*Transformational Leadership*
8. First, please tell me about the vision for the one-to-one computing initiative?

Follow-up: How was it communicated?

9. Please describe any practices that promoted cooperation among staff in working towards goals related to one-to-one computing.

10. If I asked your teachers to describe one way that you supported them individually and personally, in the one-to-one computing initiative, what would they say?

*Transactional Leadership*
11. Please describe if any incentives were provided to educators to reward them for their active participation in the one-to-one computing initiative.

12. How do you monitor or supervise the implementation of technology integration?

Follow-up: What happens if educators did not meet expectations for supporting the one-to-one initiative?
Instructional Leadership
13. How does one-to-one computing fit into the vision for teaching and learning for your school?

14. What actions have you needed to take to manage the integration of technology into the instructional program of curriculum, instruction, and assessment?

Follow-up: How have you used the supervision and evaluation process to support technology integration?

Distributed Leadership
15. Please share if other people were instrumental in implementing and leading the one-to-one initiative?

Follow-up:
   a. Why were these people also involved?

   b. How did they help you in leading the initiative?

16. Did you have a role in helping people to work together? If so, how?

   Follow-up: In what ways did these people work with each other to implement the goals for the initiative?

17. Describe any structures that exist, both formal and informal, for educator collaboration that have been used for collaboration around technology integration?
Closing:
We are almost at the end of the interview. Before we finish, I have one last question.

18. Is there anything else you would like to share with me about your experience leading a one-to-one implementation?

Thank you so much for taking the time to speak openly with me about your thoughts and experiences. Once I have finished my interviews, I will contact you so you may review a draft of my findings, in the form of an executive summary and give any recommendations for improvement.
### Appendix F: Observational Protocol

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Appendix G: Interim Summary Form

(Adapted from Miles & Huberman, 1994, p. 78)

1. Main themes, impressions, summary statements about what is going on in the school site with the leadership team

2. Explanations, speculations, hypotheses about what is going on at the school site with the leadership team

3. Alternative explanations, minority reports, disagreements about what is going on at the school site with the leadership team

4. Next steps for data collection, including follow-up questions, actions, and general directions for future work

5. Implications for revision and updating of coding scheme