Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School

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BOSTON COLLEGE
Lynch School of Education
Department of Teacher Education, Special Education, and Curriculum and Instruction

USING ECOLOGICAL LENS TO EXPLORE A ONE-TO-ONE LAPTOP PROGRAM INTEGRATION IN CLASSROOMS WITH ENGLISH LANGUAGE LEARNERS IN AN URBAN MIDDLE SCHOOL

Dissertation

by

GÜLİZ TURGUT

submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School

By Güliz Turgut

Lillie Richardson Albert, Ph.D., Chair

Abstract

Currently, one of the most popular technology initiatives used in schools to prepare information- and technology-literate students is one-to-one laptop programs. However, limited research studies have investigated factors involved in laptop programs’ integration process in schools from various participant perspectives by specifically focusing on ELL students and their needs. Through an ecological lens, this study investigated a one-to-one laptop program integrated into ESL classrooms in an urban middle school, which sustained the program for 6 years. The study included multiple perspectives of various school community members to capture an accurate account of factors necessary for the program’s implementation and continuation.

This study used a qualitative, single-case research design with exploratory purposes to investigate the multi-level nature of a one-to-one laptop program. Ecology was used as a lens to interpret data and show the relations between living (biotic) and nonliving (abiotic) factors in the program. In-depth data was collected through interviews, classroom observations, field notes, and archives. Collected data were analyzed through constructivist grounded theory using open, axial, and selective coding.

The study demonstrated that multiple factors interact with each other and impact the laptop initiative in ESL classrooms. These factors and their interaction were visually represented as a conceptual model. Factors identified in findings were discussed under three main themes: financial, technical and leadership factors.

Findings related to financial factors indicated that technical issues increased over the years due to the financial problems, which influenced the instructional use of laptops unfavorably and amplified doubts about the future of the program. Results related to leadership highlighted
the importance of having multiple leaderships and allowing the participation of various school members in the decision making process. Results also showed that the federal mandates on achievement influenced the laptop program by changing the vision of the school from teaching with technology to improving instruction and achievement scores on standardized tests. Finally, findings emphasized the importance of including ESL leadership in the laptop program from the very beginning to adjust it to the needs of ESL students. Implications for teachers, administrators, educational researchers, policy makers, and future research are discussed.
DEDICATION

This study is dedicated to my amazing sister Yıldız Turgut, who supported me in every step of my life. I love you and thank you for your endless love and support.
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I would like to thank to the current and previous teachers and administrators of “Park Middle School” who permitted me to enter their school and classrooms and shared their experiences with me. I am also grateful to the community leaders who were actively involved in the school and agreed to participate in the study. I appreciate the generous amount of time you provided.

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CHAPTER 1
INTRODUCTION

The 21st century not only has changed existing skills a 21st century citizen should have but also has introduced additional ones. Currently, an important skill is not necessarily “having information stored in one’s memory” (Molnar, 1997, p.63), but it is accessing information fast and knowing how to interpret and use it effectively. Such newly introduced skills reshape the society and social institutions, including schools (Leu, Kinzer, Coiro, & Cammack, 2004). For instance, schools are now also responsible for teaching technology literacy and preparing students for the technology saturated world in which they will live (ISTE 2007; Molnar, 1997). In other words, the focus of teaching and learning in schools is no longer to educate solely book-literate individuals. The focus is also to educate information- and technology-literate citizens who can determine the extent of information needed, access it effectively and efficiently, evaluate it critically, and incorporate it into one’s knowledge base (American Library Association, 2000). Furthermore, the accessed, evaluated, and incorporated information needs to be effectively used to accomplish a specific purpose and understand the economic, legal, and social issues surrounding the use of information (American Library Association, 2000). A way to prepare such information- and technology-literate individuals is using the 21st century tools—technology—during their educational experiences.

The United States has been increasingly investing in instructional technology to integrate technology into schools. Despite various educational technologies available, such as flip cameras, Smart Boards, Kindle, and most recently the iPad, investments have largely been in computers and the Internet. During the 1980s, approximately $2 billion was spent on microcomputers in public schools (Woodward, 2001). During the 2003-2004 school year, districts spent $7.87 billion on technological equipment (Hew & Brush, 2007). In 2004, the U.S. Department of Education
provided state funds to “facilitate the comprehensive and integrated use of educational technology into instruction and curricula to improve teaching and student achievement” (Lawless & Pellegrino, 2007, p. 577). Heavy investment in technology decreased ratios of student access to computers. The student-computer ratio was 168:1 in 1983 (Anderson & Ronnkvist, 1999), which decreased to 5:1 in 2003 (Education Week, 2004). In 2005, it further decreased to 3.8:1 (Market Data Retrieval, 2005). In Massachusetts, specifically, student-computer ratio decreased from 6.9:1 in 2004 to 4.9:1 in 2005 and to 4.0:1 in 2008 (MDE, 2008a). Although the majority of computers were initially installed in computer labs, since the 1980s, there have been more computers in classrooms (Jerald & Orlofsky, 1999). Access to the Internet and computers in classrooms continues to increase each year.

The increase in the number of computers in schools, but specifically in classrooms, is because they became smaller and more affordable. Over the years, while computers have become more affordable and smaller due to enhancements in technology, the Internet has become faster, cheaper, and wireless. These enhancements in access, quality, and speed in computers and the Internet led to a shift from desktop to laptop computers in schools. Education Week (2004) notes that more than 12% of the nation’s schools have used laptops as an instructional tool. Internet connection is increasing as more desktop and laptop computers are used in classrooms. For instance, 98% of nation’s schools have Internet access (Education Week, 2004). However, due to the increasing use of laptop computers, wireless Internet connection is increasing. Forty-five percent of public schools have wireless Internet connection (NCES, 2007).

Despite the increase in access to and quality of computers, these favorable conditions do not guarantee its meaningful integration into curriculum and instruction. Major factors limiting the integration process could be discussed as school-level and national-level factors. While some of these factors are biotic (living) entities such as teachers, some are abiotic (non-living) such as
the Internet connection. School-level biotic and abiotic factors, which may inhibit technology integration, include teachers, leadership, and emphasis put on quantified use of technology rather than qualified use. National-level factors include national policies that are abiotic such as No Child Left Behind and standardized tests. Related to the school-level factors, it was reported that many teachers show reluctance to integrate computers into their classroom due to their beliefs, pedagogies, readiness, technological skills, and lack of proper professional development (Hadley & Sheingold, 1993; Hernandez-Ramos, 2005; Inan & Lowther, 2010; Office of Educational Technology, 2004; Wenglinsky, 2005). In addition to reluctant teachers, the lack of informed and committed leadership promoting meaningful technology integration also hinders the integration process in schools (Bebell & Kay, 2010; Drayton, Falk, Stroud, Hobbs, & Hammerman, 2010; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010). Another factor that endangers meaningful integration is the overemphasis put on quantified, rather than qualified use of technology. Due to the emphasis on quantity, computers are used for drill and practice activities, or are used for the sake of using them (Becker, 2001; Cuban, 2001).

In addition to the school-level factors, national policies such as the No Child Left Behind Act and its impact on teaching practices in classrooms may also serve as a barrier to technology integration. Teachers’ technology use might be limited to drill and practice activities and preparation for standardized tests (Becker, 2001; Donahue, Finnegan, Lutkus, Allen, & Campbell, 2001; Lowther et al., 2003) due to the stressful, high accountability environment NCLB created on schools, especially on urban schools. Finally, using standardized tests to assess student outcomes and evaluate effectiveness of technology might indirectly function as a barrier for technology integration. Since standardized tests attempt to measure a broad domain of abilities, rather than specific skills, knowledge, and critical as well as creative thinking, they may present invalid results about student achievement and technology’s impact on student outcomes (McNabb
et al., 1999; Russell, 2002). Reflecting on standardized test results, school officials may believe that technology does not impact student learning and achievement positively. Informed by these potentially inaccurate results, schools and districts may decide to discontinue the technology integration after implementing it for a limited period.

The improvements in technology regarding the increasing investment, quality, affordability, as well as the barriers in its integration in educational settings have shaped research agendas in the field. Research interest has shifted from desktops, computer labs, and wired Internet connection to laptops, classroom computers, and wireless Internet connection. For example, recently, research has concentrated on portable technologies such as laptops with wireless Internet connection, which can be used anywhere in the school rather than being restricted to computer labs (Gulek & Demirtas, 2005; Russell, Bebell, & Higgins, 2004). Therefore, the most popular educational technology increasingly investigated in schools is one-to-one laptop programs, also known as ubiquitous computing.

However, upon realizing that increased access to technology does not guarantee its integration in classrooms (Becker, 2000; Cuban, 2001), research studies have begun to investigate factors that limit the integration of one-to-one laptops (Garthwait & Weller, 2005; Lowther, Ross, & Morrison, 2003; Silvernail & Lane, 2004). Finally, due to the educational policies and their increased emphasis on achievement and standards, research studies also have started to investigate laptop programs and their impact on student achievement (Bebell & O’Dwyer, 2010; Franklin & Bolick, 2007; Gulek & Demirtas, 2005; Russell, 2002; Russell, Bebell, & Higgins, 2004; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010). Despite the augmenting popularity of one-to-one laptop programs, majority of recent research on these initiatives has been limited to their impact on student achievement due to the educational policies and their emphasis on achievement. Within this busy research agenda on one-to-one laptops, use of laptops
specifically with English Language Learning (ELL) student population is being lost.

Statement of the Problem

Popularity of one-to-one laptop programs has increased throughout the country with the improved access to affordable and powerful laptops in classrooms and cheaper and faster wireless Internet connection (Hirsch, 2005; Greaves, 2008). In 1-to-1 laptop programs, all students in a class or school receive laptop computers to use throughout a school day and, in most programs laptops can be taken home (Grimes & Warschauer, 2008). The goal of one-to-one laptop initiative is to improve achievement among all student groups by providing equal access to technology-rich environments in which technology is no longer shared within groups (Gulek & Demirtas, 2005). Laptop programs are believed to provide opportunities to integrate technology more naturally into instruction by eliminating computer sharing, computer lab scheduling, student transitioning, and unequal computer access (Sandholtz, Ringstaff, & Dwyer, 1997; Warschauer, Knobel, & Stone, 2004). Some early adopters of ubiquitous computing are Beaufort County in South Carolina, Clovis Unified School District in California, and New York City Community School District Six. Some states such as Maine, Virginia, Texas, South Dakota, and Pennsylvania are implementing one-to-one laptop programs statewide (Gulek & Demirtas, 2005). While Henrico County Public Schools was one of the first large school district to implement one-to-one laptop program in its middle and high schools in 2001, Maine was the first state in the nation to offer statewide laptop program to all of its middle schools starting in 2002.

Current studies about one-to-one laptop programs have largely focused on student achievement scores, frequency of technology use, various uses of technology, motivation, or comparison of classrooms with individual laptops and group computers (Hew & Brush, 2007; Lei & Zhao, 2008; Russell et al., 2004; Shapley et al., 2010). However, studies that specifically examined the impact of laptop programs on English language learners are extremely limited.
Although some studies evaluated laptop programs in urban school environments with diverse learners, they focused and reported their findings related to students’ racial demographics, rather than linguistic demographics (Donovan, Green, & Hartley, 2010; Grimes & Warschauer, 2008; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010; Suhr, Hernandez, Grimes, & Warschauer, 2010). There are some studies that targeted ELL student population and their interaction with technology, but these studies are not specific to one-to-one laptop environments (Chang & Kim, 2009; Dalton et al., 2011; Kim & Chang, 2010; Proctor et al., 2011). Due to the lack of research examining ELL students and their interaction with laptops in ubiquitous computing environments, there is a need for research investigating the laptop initiatives targeting ELL populations and their needs.

Another limitation of the existing studies on ubiquitous computing is that they focused largely on teacher characteristics and access to technology, support, and infrastructure (Bebell & Kay, 2010; Garthwait, & Weller, 2005; Lowther et al., 2003; Shapley et al., 2010). However, because these variables have been examined in a list form, they are presented in isolation from other variables or from the general school setting (O’Dwyer, Russell, & Bebel, 2004; Zhao & Frank 2003). In order to provide a holistic view of the technology integration process, it is critical to explore factors in an interrelated fashion (Tondeur, Valcke, & Van Braak, 2008; Zhao & Frank 2003). One way to explore factors in an interrelated fashion is investigating various variables concurrently. As Inan and Lowther (2010) argue, data collected from principals, parents, and students would provide diverse perspectives and useful insights into understanding the complexity of technology integration in K-12 schools. Moreover, Hew and Brush (2007) suggest that future studies “should expand the focus to include the examination of other stakeholders in the school such as the school administrators and leadership, as well as the broader contexts such as decision-makers outside the school” (p. 247). Finally, Cuban (2001) states that internal (i.e.,
school staff), and external (i.e., decision-makers outside the school) participants are necessary for technology integration in a school.

In addition to concurrently investigating various factors necessary for laptop programs specifically for ELL students, it is also necessary to investigate these factors for the implementation, as well as the sustainability processes. Most studies on integration of ubiquitous computing have focused only on the initial years of the implementation (Drayton et al., 2010; Greaves, 2008). For instance, when Drayton et al. (2010) analyzed a literature review by Stroud (2008), they found that 67% of the studies on the ubiquitous computing program reported on the first two years of the implementation. Drayton et al. (2010) stated, “Given this backdrop, information from schools that have experience with ubiquitous computing over a longer period of time is of particular value as a source of insight about the innovation over time” (p. 7). Therefore, investigating schools that successfully established and sustained the laptop initiative for more than two years will provide valuable information for schools and districts planning to adapt a similar initiative.

To summarize, there is a need for research study in the field of ubiquitous computing that investigates factors necessary to not only implement but also sustain one-to-one laptop initiatives in urban school environments serving high rates of ELL student population. These factors should be considered from multiple perspectives and should be presented in an interrelated fashion.

Purpose of the Study

Considering the constant investment in instructional technology and the increasing popularity of one-to-one laptop programs due to easier and cheaper access to computers, the purpose of this study was to investigate a one-to-one laptop program implementation that was sustained for more than two years in an ethnically, culturally, and linguistically diverse urban middle-school. Additionally, rather than focusing only on teachers as participants, this study
examined the laptop program and its integration from multiple perspectives by including as many members of the school community as possible. The school community was not limited to just school personnel but it also included parents, technology leaders, and community leaders. Through the participation of all school community members, this study investigated factors contributing to the sustainable implementation of one-to-one laptop program and the relation between these participants and factors in a holistic manner from different perspectives with an emphasis on ELL students.

In order to meet the goals of this study, a qualitative, single-case study was used. As Merriam (1998) explains, in a case study “by concentrating on a single phenomenon or entity, the researcher aims to uncover the interaction of significant factors characteristic of the phenomenon. The case study focuses on holistic description and explanation” (p. 29). This case study had exploratory purposes to examine a situation in which little theory was available or measurement was unclear (Yin, 2003). The present study had embedded units to investigate the multi-level nature of the one-to-one laptop integration and sustainability process from different participants’ perspectives in the school community. Ecology was used as a lens to interpret data and show the relations between participants and factors in a laptop initiative. In-depth data was collected through interviews, classroom observations, field notes, and archival data. Collected data was analyzed based on constructivist grounded theory (Charmaz, 2000) using open coding, axial coding, and selective coding as described by Strauss and Corbin (1990).

Research Questions

The goal of this study was to understand how a one-to-one laptop initiative was implemented in classrooms with ELL students in an urban middle school. Specifically, this study examined the following questions:

1) Through the lens of school administrators, teacher leaders, ESL teachers, parents, students,
technology leaders, and technology personnel, what biotic and abiotic factors contribute to the implementation of a one-to-one laptop program in ESL classrooms in an urban middle school?

2) How do biotic and abiotic factors interact in ESL classrooms in an urban middle school?

3) What is the current state of the one-to-one laptop program in ESL classrooms in an urban middle school after the end of initial establishment process?

Importance of the Study

The process of integrating and implementing computers in classrooms has been well studied. However, findings from these studies cannot be generalized to one-to-one laptop environments due to differences in access, purpose, and environments. Although some qualitative and quantitative research studies have been conducted to understand integration of one-to-one laptops (Burns & Polman, 2006; Drayton, et al., 2010; Grimes & Warschauer, 2008; Lei, 2010; Penuel, 2006; Zhao, & Frank, 2003; Zhao, Pugh, Sheldon, & Byers, 2002), there are five major limitations of these studies.

The first limitation is that majority of existing one-to-one laptop studies examined factors impacting laptop integration with limited participants, whom were mostly either teachers or principals. However, inclusion of other within-school members such as principals, parents, and students as well as out-of-school members such as stakeholders would provide useful insights for understanding the complexity of technology integration in K-12 schools (Cuban, 2001; Hew & Brush, 2007; Inan & Lowther, 2010). The second limitation is about investigating the relations between various factors necessary for technology integration. While existing studies on technology integration already identified some essential factors, they mostly overlooked the relation and interaction between them. When the relations between multi-faceted factors are excluded, integration and innovation processes are oversimplified and presented as isolated and linear entities (Zhao & Frank, 2003). Such oversimplification, isolation, and linearity do not
represent the real complex and simultaneous processes; hence, they do not provide an accurate picture of the innovation. Specific to one-to-one laptop research field, only one study by Lei (2010) was identified in literature that examined factors and their relation with each other.

The third limitation of is that available studies on laptop programs commonly examined the initial two years of laptop programs (Drayton et al, 2010; Greaves, 2008; Lei, 2010). Therefore, there is a need for research that examines programs that already completed initial few years of their establishment period and report findings about the changes programs experience over the years. The fourth limitation of existing research investigating integration of one-to-one laptop programs is the setting of schools. The settings of existing studies have typically been suburban and rural areas, rather than urban areas. For instance, in his dissertation study Danielsen (2009) focused on the one-to-one laptop integration process in 3 school districts located in rural areas, where only one of the school districts had more than 10% non-Caucasian student population. The study did not provide detailed demographics of students and their socio-economic background. Other studies conducted in urban areas, investigating the one-to-one laptop integration process are limited in number. Therefore, there is a need for research to investigate factors involved in the one-to-one laptop integration process in schools located in urban schools and from as many different perspectives as possible.

Finally, very limited, if any, existing one-to-one laptop studies examined the laptop programs in relation to English language learners. Although some studies evaluated laptop programs in urban school environments with diverse learners, they focused on the general student population. Some of the studies discussed their findings related to students’ racial demographics, rather than linguistic demographics (Donovan, Green, & Hartley, 2010; Grimes & Warschauer, 2008; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010; Suhr, Hernandez, Grimes, & Warschauer, 2010). Due to the lack of research examining ELL students and their interaction with
laptops in ubiquitous computing environments, there is a need for research investigating the laptop initiatives targeting ELL populations and their needs.

This study was important to fill the three major gaps in the existing one-to-one laptop research field. The study discussed various factors and their interrelated relations involved in a laptop program. The discussion of these factors and their relations could help to meaningfully interpret studies that investigate impact of laptop programs on students and outcomes. Additionally, the complicated nature of the laptop programs could be represented more accurately by discussing the relation among various factors. Finally, by focusing on linguistically diverse student population, which currently constitutes a large number of the total U.S. student population, the study provided applicable and realistic implications of ubiquitous computing for ELL student population.

Theoretical Framework

The theoretical framework of this study is Ecology, which is the scientific study of organisms and environment (Avila, 1995). Therefore, ecology examines not only the holistic environment but also its smaller parts. It also studies the relation between the smaller parts and the whole environment (Avila, 1995). The parts and wholes in ecology are hierarchically arranged. The biggest concept in the hierarchical order is Biosphere, such as earth, and the smallest concept is organism, such as a single pine tree on Earth. In their study, Zhao and Frank (2003) explain that existing literature on technology integration in classrooms discusses factors by isolating them from each other and taking them out of context. They propose that the ecology, specifically the concept of an ecosystem, can be a powerful framework to examine the organic and interconnected process since it examines the interactions of the parts with each other as well as their interactions with the whole. In the following section, the concepts of ecology, specifically ecosystem, will be discussed in detail and it will be applied to this study.
Ecological Framework

The biggest concept in ecology is the Biosphere, which could be considered to be the planet Earth. The next sub-concept within the Biosphere is Biomes. Biomes are distinct communities created based on the dominant type of vegetation that live in a specific environment, such as forest, aquatic, desert, grasslands, and tundra (Avila, 1995). The next smaller concept within the Biome is ecosystems (Avila, 1995). Ecosystems, such as rainforests, include living (biotic) and non-living (abiotic) components (Avila, 1995). In a rainforest ecosystem, there are biotic components such as trees, animals, and plants and abiotic components such as soil, air, and water. There is a constant change and interaction among these biotic and abiotic components. Therefore, an ecosystem is an open and dynamic system. Ecosystem researchers investigate the interaction and dynamic system between biotic and abiotic components. For instance, while studying the biotic and abiotic components in a rainforest, ecosystem researchers examine how trees, plants and animals interact with the air, soil, and water; leading to an understanding of the life cycle in rainforests.

Although ecosystems change constantly, they have the ability to achieve homeostasis, or internal equilibrium. The homeostasis of the ecosystem may change by abolition of existing or introduction of new components. For instance, when water resources gradually decrease in a forest, biotic components of the forest, such as trees or animals, may adjust to this new environment. However, when the water resources decrease suddenly the homeostasis changes drastically, leaving less time and chance for biotic components to adjust to the new environment.

Besides the slow or fast abolition of existing components, ecosystems also change through introduction of new components. When new species are introduced to an ecosystem they are considered as invaders. The invader interacts with the existing components of the ecosystem trying to establish itself and its role in the new environment. Depending on the interaction
between the invader and the existing species, several consequences may occur (Zhao & Frank, 2003). The invader may spread into the new environment and force existing species to become extinct. A second result could be that both invader and existing species become compatible and survive, or the ecosystem may become dysfunctional overtime. Thirdly, invader may not survive in the new environment and becomes extinct. A final result can be that both the invader and the existing species evolve and acquire new properties (Zhao & Frank, 2003).

A subcomponent of the ecosystem is community, which consists of only biotic components (Avila, 1995). In other words, while the rainforest ecosystem includes both animals (biotic) and water (abiotic), a community includes only populations of living things (biotic). Within a community, there are different populations or species of living things. Populations are groups of interbreeding species and occupy a specific, geographically defined area (Avila, 1995). For instance, they can be a population of trees and animals. Considering the hierarchy in the ecology, the population of trees can further be thought of as population of pine trees and a population of oak trees. Within these communities, the species that are common are called dominants (Zhao & Frank, 2003). Besides dominant species, there are also rare species. In the ecosystem, the rare species are as important as the dominant species due to their unique roles. These roles are called niche (Avila, 1995). For instance, the niches of earthworms are to aerate the soil and fertilize it with their waste. Even though earthworms might be rare species, they are essential for a healthy rainforest ecosystem. All biotic forms have niches and, hence, are important. However, the most important specie in an ecosystem is called keystone specie. Keystone species can be dominant or rare species. These keystone species have a key and controlling influence over the system (Avila, 1995).

Finally, related to abiotic components in ecosystems, major abiotic components are sunlight, water, and mineral cycles. Energy from the sun is one of the most important components
(Avila, 1995). Without solar energy, water cycles do not occur, which impact the weather system and ocean currents, which in return affects the fertility of the soil. In barren soil, grass does not grow and this impacts animals that feed on grass. Without animals that feed on grass, animals that prey grass-eating animals go extinct (Avila, 1995).

**Application of Ecological Framework to the Study**

Using the ecological framework, components of the ecosystem can be applied to school environments. Biomes can be considered as school districts that include multiple schools. Similar to the ecological biomes such as deserts, scrublands, grasslands, forests, and tundras, some school districts may have richer sources than other districts. Within a biome, individual schools will be considered as ecosystems with biotic and abiotic components important for establishing and continuing a one-to-one laptop initiative. The biotic components would be administrators, teachers, technology staff, students, and parents. The abiotic components would be laptops, funding, or physical setting of classrooms. As in an ecosystem, where the biotic and abiotic components interact with each other, human personnel and physical objects interact with each other in a school ecosystem as well.

Within the school ecosystem, the community, which is only made up of biotic components, has different population groups. For instance, school administrators such as principal and co-principal form a different population than teachers or students. Teachers could be further grouped into mainstream classroom teachers and ESL classroom teachers. Similarly, students could also be grouped into native-speakers of English and bilingual students. Despite being grouped in different populations, these groups form the school community and have unique niches. All population groups forming the school community interact with each other for educational purposes.

In the school community, while students may be the dominant group due to their large
numbers, teachers are the keystone species as they are directly involved in teaching and integrating technology into classrooms (Bebell & Kay, 2010; Shapley et al., 2010; Zhao & Frank, 2003). If teachers do not value technology or if their pedagogies do not match the pedagogies new technologies bring with them, technology integration into classrooms may not happen meaningfully (Bebell, Russell, & O’Dwyer, 2004; Garthwait & Weller, 2005; Windschitl & Sahl, 2002). Within a school community, administrators and technology staff will be considered as rare species. Despite being rare species, administrators and technology staff have unique niches that cannot be underestimated. Without the school leaders’ leadership and support, and the technology staffs’ support and knowledge, the school ecosystem would not function in a healthy manner.

In terms of homeostasis, or internal equilibrium, laptops will be viewed as the new component introduced into the school ecosystem, which impacts the roles of existing biotic forms (administrators, teachers, students). Therefore, technology can be an invader. However, in order to be an invader, technology needs to be accepted as a biotic component in the ecosystem as Zhao and Frank (2003) suggest. Zhao and Frank explain that although technologies are not exactly the same as living creatures, they follow a similar process of evolution. They argue that, similar to biological creatures, the fittest technologies that meet the human needs survive while the weaker technologies go extinct. Therefore, in order to survive, technology needs to evolve based on the changing human needs.

Contrary to Zhao and Frank’s (2003) identification of computers as biotic forms, this study considers laptops as abiotic forms because it is the humans, their beliefs, pedagogies, ideologies, and practices that turn technology into a biotic form. Although Zhao and Frank (2003) accept that “… diverse human needs, experiences, and talents lead to the development of diverse technologies” (p. 812), they disregard this human touch on computers and argue that computers are biotic forms. In this study, it is accepted that without the human touch, computers are only
machines, hence abiotic forms. Based on this discussion, the invaders in this study are not computers, but human beliefs and ideologies engraved into technologies and their use.

Returning to the discussion about the survival of invader species, in order for the invader to survive without unbalancing the healthy functioning ecosystem, both the community and the technology need to adapt to each other. However, this does not frequently happen in schools. In order to survive in their new environment, technology initiatives need to become compatible with their new environment. However, compatibility of laptops as new species is not enough. Existing species should also be compatible with the new species. In other words, if teachers do not confirm one-to-one laptop programs, such programs’ establishment or continuation will be unsuccessful.

In terms of abiotic factors in an ecosystem, sunlight, water, and mineral cycles can be applied to the school context as funding, technical equipment, and professional development. Without enough funding (sunlight), necessary equipment cannot be purchased, which endangers the establishment of the program or its continuation in the future. However, having funding does not guarantee technology integration. Similar to importance of water and having it clean, having technical equipment that are in good and working condition enables teachers and students to use laptops for teaching and learning without any problems and interruptions. Finally, teachers also need professional development (mineral cycles), through which they can have a better understanding of available technologies, how to use them, and how to integrate them.

Definition of Terms

Technology: The research on technology use in schools focuses primarily on computers and/or Internet usage (Franklin & Bolick, 2007). Therefore, throughout this study, the terms technology and computers are used interchangeably within the context of K-12 schools in the United States. However, difference between desktop computers and laptop computers is established by labeling the former as ‘computers’ and the latter as ‘laptops.’
Technology Integration: There is still an ongoing debate about the standard definition of technology integration (Bebell, Russell, & O’Dwyer, 2004). Despite the lack of a clear standard definition, this literature review and study follows the definition Technology in Schools Taskforce (2003) provides:

Technology integration is the incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools. Technology resources are computers and specialized software, network-based communication systems, and other equipment and infrastructure. Practices include collaborative work and communication, Internet-based research, remote access to instrumentation, network-based transmission and retrieval of data, and other methods. This definition is not in itself sufficient to describe successful integration: it is important that integration be routine, seamless, and both efficient and effective in supporting school goals and purposes (p. 74-97).

One-to-One Laptop Initiative: The use of one laptop per one student in a classroom or whole school throughout the school day and, in most programs, at home (Warschauer, 2007). Students have continuous access to the laptop and wireless network at school and have the opportunity to take the computer home. Another term used for the initiative is ubiquitous computing. In this study and literature review both terms will be used interchangeably.

Overview of the Chapters

This dissertation is comprised of five chapters. Chapter One provides an overview of the study by stating the problem, explaining the purpose and importance of the study, and presenting research questions. Chapter Two, the Literature Review, has four sections. The first section presents a historical review of technology integration in education by examining federal policies and standards. The second section discusses factors that could inhibit technology integration. The third section presents three conceptual works on the technology integration process. Finally, the fourth section discusses a study with ELL students who had access to individual computers for an intervention study. Chapter Three, Methodology, describes the case study method and the rationale for using it in this study. The chapter also includes information on data collection and
analysis procedures.

Chapter Four and Five report findings from data analysis. Chapter Four presents financial and technical factors. Chapter Five discusses the leadership factors, which are further divided into four groups. The four leadership factors are school leadership, technology leadership, teacher leadership, and ESL leadership. Each leadership’s roles are explained. Moreover, in both Chapter Four and Five the current states of the factors are explained.

In Chapter Six, a summary and discussion of findings is provided. It also provides implications for schools and acknowledges limitations of the study. Finally, Chapter Six concludes with recommendations for future research.
CHAPTER 2

REVIEW OF THE LITERATURE

This literature review is organized into four sections. The first section serves as the historical background describing the federal initiatives that encouraged the computer integration in education. This section also discusses the national standards created to guide teachers, students, and school administrators throughout the technology integration process. The second part of the chapter discusses factors that inhibit technology integration. These factors include teacher related factors, leadership, emphasis given to the amount of technology use rather than quality, No Child Left Behind legislation, and standardized tests. The third section of the chapter presents three models that discuss factors promoting technology integration. The first model explains what teachers need to know to integrate and use technology meaningfully in their classrooms. The second presents the integration process at the classroom level, while the third discusses the integration at the school level.

Finally, the fourth section of Chapter 2 was originally planned to synthesize research on one-to-one laptop programs and ELL students. However, there was very limited, if any, research available on one-to-one laptop that specifically studied ELL students. Therefore, existing research studies were examined to find a study that specifically investigated ELL or bilingual students in an environment where each student had access to an individual computer in school for at least one academic semester. Only one study was identified to meet the criterion. The fourth and last section of the chapter discusses this study even though it was not truly a one-to-one laptop setting.

National Funding, Policies, and Standards Encouraging Technology Integration

Although the most publicized and well-known objective of using computers as instructional technologies is to prepare technology literate citizens, it is not the sole purpose.
Other purposes include improving the efficiency of education, circumventing learning difficulties, closing the achievement gap, and ending inequity between schools in accessing computers and information (Bonifaz & Zucker, 2004; Franklin & Bolick, 2007). In order to fulfill these goals, different federal programs, funds, and standards are prepared to ensure integration of technology into schools. In this section of the review, major initiatives will be briefly explained to provide a historical review of federal-level support on technology integration. Major initiatives to be discussed are: The Goals 2000: Educate America Act, Office of Educational Technology, Regional Technology in Education Consortia (R-TEC), Preparing Tomorrow’s Teachers to Use Technology (PT3), National Education Technology Standards, and No Child Left Behind Act.

One of the initial federal supports given to purchase and integrate instructional technologies was The Goals 2000: Educate America Act enacted in 1994 (Franklin & Bolick, 2007). Purpose of The Goals 2000 was to promote educational reform by establishing national education goals and standards to integrate technology, technology planning, and professional development into all educational programs (U.S. Department of Education, 1998a). As part of The Goals 2000 Act, the Office of Educational Technology (OET) was established in 1994 within the Department of Education to develop a national plan for the educational application of technology. The OET was responsible for developing national educational technology policy to ensure that Department of Educational Technology programs were coordinated and consistent. The OET was also responsible for supporting efforts to develop and disseminate educational technology and to increase its contribution to education (U.S. Department of Education, 1998b).

The Improving America’s Schools Act was another important milestone supporting the technology integration in schools. Within this act, the Technology for Education Act of 1994 was designed to provide leadership, to improve teaching and learning, and to provide equal access to educational opportunities for all students. It was also designed to provide assistance to the
neediest schools so that they could address their technology requirements and accomplish their educational goals. The bill provided major grants to the education community, private sector, and consortia, which was composed of both education community and private sector. The first type of grant was designed to assist states in developing comprehensive technology plans for the acquisition and use of the technology necessary to improve instruction from kindergarten to high school. The second type of grant was designed to help consortia to develop professional development in the use of educational technology, to assist states by providing technical assistance in the use of technology, to disseminate information concerning technology sources and programs, and to develop innovative and engaging technology products for the classroom. The third type of grant was designed to encourage research into educational applications of advanced technologies and telecommunication networks (U.S. Department of Education, 1998a).

Another federal-level support for technology was the foundation of The Regional Technology in Education Consortia (R-TEC) by the US Department of Education in 1994. The purpose of the consortia was to help states, local educational agencies, teachers, school library and media personnel, administrators, and other education entities to successfully integrate technologies into K-12 classrooms, library media centers, and other educational settings. There were ten Regional Consortiums in the U.S. serving Eastern, Central, and Western parts of the U.S. (U.S. Department of Education, 1998b). However, since September 2005, federal funding provided to the consortiums was discontinued.

In 1995, Technology Innovation Challenge Grants (TICG) was launched to provide grants to build capacity and improve teaching and learning with technology. Its goal also involved strengthening school reform efforts, improving student achievement, and providing sustained professional development for teachers, administrators, and school library media personnel. The grant program supported partnerships among educators, business and industry
corporations, and other community organizations to develop innovative applications of technology and plans to fully integrate technology into schools. The program provided competitive 5-year awards and gave priority to consortia that serve areas with high numbers of disadvantaged students or with the greatest need for educational technology. The awards were also given to consortia that provided direct benefits to students, ensured sustained professional development for teachers and other educators, and devoted substantial additional resources to the project. This grants program was not reauthorized by the No Child Left Behind Act of 2001 (U.S. Department of Education, 2006).

In 1996, additional federal grants were provided, such as Technology Literacy Challenge Fund (TLCF) as part of the Technology Literacy Challenge. For this five-year competitive grant 2 million dollars was allocated to fully integrate technology into teaching and learning and to ensure that all students are technologically literate by the 21st century. In addition to providing grants, the federal government requested stakeholders from the private sector, schools, teachers, students, community groups, state and local governors, and the federal government to work in a partnership toward achieving high levels of technology in schools (U.S. Department of Education, 1998b).

Another key initiative related to educational technology was Preparing Tomorrow’s Teachers to Use Technology (PT3) grants in 1999. Different from other grants, which were allocated specifically for buying technological equipment or professional development, this program awarded grants to colleges, school districts, and state education agencies in order to prepare future teachers to integrate technology into their teaching. These grants provided a vehicle for teacher educators to partner with K-12 schools around technology integration and offered a fertile research field for educational researchers (U.S. Department of Education, 1999).

In 2001, through the No Child Left Behind Act, the responsibility of providing
educational technology grants was given to Enhancing Education Through Technology Program, also known as Ed Tech or EETT. The primary goal of this program was to improve student achievement through the use of technology in elementary and secondary schools (U.S. Department of Education, 2001a). Additional goals included helping all students become technologically literate by the end of the eighth grade and establishing innovative, research-based instructional methods. Ed Tech was funded under Title II, Part D of the NCLB and gave grants to state educational agencies (SEAs). States retained five percent of the allocation for administrative costs. The 50% of the remainder was distributed by formula grants, while the other 50% by competitive grants (U.S. Department of Education, 2001a). ED-Tech mandated active engagement of schools and districts by: (1) implementing proven strategies for integrating technology into curricula and instruction; (2) supporting high-quality professional development activities to facilitate such integration; and (3) examining the conditions under which technology is effective in increasing student achievement and teacher performance (U.S. Department of Education, 2001b).

In addition to the federally funded programs and grants, nationwide and statewide standards were created to provide guidelines for teachers, students, and administrators to incorporate and use technology in K-12 classrooms. The nation-wide technology standards were created by International Society for Technology in Education (ISTE). ISTE is a nonprofit professional organization originally formed as an international organization in 1989 and has become a nationally recognized authority in educational technology (ISTE, 2008).

The ISTE released National Educational Standards for Students (NETS-S) in 1998. The NETS-S defined what young people should know about technology and what they should be able to do with it before graduating. ISTE unveiled the new version of the NETS-S in 2007. The new standards included items related to several higher-order thinking skills and digital citizenship.
These items included the ability to demonstrate creativity and innovation, communicate and collaborate, conduct research and use information, think critically, solve problems, make decisions, and use technology effectively and productively (ISTE, 2007). As of 2009, all states, except for the District of Columbia, adopted, adapted, aligned with, or referenced the NETS-S in their state standards (Education Week, 2009).

The ISTE also published the National Educational Technology Standards for Teachers (NETS-T) in 2000. It explained the ISTE’s technology standards for teachers and defined the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. It was updated in 2008 and includes the new standards for students with its emphasis on skills and expertise supported by technology. After the release of NETS-T, in 2002 the National Educational Technology Standards for Administrators (NETS-A) was published. It was updated in 2009 and explains what administrators need to know and be able to do to optimize the effective use of educational technology and how to release their responsibility as leaders overtime to teachers (ISTE, 2009).

Factors Inhibiting Technology Integration

Despite the federal support provided to integrate technology into schools, technology has not still been fully incorporated in the nation’s schools (ISTE, 1999; Lowther, Inan, Strahl, & Ross, 2008; Zhao & Frank, 2003). A study conducted by Editorial Projects in Education revealed that students in approximately 70% of the states are not experiencing the full benefits of effective technology implementation (Swanson, 2006). In other words, “students still spend most of their school day as if these tools and information resources had never been invented” (Becker, 1998, p. 24). The failure to fully integrate technology in schools created pessimism towards instructional technologies. For example, Stoll (1999) and Oppenheimer (2003) criticized investments in instructional technologies on the basis that there is little evidence that they positively impact
teaching and learning. Cuban (2001) also argued that technology is “oversold” but “underused.”

Some researchers identified one of the reasons for the limited positive impact technology had on teaching and learning as the unsuccessful integration of technology. Since unsuccessful technology integration may not provide the expected educational results, some researchers began to examine the factors that inhibit technology integration. Major factors limiting technology integration in schools were identified to be related to teachers’ beliefs, pedagogies, readiness, and skills to use technology. Another factor was overemphasizing the quantity of technology use rather than the quality of its use. A third factor was the No Child Left Behind Act (NCLB) and its impact on teaching practices in classrooms. Finally, related to the NCLB act, a final factor identified to be inhibiting technology implementation was using standardized tests to evaluate the impact of technology on student outcomes.

Teacher-Related Barriers

Access to technology does not necessarily lead to its integration and use in instruction (Cuban, 2001; Lowther et al., 2008; Zhao & Frank, 2003). As keystone species in the school ecosystem, teachers play an essential role in the implementation of one-to-one initiatives (Bebell & Kay, 2010; Bebell & O’Dwyer 2010; Shapley et al., 2010; Zhao & Frank, 2003). Therefore, as Bebell and Kay (2010) conclude, it is “impossible to overstate the power of individual teachers in the success or failure of 1:1 computing” (p. 47).

One reason explaining unsuccessful technology integration and teachers’ reluctance to integrate technology is their low levels of readiness and skills in using and integrating technology (Baylor & Ritchie 2002; Eteokleous, 2008; Russell et al., 2004). In Inan and Lowther’s (2010) study, researchers found that of all the factors they examined related to teachers, the most important influence on implementing technology was teachers’ readiness to incorporate technology into their lessons. Feeling ready and confident to use technology led teachers to use
technology more frequently in their classroom instruction. Research also indicates that the more computer proficiency teachers had, the higher was their readiness to use technology (Hernandez-Ramos, 2005).

Professional development has an important role in increasing teachers’ readiness and skills to implement technology. For instance, Penuel (2006) reported that teachers’ preparedness is positively related to the amount of professional development teachers receive. When teachers lacked professional development, it inhibited the implementation of technology (Drayton et al., 2010). As the National Educational Technology Plan 2004 explains, “the problem is not necessarily lack of funds, but lack of adequate training and lack of understanding of how computers can be used to enrich the learning experience” (Office of Educational Technology, 2004, p. 22). Therefore, providing proper training through professional development sessions can help teachers not only to understand how computers can be used and integrated into curriculum, but also to increase their skills and feeling of readiness.

The quality and content of these professional development sessions are as important as their frequency. Shapley et al. (2010) found that teachers’ level of technology implementation was statistically significantly related to the “quality of professional development ($r = .47$)” (p. 33). Although the 2005 NCES report indicated that 84% percent of schools offered professional development aimed at integrating technology into curriculum (Wells & Lewis, 2006), it is not clear if the content and approach of these professional development sessions adequately addresses teachers’ beliefs about technology and the challenges they face in integrating technology into their instruction. Moreover, research indicates that teachers prefer continual trainings, as opposed to one-time sessions, where the sessions are differentiated based on teachers’ needs (Jaber & Moore, 1999). Shortly, studies on professional development indicate that the quality and depth of preparation teachers receive has a central role in the success of technology integration.
Another factor that impacts teachers’ technology integration in schools is related deeply to their philosophies of schooling, theories of learning, and visions about the role of technology (Cuban, 2001; Garthwait & Weller, 2005; Lawless & Pellegrino, 2007; Lowther et al., 2003; Mouza, 2008; Windschitl & Sahl, 2002). Most common pedagogies originate from behaviorist or constructivist philosophies. Teachers embracing the behaviorist theory consider direct instruction, proper sequencing, immediate feedback, and immediate reward as the best way to achieve the educational objectives (Fouts, 2000). Teachers informed by behaviorist theory use computer technology closely mirroring the behaviorist practices in which technology is used for drill-and-practice activities with emphasis on lower-level thinking skills (Lawless & Pellegrino, 2007; Waxman, Huang, Saldana, & Padron 1995; Padron & Waxman, 1993).

As the constructivist theory of learning gained power, teachers began using technology to support student learning through active engagement and complex academic content (Lawless & Pellegrino, 2007). According to research, teachers with constructivist teaching pedagogies and practices are more likely to use computers and the Internet with their students (Hadley & Sheingold, 1993; Wenglinsky, 2005). These teachers use technology for thinking critically and solving complex problems in a collaborative environment by sculpting activities to student interest (Becker, 2000). Research also suggests that teachers who use computers develop constructivist pedagogies over time (Becker & Ravitz, 1999; Pogany, 2009; Sandholtz, Ringstaff, & Dwyer, 1997).

No Child Left Behind Act

Research suggests that low-level approaches to technology typically occur with poor and minority students (Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Zhao & Frank, 2003). While low-level technology use with poor and minority students may be related to teachers’ teaching pedagogies, it may also be due to external factors such as the educational policy No Child Left Behind.
The accountability and achievement concerns the NCLB creates on teachers, especially on ones that work in urban schools, limit their technology use to drill activities and preparation for standardized tests (Becker, 2001; Donahue et al., 2001; Lowther et al., 2003). Therefore, NCLB of 2001 might be inhibiting integration and use of technology in schools.

Due to NCLB, educators, especially ones working in urban schools, are under increasing pressure to raise student achievement on state-mandated exams, which is reported to adversely affect teachers’ morale (Byrd-Blake, Afolayan, Hunt, Fabunmi, Pryor, & Leander, 2010). Under this increasing stress and decreasing morale, teachers are also expected to increase the use of technology in their classrooms (Potter & Small, 1998). Lowther et al. (2003) acknowledge the difficulty of designing quality computer-based lessons that address mandated content and standards. Lowther et al. (2003) further argue that teachers often use technology for basic skills due to the additional stress NCLB creates on teachers, who are already pressed under creating quality computer-based lessons. Instructional technologies are observed to be used for basic skills specifically in urban schools with diverse student population. For instance, Becker (2001) observed that teachers in low-income schools use computers for more routine skills and practice than for presentations, analytic work, revision and publication of text, or problem-solving activities. Donahue et al. (2001) emphasized the need to use technology for knowledge-building rather than information transmission. However, under the achievement and accountability pressure the NCLB creates, teachers use technology in behaviorist patterns, in which students are passive learners and receive information in a teacher-centered classroom.

Leadership

Leadership is another variable within a school ecosystem that impacts the technology implementation. In their study Shapley et al. (2010) investigated 21 middle schools participating in one-to-one programs. The authors wrote, “[c]ore-subject teachers’ extent of Classroom
Immersion was associated at a statistically significant level with their perceptions of the strength of the school’s administrative leadership (r = .59)” (p. 33). Shapley et al. (2010) also reported that participants at schools that implemented the laptop initiative at high levels mentioned having committed leaders as one of the keys to their successful implementation of Technology Immersion. Supporting Shapley et al.’s findings, Drayton et al. (2010), who studied 14 upper elementary classrooms/schools equipped with one-to-one technologies reported that “[i]nformed and consistent administrative policy … helped create the conditions necessary for the maturation of these experiments with ubiquitous computing” (p. 44). While committed and informed leaders were consistently reported to positively impact the integration process, lack of leadership was reported to weaken an implementation (Bebell & Kay, 2010). Overall, studies indicate the need for strong leadership with committed, informed, and supportive school leaders.

**Quantity versus Quality**

A fourth factor inhibiting successful technology integration is the emphasis given to the sheer quantity of technology rather than the quality of its use in schools. Research indicates that the key issue concerning technology is how it is used, by whom, and for what purposes rather than how many or how much (Burbules & Callister, 2000; Lei & Zhao, 2008; Lowther et al., 2008). As Wenglinsky (1998) noted, “technology could matter, but this depended upon how it was used” (p. 3). High frequency of technology use does not necessarily mean its high quality use in instruction. Research suggests that high-poverty schools use computers more frequently than low-poverty schools, but, despite this high frequency, technology was not associated with any academic gains in high poverty schools (Becker, 2000; Norris, Sullivan, Poirot, & Soloway 2003; Swain & Pearson, 2002).

Researchers have offered various explanations for the non-association between technology and academic gains by low quality or non-educational use of technology. A study by
Lei and Zhao (2008) suggests that students who spent more than 3 hours a day on computers in school experienced significant loss in GPA compared with students who spent less than 3 hours a day on computers. Authors hypothesized that this result may be related to how students spent their time on computers, which specific technology they used, and what activities they did. For instance, students, who spent more than 3 hours a day, spent most of their time on tasks that did not contribute to academic achievement, such as computer games or chatting (Lei & Zhao, 2007).

Despite the importance of using computers in a quality manner for educational purposes, schools show variance in how they use computers. Smerdon and his colleagues (2000) reported that while students in low-poverty schools use computers for drill and practice 26% of the time, students in high-poverty schools use computers for drill and practice 35% of the time. While the difference between 26% and 35% may not be drastic, considering the differences in the quality of technological equipment, this difference may potentially increase. Research suggests that despite the improvements in the Internet and computer access, the digital divide between schools still exists not quantitatively, but qualitatively (Becker, 2000; Solomon, 2002). Becker (2000) found that technology available in schools serving to students from low-income families is usually 1 to 2 years behind than that offered in schools serving students from middle-income families. The discrepancy in technology available in schools serving low-income students is even higher- 3 to 4 years behind- compared to students from high-income families (Becker, 2000).

Besides the access to computers at school, an area that has been overlooked until recently is computer access at home and using home computers for educational purposes. Access to computers at home extends the technology initiative started in school to home, creating a continuous and complementary in- and out-of-school technology program. Access to home computers is especially important for students with low-SES backgrounds. In 2001, children and adolescents with low socioeconomic status (SES) were less likely to use computers at home
than were children and adolescents living in families with high SES (75% at home) (Judge, Puckett, & Bell, 2006).

According to Fulton and Sibley (2003), similar to the presence of books and reading materials at home, which can impact the reading readiness of a child, the availability of computers and Internet access at home can also influence a child’s technology literacy readiness. Research supports Fulton and Sibley’s (2003) statement. Judge et al. (2006) found that mathematics and reading achievement were correlated significantly with home computer use. Shapley et al. (2010) found similar results, which indicated that students’ use of laptops outside of school for homework and learning games was the strongest implementation predictor of their achievement. This positive and significant correlation between accesses to technology at home for academic purposes and achievement in mathematics and reading indicates that children’s lack of access to technology at home can be a disadvantage.

**Misaligned Measures for Assessment**

A final factor that may hinder technology integration in schools is the skills assessed and the measures used to determine the impact of technology on student outcomes. When technology’s positive and significant impact on student achievement cannot be demonstrated, the integration process might be hampered due to decreasing funds and increasing pessimism. Researchers explain the insignificant impact technology has on student achievement by the mismatch between the assessment tools used and the skills assessed. For instance, Russell (2002) and McNabb, Hawkes, and Rouk (1999) acknowledge that measuring technology’s effectiveness and its impact on student learning through standardized test may provide invalid results. Since most standardized tests attempt to measure a broad domain of abilities, standardized test scores often do not provide measures that are aligned with the specific skills or knowledge that may be learned through technology (Russell, 2002). In addition to the assessment of broad, rather than
specific skills and knowledge, standardized tests do not evaluate the critical and creative thinking skills technology fosters (McNabb et al., 1999). Standardized K-12 assessments in widespread use today are criticized since they “... measure a student’s knowledge of discrete facts, not a student’s ability to apply knowledge in complex situations” (Partnership for 21st Century Skills, 2006, p. 1). Research, which studied the effects of computer-assisted instruction, indicated that in one-to-one laptop environments students’ higher-level reasoning and problem solving activities increased. However, in standardized tests students in the one-to-one laptop performed no better than comparison groups and the nationally report norms (Baker, Gearhart, & Herman, 1994).

Findings of multiple studies support the notion that assessment tools evaluating lower-level skills cannot accurately evaluate complex, higher-order skills technology can facilitate. However, it is also argued that even if gains on student achievement are measured accurately with some tests, it is difficult to correctly capture or point out technology’s role in that achievement (Becker, 1992).

Factors Promoting Technology Integration at Teacher, Classroom, and School-Levels

Although some factors may inhibit successful and meaningful technology integration, “[w]hen properly implemented, the use of computer technology in education has a significant positive effect on student achievement as measured by test scores across subject areas and with all levels of students” (Statham & Torell, 1996, p. 42). Therefore, the initial question to pose before investigating whether technology impacts student outcomes is how successful technology implementation happens in schools and what factors are required. In this section of the review, three major and recent models explaining the factors promoting technology integration into instruction will be presented. The first model will discuss what information teachers need to have for technology integration. The second model will focus on factors for classroom-level integration, while the third model will discuss factors for school-level integration.
**Teacher-Level Factors**

Teachers need to have complex and multifaceted knowledge about technology for an effective, successful, and sustainable technology implementation in their classrooms. In order to explain this complex and multifaceted knowledge teachers need, Koehler & Mishra (2009) created Technological Pedagogical Content Knowledge (TPACK) based on Shulman’s (1986) Pedagogical Content Knowledge. TPACK is based on three primary forms of knowledge: Content Knowledge (CK), Pedagogy Knowledge (PK), and Technology Knowledge (TK). CK is the knowledge of concepts, theories, and conceptual frameworks as well as the knowledge about accepted ways of developing knowledge (Shulman, 1986). In other words, CK means knowing your subject matter. PK is the knowledge about different theories about learning and the best approaches to learning, teaching, and assessment (Harris et al., 2009; Shulman, 1986). PK is not sufficient by itself for teaching purposes without the CK. TK refers to digital technologies such as laptops, the Internet, and software applications. It means using available technologies for educational purposes (Harris et al., 2009).

![Figure 2.1: Technological Pedagogical Content Knowledge (TPACK) (Koehler & Mishra, 2009)]
Knowledge on content, pedagogy, and technology are not isolated entities. The interaction between them creates the multi-level knowledge teachers need to use instructional technologies properly. One of the multi-level knowledge areas is Pedagogical Content Knowledge (PCK) created as a result of the interaction between PK and CK. PCK demonstrates that in order to teach effectively and make a subject understandable, pedagogy and content should be combined (Koehler & Mishra, 2009). Through knowledge of PCK, teachers can make subject matter more accessible for learners. Through interaction between technology (TK) and content knowledge (CK), Technological Content Knowledge (TCK) emerges. TCK represents the knowledge teachers need to have in order to use various technologies meaningfully to teach their content (Koehler & Mishra, 2009). Finally, Technological Pedagogical Knowledge (TPK) is the knowledge created through the interaction of knowledge on technology (TK) and pedagogy (PK). A teacher with TPK has knowledge on the advantages and limitations of available technologies and uses this knowledge to make information accessible to learners through different pedagogical approaches (Koehler & Mishra, 2009). For example, wikis’ collaborative nature can be used as a learning platform where learners can support each other’s learning process.

The peak of multi-level knowledge teachers need for technology integration is the area where all components interact with each other. This peak point is called Technological Pedagogical Content Knowledge (TPACK), which is the knowledge and understanding of the interplay between CK, PK, and TK (Schmidt, Baran, Thompson, Koehler, Mishra, & Shin, 2009). In order for teachers to use technology meaningfully and effectively, they need to have knowledge not only on content, pedagogy, and technology as individual items, but also on the interaction between them. When teachers know limitations of available technologies, their compatibility with the content they need to teach, and their compatibility with pedagogical beliefs, teachers can mold technology into what they want to achieve.
Classroom-Level Factors

Unlike the teacher-level model, classroom-level model involves not only teacher related factors but also external factors that impact teachers and their classrooms. These external factors can be collaboration or competition with other teachers, directions received from administrators, or parent expectations. A well-developed classroom-level model explaining factors involved in technology integration and the organic nature of the process is by Zhao, Pugh, Sheldon, & Byers (2002). In their empirical study, Zhao et al. (2002) investigated why teachers do not integrate technology in their classrooms when they have access to computers. Their goal was to “understand the conditions under which technology innovations can successfully take place in classrooms” (p. 484). Zhao et al. (2002) worked with a group of K-12 teachers for a year. Upon analyzing their data, Zhao et al. (2002) found eleven important factors impacting classroom technology integration. Although some of the variables had already been mentioned in existing research, they found some additional factors. Zhao et al. (2002) grouped the eleven important factors into three main domains based on whether they were related to teachers, the innovation, or the context. The three main domains (teacher, innovation, context) and the eleven sub-factors interact with each other, rather than stand in isolation.

The first domain is related to teachers, who are also called the innovator. There are three factors in this domain, which are teachers’ knowledge of the technology, the compatibility between their pedagogy and technology, and social knowledge about organizational and social culture of the school. Although the importance of teacher’s knowledge and proficiency with technology has been emphasized in previous literature, Zhao et al. (2002) bring a different perspective to the existing knowledge. They state that in addition to proficiency in knowing how to operate a piece of technology, teachers also need to be adept in knowing what additional equipment or knowledge is necessary to use that piece of technology. For instance, although
teachers may know how to send or receive email, they also need to know that they need network connection, e-mail software, and filter software to send and receive e-mail. This additional information about how to send e-mail can help them solve some technical problems on the spot and be self-sufficient. However, the additional knowledge on technical aspects does not mean that teachers need to be technicians.

Figure 2.2: Conditions for classroom technology innovations. (Zhao et al., 2002)

The second teacher-related factor is the compatibility between teachers’ pedagogical beliefs and the technology. Results of the study indicate that successful technology integration in the classroom occurs more “when teachers are highly reflective about their own teaching practice and goals, in the sense that they consciously use technology in a manner consistent with their pedagogical beliefs” (Zhao et al., 2002, p. 492). The third and final teacher-related factor is social awareness. Teachers’ understanding and negotiation of social aspects of the school culture impact
the success of the technology innovation (Zhao et al., 2002). This social knowledge on school culture helps teachers to collaborate with each other, seek help when needed, and know to where or whom to go when necessary.

The second major domain in classroom-level technology integration is innovation. Zhao et al. (2002) found that innovations have two dimensions: dependence and distance. Dependence refers to “the degree that an innovation relies on other people or resources—particularly people and resources beyond the innovator’s immediate control” (Zhao et al., 2002, p. 496). For instance, while teachers that integrate technology into their own classrooms are less dependent, teachers that collaborate with other teachers and administrators are more dependent. Teachers could depend on others or on technological resources. Innovations with low dependence on others were more successful than innovations that required more dependence among people. Dependence on technological resources is the degree of use of technology resources required for the innovations that are beyond the control of the teacher. Since teachers who needed technology beyond their control became dependent on other people to access the needed technologies, their integration process was negatively affected.

The second dimension of innovation is distance. Distance is “how much the innovation deviated from the status quo” (Zhao et al., 2002, p. 496). The distance of innovation from the school culture, the available resources, and teachers’ classroom practices are important factors impacting technology integration. Distance of innovation from the school culture refers to the difference between the innovation and the school’s existing and well-established values, pedagogical beliefs, and practices. When the distance between the innovation and the school culture increases, the success of the innovation becomes negative. Distance of innovation from available technological resources explains the adequate access to new technologies. Innovations that did not require new technologies or required minimal new technologies were the most
successful innovations because the innovation process was not disrupted by factors such as late purchase of the new technologies, not knowing how to use them, and lack of professional development. The final factor in innovation is the distance of innovation from the teachers’ classroom practices. When teachers had experienced similar innovations previously or when the new innovation was an extension of a previous project, the innovation was more successful. The most successful innovations were not only low in distance but also low in dependence.

The third and final domain in technology innovation in classroom-level is context. The context of technology integration includes three factors: technological infrastructure, human infrastructure, and organizational culture. Technological infrastructure refers to the access to and availability of technology. Human infrastructure refers to “the organizational arrangement to support technology integration in the classroom” (Zhao et al., 2002, p. 502). Human infrastructure not only includes the technical staff that helps teachers understand and use technologies in their classrooms, but also institutionalized policies and procedures such as professional development, purchase of technological equipment, and student access to computers and the Internet. The institutional support is important for the success of technology innovations as it enables teachers to access resources that are beyond their immediate reach or control. The final component of the context in technology innovation in classrooms is the organization culture and the support provided. When teachers supported each other the task became easier and the problems were solved quicker.

The three domains (innovator, innovation, and context) interact throughout the innovation process. However, each domain’s contribution to the innovation is different. Innovators make the biggest contribution. Zhao et al. (2002) found that innovations were more likely to be successful with teachers competent in integrating technology. However, without proper innovation, such as access to technology, leadership, and collaboration, a competent teacher alone is not strong
enough to accomplish the technology innovation. Therefore, although teachers are the key
component of the innovation, without a favorable context and well-planned innovation project,
they are not strong enough to successfully execute the innovation on their own.

The model by Zhao et al. (2002) is an initial step to demonstrate and explain the
classroom-level factors for successful technology innovation. The model is strong in terms of
identifying the sub-factors and explaining the interaction between them and the three domains.
However, since the model explains the classroom-level factors for technology innovation, only
teachers’ perspectives were investigated. Zhao et al. (2002) mention the importance of other
school personnel, such as administrators and technology staff in their model. However, they do
not include these personnel’s perspectives in the model.

Considering the important role other school community members have, this current study
aims to create a model that includes various participant perspectives. Since technology integration
is a multi-factored process as Zhao et al. (2002) demonstrate in their model, the sole attention
given to teacher perspectives will present limited information.

School-Level Factors

In 2003, Zhao and Frank developed and tested a framework on the organic process of
computer uses and integration in schools through an ecological perspective. They proposed a
theoretical framework based on the ecosystem metaphor arguing that computers are alien species
introduced to schools. After building their framework, Zhao and Frank tested it empirically by
studying technology integration in 19 schools. Their model provides a holistic picture of multi-
leveled technology integration since they include classroom, school, district, state, and national
levels. Figure 2.3 explains that a “given teaching context is nested within a multilevel ecological
hierarchy, including government agencies, societal institutions, local community organizations,
and the school bureaucracy” (Zhao & Frank, 2003 p. 815). The largest component of the
multilevel hierarchy is the government and legislatures at the national level. Although governmental and the societal institutions are remote from individual classrooms, they still impact technology integration in classrooms through encouraging technology integration and serving as a source of energy. The governmental and societal institutions function as the fuel of the integration process through the grants they provide and the standards they prepare nationwide.

Figure 2.3: The school ecosystem (Zhao & Frank, 2003 p. 815).

The sublevel within the national-level is state-wide government and legislature. Since the state-level government and legislatures are molded primarily for the specific needs to each state, state-level has more impact on classroom-level technology integration than the national-level government and legislature. Zhao and Frank explained that the district-level, situated within the state-level component, is more crucial for computer use in the school. If the district is not compatible with computer use and does not provide sufficient resources, the integration process will not be fast, efficient, and widespread.

The next level in the multi-level ecosystem is the school environment, including administrators and teachers, which shape the local and immediate ecosystem where computers are
used. At the school-level, if enough professional development, collaboration, or release time to discover new technologies is not provided, computer use and integration processes may be negatively impacted. The lowest level is the classroom, where teachers teach their students through existing technologies and pedagogical practices. Teachers’ use of technology might be impacted by their beliefs on technology, which may become positive or negative over time based on the compatibility of new technologies with their classroom environments.

All levels in the model are integrated within each other and interact with each other. However, Zhao and Frank do not provide the direction of this interaction. For instance, although generally the higher-level components impact the lower-level components, it can also be reverse. In educational reform, usually decisions taken in the higher-level institutions impact the lower-level institutions and, therefore, cause top-down reforms. However, a healthier reform can be made through actions taken by lower-level institutions, which inform and shape the higher-level institutions. From this model, it is unclear if the interaction between the levels is bi-directional or unidirectional, and which leads to a more successful technology integration. Other two unclear points are whether a lower-level component can skip a mid-level component and communicate with a higher-level component despite the order of hierarchy, and how this impacts the system.

Zhao and Frank (2003) tested their framework after creating it. Based on the analysis of their data, they presented their findings in Figure 2.4. Figure 2.4 has three pictures that illustrate the progressive phases of technology adoption. They acknowledged that although they presented three phases, there might be more than three. In the first phase, the district had two main roles: to provide computer hardware and software, and to provide in-service training. By providing hardware and software, the district established presence of the technology in the classroom environment. As districts were able to provide rich resources to schools in the study, the arrow representing this role of districts was depicted as penetrating the school walls on the left part of
the Phase one. However, the second role of districts, providing in-service trainings, was not very successful in meeting teachers’ needs and did not have a significant impact on technology use in schools. Therefore, the arrow at the top signifying in-service training was represented as barely entering the school.

Figure 2.4: The interactive process of technology adoption in schools (Zhao & Frank, 2003 p. 829)

The waves in the upper right and lower left corners represent the new forces introduced by external social and political institutions due to the emergence of new technology in the environment. The new pedagogies introduced into the classroom environment are represented on the right. Along with the new technologies introduced, pedagogies already used by teachers may need to change or new pedagogies may need to enter the environment. In order for these new pedagogies to penetrate into the new learning environment, teachers need to be receptive about necessary pedagogical changes that need to happen. Acceptance of new pedagogies and
technologies can be improved through collegial ties within the school, as shown by the solid lines between stick figures. In some instances, teachers may not be certain about the value of the new technology, which is indicated by the question mark over the head of one stick figure in Phase 2 and 3.

Finally, the teacher in the center of the Phase 1 is the teacher with perceived advantages about new technologies introduced to the school. These perceived advantages are represented as the rectangular box surrounding the teacher. Teachers may have specific experiences, skills, and history with technologies, which may be different from the new technologies introduced.

In Phase 2, the teacher’s perceived beliefs start changing through the interaction with the new technology, as represented by the changing bottom left corner of the rectangular box surrounding the teacher. Other people around the teacher may influence this co-evolution between the teacher and new technologies. Others may provide help or they may create pressure on the teacher, as shown by the dotted lines.

In the third and last phase, new technologies begin to conform to the teacher and teachers also conform to new technologies. As teachers become more familiar with the new technologies and learn their limitations and advantages, they start adjusting these new technologies to their needs. Through this mutual conformity between teachers and new technologies, the existing teaching pedagogies may not be enough and may require adaptation. If teachers do not find the existing technologies compatible with their needs, they may stop using it. Although rare, in some cases the teacher’s role at school can be totally transformed and their old roles becomes extinct due to high levels of integration.

This model is one of the first attempts to holistically explain the complex, multi-leveled, and organic nature of technology integration at the school level. Rather than solely focusing on identification of the individual factors impacting the integration, this model explains the relation
between the factors explaining the dynamic and organic process of integration. However, despite its strengths, the model mostly focuses on teachers since they are the keystone species (key participants) in the school ecosystem. However, as explained by the ecology theory, rare species such as administrators, parents, and students may also have crucial roles in the system. Although this is a complex model explaining the integration process by placing the teacher at the center, it ignores teachers’ interaction with other biotic species. Therefore, the model presents the multi-leveled technology process from the limited perspective of teachers.

Additionally, the classroom-level model by Zhao et al., (2002), which was discussed earlier, and the school-level model by Zhao and Frank (2003), are limited to schools in rural and suburban areas with middle-class population. Therefore, the question is whether these technology integration models would work effectively at schools serving at-risk, diverse, low-socioeconomic status (SES) students. This question is especially important considering that the U.S. has the most unequal distribution in spending, curriculum offerings, teaching quality, and outcomes among the industrialized countries (Darling-Hammond, 2006).

English Language Learners with Access to Individual Computers

This last section of the literature review is for the synthesis of research on one-to-one laptops initiatives and English Language Learners. However, no studies were found that examined one-to-one laptop initiatives specifically targeting ELL students. Although some studies evaluated laptop programs in urban schools with culturally and linguistically diverse learners, their findings were reported related to students’ racial demographics, rather than linguistic demographics. Therefore, for this part of the literature review, existing research that specifically investigated ELL or bilingual students was explored to find a study in which each ELL student had access to an individual computer for at least one academic semester. Due to the quick changes in educational technologies, only studies published after 2005 was considered as
potential research for the review. Two studies by Proctor et al. (2011) and Dalton et al. (2011) were identified to meet the search criterion. Although neither of the studies had a one-to-one laptop setting, students had access to individual computers at a computer lab for 12 to 16 weeks. However, it should be mentioned that both studies examined the impact of an online literacy intervention on ELL students’ vocabulary and comprehension, which required access to individual computers. Therefore, the results of the studies may not be a result of access to individual laptops, but a result of the intervention investigated. Despite this limitation, reviewing these studies may be informative to understand the potential impact reading in digital environments through individual access to computers could have on ELL students.

The quasi-experimental study by Proctor et al. (2011) investigated the effects of an Internet delivered, universally designed, Strategic Digital Reading (SDR) program on English-speaking and Spanish–English-speaking students’ vocabulary knowledge and comprehension skills. The intervention was integrated into the school’s existing literacy curriculum and consisted of two 50-min sessions per week for 16 weeks in the school’s computer lab. A total of 240 fifth grade students, 49% of whom were Spanish–English bilinguals, participated in the intervention. The intervention included eight narrative and informational multimedia texts with embedded instruction on 40 words. Each text had features such as Spanish translations, human read-alouds in English and Spanish, a multimedia glossary, and pictures illustrating the text content. Some of the vocabulary strategies used in SDR were cognates, Spanish translation of the words, creating word web, identifying semantically related terms such as synonyms and antonyms, and making personal connections. Comprehension strategies included prediction, questioning, clarification, summary, visualization, and perspective taking. Researchers administered a standardized measure to assess students’ reading comprehension, vocabulary, and overall reading skill. They assessed breadth and depth of vocabulary knowledge through researcher-designed measure, whose validity
was established

Results indicated significant intervention effects on the standardized measure of vocabulary knowledge and researcher-developed measures of vocabulary depth. The results were so significant that researchers reported students who completed the entire intervention could be expected to outperform their counterparts, who had the same entering vocabulary performance, but did not participate in the intervention. However, standardized measure of comprehension and researcher-developed measure of breadth was not significant. As the researchers indicated, the non-significant result in comprehension was surprising based on the fact that vocabulary and comprehension is highly associated. Authors speculated this unexpected result in comprehension could be due to the heavy attention given to vocabulary rather than comprehension.

The second study by Dalton et al. (2011) also examined how a universally designed, web-based scaffolded text environment influences fifth-grade monolingual English and bilingual students' reading achievement. The intervention was integrated into the school’s existing literacy curriculum and consisted of two 90-min sessions per week for a total of approximately 24 sessions at the computer lab. Seventy-five monolingual English and 31 bilingual students were assigned to one of three conditions: reading comprehension strategies, vocabulary, or a combined version of comprehension strategies and vocabulary. Students read eight multimedia folktales and informational texts and completed embedded activities, researcher measures of comprehension and vocabulary, and pre- and post-intervention standardized reading achievement tests.

Results indicated that after controlling for initial reading achievement, both the combination group and vocabulary groups significantly outperformed the comprehension strategy group. No effects were identified for comprehension group and on narrative comprehension related to students’ language status. However, there was a main effect of language status on expository text comprehension and standardized vocabulary achievement, with monolingual
students performing more strongly than bilingual Spanish-speaking students.

Studies by Proctor et al. (2011) and Dalton et al. (2011) have similar results in terms of increased scores in vocabulary but non-significant changes in comprehension. Despite some limitations and some non-significant results, these studies are pioneers in their field and have intriguing results. The results of both studies show that middle-grade students benefit from scaffolded digital text. These results are especially informative in terms of demonstrating how one-to-one laptop programs could be used to access such scaffolded digital texts.

Summary

In order to prepare a technology literate generation, a series of federal policy acts and funding programs emerged to support the integration and use of technology in schools. The federal technology initiatives have gained momentum during early 1990s. Although some initiatives seized to exist or changed their names, the federal support for technology integration continues. In addition to the federal policies and grant programs, National Educational Standards for teachers (NETS-T), students (NETS-S), and administrators (NETS-A) are created by International Society for Technology in Education (ISTE) to provide guidelines about how to incorporate and use technology in K-12 classrooms. The federal support and national standards for technology integration will continue as long as the technology will be a part of the society. Therefore, research on various instructional technologies will continue as well. While the research agenda may vary, new instructional technologies, such as one-to-one laptop initiatives, will be explored increasingly due to more affordable and compact computers.

Despite the continuous federal support for technology integration in schools, technology has not still been fully incorporated into the nation’s schools (ISTE, 1999; Lowther, Inan, Strahl, & Ross, 2008; Zhao & Frank, 2003). Five major factors that inhibit the technology integration were synthesized from existing literature. One major factor was teacher-related and included
factors such as teacher readiness, skills, and pedagogical beliefs. Professional development sessions, which are designed to meet teachers’ specific needs in a continuous manner, were also identified to be important to increase teacher readiness and skills to use and integrate technology.

A second major factor inhibiting technology integration was national policies such as NCLB that emphasize testing. The accountability and achievement pressure the NCLB created are felt especially in urban school with linguistically and culturally diverse students. Due to the stress the testing environment created on teachers in urban schools, technology is used majorly for low-level skills in urban schools for test preparation purposes. A third factor reported to inhibit technology integration was not having committed, informed, and supportive leadership leading the integration. Another factor was the emphasis given to quantity of computers rather than their quality use in schools and at home. Non-educational or shallow use of technology was reported to impact student outcomes poorly. Research also suggested that in urban schools the quality of technology use was not as high as non-urban schools. The fifth and final factor inhibiting technology integration was the misaligned assessments that were used to evaluate the impact of technology on student outcomes. Due to perceiving these misaligned assessments as a correct indicator of student outcomes, technology initiatives may be criticized and even discontinued.

The five factors discussed to inhibit technology integration could apply to many educational settings. However, due to the limited resources and the political pressures, urban settings were commonly reported to be affected by these five factors the most. While federal and state programs pilot various top-notch technology initiatives, such as ubiquitous computing, in medium- or high-income schools, low-income schools are often not provided with the same opportunities. Therefore, it is essential to investigate urban schools that are able to have the technological opportunities other medium- or high-income schools have. Investigating the
integration of a rich technology program and the factors involved in the integration in an urban school could provide a different and fresh perspective to existing literature.

In order to understand available technology integration processes, three most recent models explaining factors that promote technology integration were reviewed. The first model was Technological Pedagogical Content Knowledge (TPACK) (Koehler & Mishra, 2009). This model explained the complex and multifaceted knowledge teachers needed to have to successfully use technology. The second model explained the technology integration at the classroom-level (Zhao et al. 2002). This model had three major factors (innovator, innovation, and context), and eleven sub-factors, all of which interacted with each other. The third model was at school-level and was multilayered.

Despite the significant contributions these three models made in the technology integration field, they have some limitations. For instance, both the classroom- and school-level models are limited to schools in rural and suburban areas with middle-class population. Therefore, there is a need for research to investigate whether these technology integration models would work in schools serving at-risk, diverse, low-SES students. Additionally, all three models are teacher focused and do not consider how teachers interact with other participants, such as administrators, students, or parents. Therefore, the models present the integration process from a limited perspective. There is need for research to investigate the technology integration process in urban schools by involving multiple participants and perspectives.

Finally, the last section of the chapter originally planned to review one-to-one laptop studies that specifically studied ELL students. Since no research was available on ubiquitous computing and ELLs, research that studied ELL population with access to individual computers was reviewed. The study was informative in terms of understanding how ESL students can use individual laptops and how this individualized use may impact their learning. However, since the
study was not an exact one-to-one laptop environment, there is need for research to investigate integration and use of one-to-one laptop initiatives in ESL classrooms.

In order to address various gaps in the literature, this study examined a one-to-one laptop initiative in ESL classrooms located in an urban school with high numbers of linguistically and diverse students. The factors involved in the integration and continuation of the one-to-one laptop initiative are collected through the participation of multiple participants representing various perspectives. The study uses qualitative case study design to explore a phenomenon that has not been investigated in-depth. In-depth data is collected through individual interviews and multiple classroom observations. The next chapter explains the methodology that guided the data collection and analysis procedures for this study.
CHAPTER 3

METHODOLOGY

This chapter initially restates the purpose and research questions of the study. Later, it presents the methods and procedures that guided data collection and analysis. This chapter also includes research design, participants and context, data collection and procedures, data analysis, and limitations of the design. The rationale for choosing a qualitative single-case study is integrated through various sections.

The purpose of this study was to understand how a one-to-one laptop initiative was implemented and continued in classrooms with high number of ELL students in an urban middle school, which sustained the initiative for five years. Multiple perspectives were included in order to provide a complete representation of the implementation. Specifically, this study examined the following questions:

1) Through the lens of school administrators, teacher leaders, ESL teachers, parents, students, technology leaders, and technology personnel, what biotic and abiotic factors contribute to the implementation of a one-to-one laptop program in ESL classrooms in an urban middle school?

2) How do biotic and abiotic factors interact in ESL classrooms in an urban middle school?

3) What is the current state of the one-to-one laptop program in ESL classrooms in an urban middle school?

Research Design

A qualitative, single-case study was used to address the research questions and to inform the data collection and analysis processes. A qualitative case study was used for this study because “by concentrating on a single phenomenon or entity, the researcher aims to uncover the
interaction of significant factors characteristic of the phenomenon. The case study focuses on holistic description and explanation” (Merriam, 1998, p. 29). This study examined a one-to-one laptop initiative implemented in one urban middle school to uncover the factors involved in the establishment and continuation of the program, as well as the interaction between the factors. Moreover, multiple participants representing different perspectives were included in the study in order to capture a “holistic description and explanation”.

A case study also investigates “a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2003, p.13). In order to study a phenomenon in its real-life context, the case to be examined should be selected purposefully, rather than randomly (Merriam, 2002). For this case study, the urban school implementing the one-to-one laptop for more than five years was purposefully selected. In order to understand factors and their relations involved in a laptop initiative in ESL classrooms “within its real-life context” on-site interviews and observations were conducted.

Since the study investigated the integration process of a one-to-one laptop program from multiple perspectives, the study had embedded units to explain the multi-leveled and interactive nature of the integration process. Due to the embedded nature of the study, the study had multiple units of analysis. While the initial unit was individual participants, the second unit of analysis was the groups of school administrators, teachers, students, parents, technology leaders, and technology coordinators. A third unit of analysis was the interaction between the participant groups. These three units of analysis were used to answer all the research questions.

Finally, this case study had exploratory purposes. Exploratory case studies investigate a situation in which little theory is available or when measurement is unclear (Yin, 2003). The literature review in Chapter 2 indicated that there is need for a conceptual framework that explains a one-to-one laptop implementation in urban schools with a special focus on ELL
student population. Therefore, this study aimed to explore and understand factors required to create this needed conceptual framework through case study design.

Access and Entry

Access to the target school was gained after communicating the purpose of the study with a research colleague, who is one of the leading names in ubiquitous computing research and conducted research studies at the target school. The research colleague provided contact names of key administrators responsible for the initiative in the school and initiated the communication. I sent an email to the key administrators and briefly explained the purpose and design of the study. After receiving an email indicating interest in participating in the study, I sought permission to conduct research with human subjects by following the procedures through Institutional Review Board. I also sought permission for the study from the city’s office responsible for Public Schools.

After receiving all the necessary permissions, I entered into the school and began to identify participants purposefully based on the suggestions of key administrators and the research questions I was investigating. After identifying the target participants, I approached them with a brief summary of the study and asked if they would be interested in participating in the study. While conducting the study, consent forms were collected from each participant.

Participants and Context

Participants

This exploratory, embedded unit, single-case study used purposive sampling procedure for the selection of the school and the participants. Purposive 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” (Merriam, 1998). Purposive sampling is a dominant strategy in qualitative research, especially in case studies, because it seeks
information-rich cases that can be studied in depth (Patton, 1990). Purposive sampling is also useful in situations where the researcher needs to reach a targeted sample quickly without concerning about sampling for proportionality (Patton, 1990). Therefore, researchers need to define the sample they want to study.

In this study, the cases targeted to study was purposefully selected schools situated in an urban environment, which had been implementing a one-to-one laptop initiative for at least two years. Upon identifying some schools, their ESL student population was examined and the Park Middle School1 was selected since it fit the selection criteria and had high ELL student population. After identifying the school and acquiring necessary permissions, school members who actively or inactively participated in the one-to-one laptop initiative for at least two years were requested to participate in the study. The participants are listed in Table 3.3 on page 67.

The case study school consists of four semi-independent academies, each of which has an academy leader. Academy leaders manage operations and instructional strategies in their academies. They are also the point people teachers go to if they have questions and concerns. Each leader was requested to participate in the study. Since one academy leader was newly hired, the leader declined to be a participant. Each academy also had an academy coordinator, who not only helped the academy teachers with technology but also with management and discipline. One academy coordinator declined to participate in the study due to hectic school schedule.

The academy with the largest ELL population was Academy 4, followed by Academy 3. Therefore, the two ESL classroom teachers and the ESL literacy coach in Academy 4 along with one ESL teacher in Academy 3 were asked to participate in the study. All ESL teachers and the literacy coach agreed to be interviewed and observed. Before the interviews and observations, it was checked if all ESL teachers worked in the school for at least two years to be able to provide

1 Pseudonyms are used for all institutions and participants throughout this study to maintain anonymity.
informative data. All ESL teachers met this criterion. In total four teachers working with ELL students in ESL classrooms participated in the study.

In order to present student views, two students from each ESL teacher’s classroom were selected. Since two ESL teachers shared the same students, only two students were selected from their class instead of four. Although the student selection was originally planned to be random, upon teachers’ suggestions, 7th and 8th grade students were selected since they used laptops for at least one year. In addition, since students were ESL students, teachers selected students with higher English proficiency so that they could understand the questions and appropriately express their ideas in English. Student and parent consents were collected for the student interviews (see Appendix A, B). Considering that parents might not know English, parental consent forms for student interviews were provided also in Spanish (Appendix C). A total of six ESL students were interviewed.

In order to present parent views parent surveys were prepared in English and Spanish and sent home with participating students. However, majority of the parents did not respond to the request to take a survey. Therefore, three parents who served in the school board were contacted requesting to participate in an interview. One parent agreed to participate.

The school administrators were also contacted to represent administrative perspective. The previous school principal, technology director, technology consultant, and the current school principal, technology director, and assistant principal were interviewed. The ESL director was also interviewed. A total of seven administrators agreed to be interviewed.

Since schools are directly impacted by the decisions made at the district-level (Zhao & Frank, 2003), district level administrators were also planned to be included in the study. The targeted district-level administrators included superintendent, district technology administrator, and professional development administrator. However, district-level administrators were not
included in the study because at the beginning of the study school members explained that the school hired its own technology consultant and technology director. Additionally, the school provided professional developments independent from the district. As a result of this independence, the district was involved in the initiative at minimal levels. The school members reported that community leaders took a more active part in establishing the initiative and suggested that interviewing community leaders would be more informative compared to the district administrators. As a result of this suggestion two community leaders were requested to participate in the study and both leaders accepted to have an interview.

Context

Research was conducted at Park Middle School, an urban public school in a Northeastern state. The school opened in 2004 and serves to a total of 632 sixth through eighth grade students that are linguistically and culturally diverse and are from low-income family backgrounds. In 2010-2011 academic year 96.1% of teachers was identified as highly qualified. The student-teacher ratio was 10.8:1, which was lower than the district (13.2:1) and the state (13.9:1). Table 3.1 shows the Park school students’ racial and ethnic demographics and compares it to the district and state students. The data was retrieved from the state’s Department of Education. Table 3.2 below compares the Park school’s ELL student population for the 2011-2012 academic year. The data was retrieved from the state’s Department of Education.

<table>
<thead>
<tr>
<th>Race</th>
<th>% of School</th>
<th>% of District</th>
<th>% of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>46.6</td>
<td>33.7</td>
<td>8.3</td>
</tr>
<tr>
<td>Asian</td>
<td>2.5</td>
<td>8.3</td>
<td>5.7</td>
</tr>
<tr>
<td>Hispanic</td>
<td>44.0</td>
<td>43.0</td>
<td>16.1</td>
</tr>
<tr>
<td>Native American</td>
<td>0.6</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>White</td>
<td>3.2</td>
<td>12.6</td>
<td>86.0</td>
</tr>
<tr>
<td>Native Hawaiian, Pacific Islander</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Multi-Race, Non-Hispanic</td>
<td>1.1</td>
<td>1.9</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 3.1: 2011-2012 Enrollment by Race/Ethnicity in Park Middle School
Table 3.2: 2011-2012 Comparison of ESL students in Park Middle School, District, and State.

<table>
<thead>
<tr>
<th>Title</th>
<th>% of School</th>
<th>% of District</th>
<th>% of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Language not English</td>
<td>50.3</td>
<td>44.8</td>
<td>16.7</td>
</tr>
<tr>
<td>Limited English Proficient</td>
<td>37.5</td>
<td>30.6</td>
<td>7.3</td>
</tr>
<tr>
<td>Low-income</td>
<td>71.2</td>
<td>69.5</td>
<td>35.2</td>
</tr>
<tr>
<td>Special Education</td>
<td>24.8</td>
<td>18.7</td>
<td>17.0</td>
</tr>
<tr>
<td>Free Lunch</td>
<td>69.9</td>
<td>64.2</td>
<td>30.4</td>
</tr>
<tr>
<td>Reduced Lunch</td>
<td>1.3</td>
<td>5.3</td>
<td>4.8</td>
</tr>
</tbody>
</table>

In 2006, a three-year Wireless Learning pilot program was launched to investigate the potential of a one-to-one technology program in an urban school. The school has been named an “Apple Distinguished School” for technology innovation and was one of the 33 schools across the country to earn the distinction. The purpose of the laptop initiative was three-fold: to target the digital divide that impacts the neighborhood and students, to even out the resources and the access to resources that students might not have, and to compete with other students and acquire 21st century skills. The laptop initiative was also expected to ease differentiation of instruction and content, provide immediate feedback to students and teachers, and increase engagement. Related to increasing engagement, the initiative was also projected to increase attendance and achievement. Finally, the initiative was anticipated to promote accountability, efficiency, and communication among teachers.

Besides aiming to close the digital divide at school, the school and community leaders also worked collaboratively to close the digital divide at students’ home environment. In order to close the digital divide at home and equip parents with 21st century skills, they connected the laptop program in the school with a technology program that the city already had in place. After attending mandatory trainings, parents were eligible to purchase affordable netbooks for their home. Access to the Internet and computer at home ensured a continuous access for students.

Prior to the initiative, each of the four academies had a computer lab composed of 3- or 4-year-old desktop machines. Each academy was reported to have about 20 to 30 machines, a
total of 80 to 100 machines in the school. When the laptop program started, the computer labs were gradually eliminated. The laptops were initially distributed to 7th and 8th graders in September 2006 and later to the 6th graders in March 2007. Since the 6th grade received their laptops later than the 7th and 8th grades, they used the computer labs until they received their laptops in March. In the third year of the implementation, all grades received their laptops at the beginning of the academic year, and hence, all computer labs were eliminated.

Since the Park Middle School served high numbers of ELL students, it has a multi-leveled ESL program. There are five ESL levels. The first two levels are for beginner ESL students. The third, fourth, and fifth level ELL students are intermediate and advanced students and are mainstreamed into classrooms that use Sheltered English Instruction model. An interesting aspect of the program is that ELL students that have interrupted formal education are placed into a program called Students with Interrupted Formal Education (SIFE). Since these students have interrupted education before coming to the U.S., they do not necessarily have literacy skills in their native languages. They are placed in the SIFE program because they have different needs than ESL students who were born in the U.S. and do not have interrupted education. While students in other ESL program are comprised predominantly of bilingual speakers of Spanish, students in the SIFE program speak various languages such as Vietnamese, Haitian Creole, and Somali to name a few.

The four ESL teachers who participated in the study were different in terms of the content areas and the student population they taught. Two of the ESL teachers taught to 6th, 7th, and 8th grade Level 1 and Level 2 Spanish-English bilingual students. These two ESL teachers shared the same students and Mrs. Vander taught ESL class while Mrs. Cople taught Math class. Mrs. Vander worked at the school for three years and Mrs. Cople worked at the school for two years. Both ESL teachers were bilingual in Spanish and due to students’ newly developing
proficiency in English, they used Spanish frequently during their instruction. While they used higher amounts of Spanish with 6th graders, the amount decreased with higher grades. Mrs. Vander and Mrs. Cople used Spanish to clarify confusions, give directions, have quick casual chats with student, and to teach new content.

The third ESL teacher taught to Level 1 and 2 ESL students in the SIFE program. Mrs. Frances worked in the school for two years and was bilingual in Spanish. Her students were recent arrivals to the U.S. and spoke various languages other than Spanish, such as Vietnamese, Somali, and more. Therefore, although she was bilingual in Spanish, she could not use Spanish with her students during instruction. The fourth ESL teacher was an ESL literacy couch and supported mainstreamed ESL students in various subject areas. Mrs. Yars was in the school for two years and had limited knowledge of Spanish.

Data Sources

Interviews

After receiving necessary IRB approvals, data collection started in September 2011 and was completed in December 2011. Interviews were semi-structured and were 40 minutes long on average (see Appendices J, K, L, M). They were individually conducted, one-time interviews and took place at the school. Interviews were digitally recorded with the participants’ permissions and were beneficial for collecting in-depth information about the laptop initiative (Hesse-Biber & Leavy, 2006). Since interviews were semi-structured, they allowed me to ask additional unplanned questions to clarify or expand on participants’ statements (Berg, 2007). After completing all interviews, they were assigned identification numbers to maintain anonymity.

Although interviews can be used as the primary source for data, they can also be used in conjunction with other sources such as observations and document analysis (Bogdan & Biklen, 1982). In this study, semi-structured interviews were used in conjunction with classroom
observation, field notes, and artifacts for triangulation purposes. The table below outlines data sources, participants, and research questions they address:

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Participants</th>
<th>Frequency per participant</th>
<th>Research Question</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>Focus: ESL teachers and students, Laptops and other available technologies (their use, problems &amp; solutions)</td>
<td>For one week on Monday, Wednesday, Friday from the beginning of the school day to the end of the school day</td>
<td>RQ 1 RQ 2 RQ 3</td>
<td>12 ESL classroom observations</td>
</tr>
</tbody>
</table>
| Semi-structured Interviews | -Ex School Principal= 1  
-Current School Principal= 1  
-Assistant principal= 1  
-Technology consultant= 1  
-Ex Technology Coordinator= 1  
-Current Technology Coordinator= 1  
-ELL Coordinator= 1  
-Academy leaders= 3  
-Academy coordinators= 3  
-ESL teachers= 4  
-Students= 6  
-Parent= 1  
-Community Leaders= 2 | One semi-structured interview for 40 minutes | RQ 1 RQ 2 RQ 3 | 26 semi-structured interviews |
| Field notes        | Throughout the study, field notes were taken following observations and interviews to reflect on the information collected. | | RQ 1 RQ 2 RQ 3 | 19 Field notes |
| Archival Records   | Documents related to establishment of one-to-one laptop initiative such as goals, funding, professional development were read. Also one-to-one laptop research conducted in the school was read. | | RQ 1 RQ 3 | 6 documents |

Table 3.3: Data sources, participants, and research questions

**Observations**

Four interviewed ESL teachers’ classrooms were observed to collect information about how laptops were integrated into instruction. Observations were also utilized to compare teachers’ and students’ interview statements about laptops to their practices in classrooms.

Finally, observations were beneficial to collect information about the factors necessary to use laptops in classrooms, barriers that emerged in their use, and how they were solved. Each of the four ESL classrooms was observed three times within one week. Each observation started with
the arrival of students to school and ended with their departure for home. A total of twelve observations were completed.

During the observations, I was in the non-participant role to be as unobtrusive as possible while sharing the same context with students and teachers. Before the arrival of students and the beginning of observations, I took pictures of the classrooms with digital camera to remember the setting of classrooms and the student work that were hanged on the walls. During the observations, the Classroom Observation Protocol (Appendix I) was completed using a personal laptop computer. When students were using their laptops, I walked around the classroom, which helped me to capture what they were doing on the computer. The observations offered a first-hand account of how students and teachers used laptops in ESL classrooms and the problems experienced in using the laptops. The observations increased the validity of data because I was able to understand and interpret interview data better after becoming familiar with classroom contexts. The validity of the study also increased because observational data enabled me to triangulate it with interview data.

**Field Notes**

After completing interviews and classroom observations, I took quick notes reflecting on them. Reflection through field notes helped me to generate additional questions to expand on some interview statements interviewees made. Through field notes, I was also able to highlight points that needed to be asked to other participants to confirm some interview statements or observations made. The additional questions were asked in informal settings in the following school visits. A total of 19 field notes were written on the day of interviews and observations. A folder for field notes was created and each note was named based on the date and was used in conjunction with other data sources for triangulation purposes.
Archival Records

In addition to the interviews, observations, and field notes, some archival records were collected to understand the school culture and the history of the one-to-one laptop initiative. Some records explaining the school’s demographics, standardized test scores, achievements, and the laptop integration plan were collected. Additionally, previous research studies that investigated the school’s laptop initiative were examined. However, based on Yin’s (2003) warning about collecting and utilizing archival records, the collected information was analyzed in the light of research questions. Records that were not related to technology integration or did not answer the research questions were excluded from the analysis. A total of six published documents were collected along with multiple websites, including the school website.

Instrumentation

Interview Protocol

The semi-structured interview protocols were constructed after a rigorous, iterative, multistep process. First the existing studies on one-to-one laptop initiative, as well as technology integration in general, were identified. The identified studies included peer-reviewed journal articles and dissertations. Following the identification, the interview protocols used in the studies were analyzed in the light of the research questions this study investigated. A list of questions that could be used in the study was created. After creating the list, they were reviewed for a second time to examine their compatibility with the research questions. Upon this second review some questions were eliminated and since some research questions were not addressed new researcher-created questions were added. Finally, the questions were examined for their language to ensure that they were clear and simple.

The first set of interview questions were generated for teachers. The questions were piloted with a teacher in the school. Based on the piloting, some questions were eliminated or
reframed and the order of some questions was changed. The questions created and piloted for teachers were later adapted to other participant groups such as administrators. A simplified version of teacher interview questions was created for students. While adapting questions to students, I paid special attention to ensuring that ESL students could understand what is asked. Therefore, the language of questions was simplified further. The student questions were also piloted with an ESL student and based on the pilot the student interview protocol was further simplified. The following ten themes were the foci of the interviews: one- background information of the participants; two- historical and current information about the initiative; three- past experiences with laptops and self-perceived role in the initiative; four- unexpected outcomes of the initiative in general and specific to ELLs; five- identification of biotic factors in the initiative, their roles, and interaction; six- identification of biotic factors in the initiative specific to ELLs, their roles, and interaction; seven- identification of abiotic factors in the initiative, their roles, and interaction; eight- identification of biotic factors in the initiative specific to ELLs, their roles, and interaction; nine- suggestions that other schools should consider; ten- conclusive thoughts. Interview questions for different participants and the rationale for asking them are located in Appendix J, K, L, and M.

*Observation Protocol*

The observation protocol (see Appendix I) was constructed in a similar iterative manner as the interview protocol. The existing observation protocols for technology integration and use were identified and analyzed for their compatibility with the research questions of this study. Creating a valid observation protocol was important since observational data could be used to triangulate emerging findings from other data collection methods (Merriam, 1998). After reviewing existing observation protocols, the Classroom Observation Tool (ICOT®) by International Society for Technology in Education (ISTE) was adapted as the observation
protocol for this study. ICOT was developed by the staff and consultants in the Education Leadership Department at the ISTE with support from Hewlett-Packard Company. The tool was helpful in providing a set of questions guiding classroom observations and focusing on a number of key components of technology integration. However, since some parts of the tool did not address the research questions, these sections were eliminated. Moreover, in order to address all the research questions, some new sections such as the issues experienced and their solutions, were added to the protocol. After creating the observation protocol it was piloted in a classroom by conducting observations for three days. Minor adjustments were made after piloting.

Observations were useful in examining how laptops were used in ESL classrooms, the problems experienced, and the solutions found. Observations also allowed me to have a better understanding of the classroom context, which in return enabled me to interpret the interview data more accurately. Finally through observations I triangulated data and compared whether the student and teacher statements in interviews matched the practices in classrooms.

Data Analysis

Qualitative data analysis (Bogdan & Biklen, 1982) is “working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others” (p. 145). During data analysis, information collected through interviews and observations were examined through HyperRESEARCH, a software program used for managing and coding qualitative data, allowing easy retrieval and analysis of large interview and observational data.

A constructivist grounded theory approach (Charmaz, 2000) was used to code raw data from various data collection methods. Analysis was iterative and a constant comparative method was used. The constant comparative method involves comparing similar items for emerging patterns and themes (Spiggle, 1994). In order to prevent data overload during the analysis
process, data reduction methods were employed throughout the data collection and analysis stage
by focusing on themes that directly connect to the research questions (Merriam, 2002).

For data analysis, I first transcribed each digitally recorded interview. Following
transcription, analysis of interviews, noted observations and field notes was done using open
coding, axial coding, and selective coding (Strauss & Corbin, 1990). In open coding, concepts are
identified and developed in terms of their properties and dimensions. It took place at the
beginning of the study and the data was conceptualized and given names. Theoretical saturation
was reached since participants did not provide any new information by the end of the study. Upon
reaching saturation, axial coding was used. The purpose of axial coding is to reassemble data that
were fractured during open coding (Strauss & Corbin, 1998). During axial coding a core
category, around which all the other categories are related, was created (Strauss & Corbin, 1990).
The axial coding enabled me to represent the relationships between categories and subcategories,
which helped me to initiate the creation of my conceptual theory. The final step for data analysis
was selective coding. Selective coding is “the process of selecting the central or core category,
systematically relating it to other categories, validating those relationships, and filling in
categories that need further refinement and development” (Strauss & Corbin 1990, p. 116).
During selective coding, relationships among the categories were created and were related to the
core category. The coding of the data was analyzed to determine salient themes and to provide a
theory of how factors were related. In order to represent the factors and their relation, I created a
matrix that visually presented the conceptual theory.

The field notes and artifacts were compared to the interview and observation data to
validate collected information. Participants were asked to check the accuracy of statements once
data were transcribed. Some participants were also approached after the coding to discuss what
was found and to get feedback on interpretations. These member checks ensured the accuracy of
interpretations and also prevented possible researcher biases (Swenson, 1996).

Limitations

The first limitation in this study could be the nature, size, and depth of sampling. This study used purposeful sampling, which may not be representative of the whole population. However, since the purpose of this study is to understand the technology integration process to generate a conceptual framework, choosing participants purposefully is the most beneficial strategy to collect in-depth information. Another limitation regarding sampling is sample size. While this study was not concerned with insufficient breadth in sampling (Patton, 1990), a potential concern was collection of limited in-depth data (Patton, 1990) due to the involvement of more than 20 participants. In order to minimize this limitation, I carefully prepared open-ended interview questions to initiate detailed conversations. I also reserved more than 40 minutes for 40-minute interviews. This allocation of extra time enabled interviewees give in-depth answers to the interview questions. Finally, in order to increase the depth of data, the researcher used multiple data collection techniques (Yin, 2003).

Other limitations of this single case study could be related to its method such as its construct validity, external validity, and reliability (Yin, 2003). In order to increase the study’s construct validity Yin’s (2003) suggestions were followed: multiple sources of evidence were used, a chain of evidence was established, and some key informants reviewed the interview transcripts and interpretations. Regarding external validity, results from qualitative research cannot be generalized to other populations as in quantitative methods (Merriam, 2002). However, through detailed descriptions of context and participants as well as member checks, readers can be presented valuable information to decide whether the results could be applied to other contexts. Finally, related to reliability of this study, replication of a qualitative research study may be difficult because of the inconsistent and changing human behavior (Yin, 2003). Based on
Yin’s (2003) suggestions, the reliability of this study was increased by taking notes on the case study protocol and memoing rich details of the study through field notes.

Finally, it should be mentioned that qualitative studies are prone to researcher bias, because data interpretation process is researcher dependent and qualitative researchers cannot distance or isolate themselves from the study (Brody, 1992). In order to minimize researcher bias, I consciously evaluated my preconceptions and assumptions, as suggested by Brody (1992). I also conducted member checks to ensure the information and interpretation of data is accurate. With member-checks, “bias is not a concern, since the subjective constructions of the inquirer are shared with respondents for challenge and criticism” (Swenson, 1996, p. 190).

Summary

This chapter discussed the methods used to collect and analyze data. The research questions were restated, which was followed by a rationale for the qualitative, exploratory, single-case study design. At the data collection process, participants were described. Then, data collection and qualitative analysis procedures were provided. Lastly, limitations of the study were discussed.

The next three chapters report the results of this study. Chapter Four focuses on financial and technical factors while Chapter Five presents leadership factors. An interpretive summary is provided at the end of each chapter to highlight major findings and themes related to the research questions.
The purpose of this qualitative, single-case study was to understand how a one-to-one laptop program was implemented in ESL classrooms in an ethnically, culturally, and linguistically diverse urban middle school, which sustained the initiative for more than five years.

There were three specific phenomena explored about the one-to-one laptop program. The first phenomenon was the biotic and abiotic factors involved in the implementation of a one-to-one laptop program in ESL classrooms. Related to the first phenomenon, the study also explored the relation between the biotic and abiotic factors through an ecological perspective. The third phenomenon was the current state of the laptop program, which was examined by comparing the biotic and abiotic factors’ past and current states. The findings presented in Chapter 4 will answer the following research questions:

Through the lens of school administrators, teacher leaders, ESL teachers, parents, students, technology leaders, and technology personnel, what biotic and abiotic factors contribute to the implementation of a one-to-one laptop program in ESL classrooms in an urban middle school?

How do biotic and abiotic factors interact in ESL classrooms in an urban middle school?

What is the current state of the one-to-one laptop program in ESL classrooms in an urban middle-school?

The biotic and abiotic factors synthesized from participant interviews and observations are grouped within three themes: financial factors, technical factors, and leadership factors. In Chapter 4 findings related to financial and technical factors will be presented. The third theme, leadership factors, will be discussed in detail separately in Chapter 5.
Findings related to financial theme indicated crucial biotic and abiotic factors as state legislator, community leaders, and funding. Findings related to the current state of these factors showed that the school financially struggled after the completion of three year piloting program. However, the school was able to secure financial stability for the next three years until 2014, although the future of the initiative after 2014 still remains unclear.

Findings related to technical theme highlighted crucial factors mainly as abiotic items such as laptops and laptop carts, systems, Internet, and software programs. Other technologies besides laptops were also presented to provide a complete view of what technologies are used in ESL classrooms. Findings about the current state of the technical factors showed that as a result of financial issues, the school has been experiencing technical problems, which negatively impacts how teachers and students use laptops in ESL classrooms.

The last section of Chapter 4 is an interpretive summary, which visually presents the conceptual framework that emerged from the findings related to financial and technical factors. Besides introducing the factors, the framework also discusses the relationship between the technical and financial factors.

Financial Factors

Participants discussed financial abiotic and biotic factors as money and funders. The following section presents information participants provided about the initial funding process, the current financial state of the initiative and the efforts to financially sustain the laptop program.

The one-to-one laptop initiative in the school was funded mostly by the state as a line-item grant. The state budget has specific lines dictating how to spend funds and the state wanted to pilot two one-to-one programs in a rural and in an urban area. The Western part of the state was chosen as the rural pilot area, and a previous state legislator encouraged the Park Middle School to be picked as the urban pilot school. The Park Middle School received about 1.2 million
dollars through the in-line state budget. The money was spent to buy laptops, carts, LCD projectors, and educational software programs. The initial fund was also used to prepare necessary infrastructure such as wireless network and to provide professional development.

Despite receiving funds over 1 million dollars from the state, previous school leaders had to raise additional funds to support the school’s needs, such as hiring a technology director, which was not available through the grant received from the state. The school leaders had to be creative about raising additional funds to meet the needs of the initiative since there was limited number of grants to apply for technology. The school applied to grants that would fund something that was already in the school budget and use the money that was already in the school budget for technology. Moreover, similar to what previous research studies indicate (Lowther et al., 2003; Sandholtz et al., 1997; Zucker, 2004), some school expenses decreased by using laptops. For instance, the school used less paper and stopped buying textbooks. Some chores, which required a lot of time, were reduced and the available time and personnel was used for other purposes.

Community leaders and school administrators were the most accurately informed participants about finance. The ESL teachers, who worked in the school for about two years, could not accurately identify the financial source of the initiative and did not know the community leaders who actually took part in getting the grant for the school. ESL students also inaccurately identified the financial source of the initiative. Despite the confusion among the financial origins of the initiative, one common theme expressed by all participants was that the school financially struggled to sustain the initiative after the end of the first flux of state money, but began to recover, at least temporarily.

Money and Funders as Abiotic and Biotic Factors

A parent discussed money as an important abiotic factor when she said, “It is always about the money. So, the money. That’s it. There’s nothing else. Because the money brings
everything” (Interviewee 15). A community leader added the importance of funders as a key biotic factor, saying, “You definitely need money, you need a core group of people to support the initiative” (Interviewee 18). Despite receiving more than a million dollars from the state and raising additional money through grants, the school was in constant need of money. Therefore, all participants identified money as one of the most critical abiotic factor from the beginning of the initiative. While money was initially needed to establish the program, after six years into the program, it was needed to fix and renew six-year old technical equipment, as well as to ensure the future of the laptop program.

Besides mentioning the need for money, participants also mentioned the large amount needed. They stated that since almost all the laptops were old, they needed to replace about 600 laptops. Therefore, they would need over a million dollars for new equipment and fixing infrastructural issues. Besides fixing the technical equipment, money was also needed to renew the licenses for the educational software programs. For instance, the license the school had for Rosetta Stone expired in 2010 and the school had to renew the license which was indicated to be ‘not cheap”. These results resonate with Lei’s (2010) conclusion that “[u]biquitous computing is expensive to start, and it is expensive to maintain” (p. 49).

Besides its importance to resolve current issues, money was also important to secure the future of the program. Therefore, some participants emphasized the need for constant financial support for the long-term future of the program. An academy leader said they “need millions of dollars, not for once but every three years to keep things updated, to keep things fresh” because the initial funding was provided for once (Interviewee 6). Lei (2010) reported similar findings showing that ubiquitous projects are in constant need of money to upgrade software and hardware and to improve technical support to guarantee the successful and continued implementation of the projects. Continuing relations with the funders and stakeholders were crucial to receive multiple
waves of financial support. Therefore, as previous research (Billig, Sherry, & Havelock, 2005; Franklin & Bolick, 2007) indicates, funders and stakeholders and a strong, continued relationship with them were another critical biotic factor. A technology leader described stakeholders with political power and building connections with them as “key for investment” to get necessary funding, as the previous state representative got necessary funding for the school at the beginning of the initiative. Therefore, politics and “relation between the school and the mayor, the state representative were very critical” (Interviewee 10).

In 2010 the school was reported to be in serious and urgent need of money to fix and ensure the future of the program. The financial issues were so serious that teachers were informed that 2011 might be the last year of the laptop initiative. Participants discussed three major reasons for the financial instability of the program; unforeseen economic crisis, expensive equipment, and lack of sustainability plan.

The first reason participants discussed to explain the financial difficulty was the national economic crisis, which impacted educational funds. The previous school leader discussed the impact of crisis on educational funds when she said, “[i]t is much harder to sustain things now than it was 8 years ago when there was money and funding” (Interviewee 17). A community leader explained that the nation-wide economic crisis was unexpected and was not considered when the initiative was established. She further added that when they started the initiative, they thought there would be “better opportunities” to financially support the initiative. Besides the shrinking educational funds due to the economic crisis, the changing nature of available funds made finding financial sources more difficult. While discussing their current effort to find money through grants and fundraising, the school principal said, “the trending has somewhat changed on the grant piece” (Interviewee 7). The leader further explained, “a few years ago it was like, ‘Let’s
fund the underachievers. Let’s fund the underachievers.’ But, now some of the funding is looking at the middle achievers and the above average achievers” (Interviewee 7).

The second reason for the financial difficulty was due to Macbooks that were one of the more expensive laptops and the lack of financial support Apple provided to the school. A school leader explained that although the sturdiness of Macbooks helped to sustain the initiative longer than expected, it also might have endangered the sustainability of the program. The leader said the school “probably could have kept it [the initiative] going more easily with a less expensive computer” (Interviewee 17). The difficult economic times were exacerbated by lack of support Apple gave to the school from the beginning of the initiative. Some participants explained the persistent lack of support from Apple as:

They [Apple] don’t give, they don’t make a lot of contribution, they take and so that is one of the big problems we face. They don’t do any like “you know you are about 400, we are gonna give you 50 free.” They do not do any of that. We have to pay full price for everything and they are not sending people out to update the laptops and the stuff like that so that is a big issue (Interviewee 3).

Based on the lessons learned while working with Apple, some participants suggested other schools to demand free things, such as free computers or free updates, before signing a deal.

Along with the end of first wave of funding, economic crisis, and unsupportive computer vendor, the school staff was further surprised when they realized that there was not a sustainability plan prepared following the end of the piloting period. Most of the participants argued that the problems experienced after the piloting period were not considered in the initial plan. An academy coordinator said:

It’s [maintaining the initiative financially] hard, and I don’t think that they thought about that going into this program. … The problems that we’re having right now, I don’t think
that they thought through very well: how they were going to handle it, were they going to have backup money? (Interviewee 16)

Many participants were upset about the lack of such a plan. While they acknowledged that the piloting period was mainly about establishing the process, they were upset that the future of the program after the piloting period was not laid out as a plan.

**Current State of Financial Factors**

After the serious financial difficulties experienced especially in 2010, many participants still stated that, “the biggest issue facing [the school] in respect to technology is funding” (Interviewee 20). However, despite the continuing financial difficulties, they acknowledged some financial improvements they observed since 2010. Since 2010, the school was able to raise some money for the initiative and ensured to sustain the initiative for another 3 years until 2014. The school used the money to re-image all the student laptops and to hire an on-site technology director. The money was also used to renew teacher laptops and 6th grade laptops. Although “there’s not enough funding right now to fix all of the issues and the problems, when there is money available, … they try to allocate it where it’s most needed.” (Interviewee 16)

The news about the funding and renewal of some equipment created excitement among teachers who were worried that the program might end in 2011. The reason for the excitement could be the strong attachment many participants felt toward the program. A school leader explained this attachment and the determination to continue the program when he said that they “still remain a one-to-one school, that is not going anywhere. This is who we are. That is our identity.” (Interviewee 7) Some academy leaders also expressed their determination to continue the program by saying that they would continue to use the laptops “until the technical issues or the operational issues make it impossible for them to be used for instruction.” (Interviewee 14)
Due to the emotional attachment the school staff had for the laptop program, which became the identity of the school, the school and technology leaders are investigating various ways to continue the program. One option they are considering is lightening the financial burden expensive laptops creates by purchasing cheaper equipment to use along with computer labs. Another consideration is leaving a financial sustainability plan for the future school leaders. The school is also creating a new personnel position to seek grants to support the laptop initiative.

As an alternative to expensive MacBooks, a school leader explained that they are currently piloting iPads to use permanently in special education classes. The technology leader said that since most of the educational products are becoming web-based, which can be accessed with cheaper equipment, the school does not have to rely on expensive laptops. The school is considering using smaller and cheaper portable technologies, such as iPads or netbooks, along with computer laboratories. Therefore, the computer labs might be brought back. The school already received some donation from a local public broadcasting company. The company donated some desktops to set up a computer lab. They also provided some financial support. However, these alternatives are still under discussion and a final decision has not been made. Some technology staff mentioned that before going back to a computer lab setting, the school would consider changing the computer vendor to a company that would offer deals in pricing and equipment. The technology leader mentioned that since Microsoft made great strikes in security, “the worst case scenario would be going back to Microsoft.” (Interviewee 20)

Besides considering alternatives for the expensive equipment, the school principal is also working on leaving a sustainability plan for the next school leaders. The principal explained his efforts to leave a plan as:

I am a visionary and I know that, whether I will be around or not in three years, I do not want another person coming and having that sort of problem, “where do I get the
money?” It is just not fair. So we do have a good amount saved up basically to give to that person 3 years from now and hopefully they will do what they want to do (Interviewee 7).

An advantage the school had in preparing a financial plan for next administrators was being a pilot school and having less dependence on the district compared to other schools. The principal said, “If we had not been a pilot school, we would have been in trouble. The district oversees it [budget], the district rotates it and would say ‘no, you cannot use it for technology’ …” (Interviewee 7). Since the school did not have to discuss its budget with the district and seek its approval, the school leader was able to save money for the next school principal.

Finally, in order to sustain the initiative in the long term, the principal is currently working on creating a new personnel position for grant writing and fundraising. The previous principal had mentioned that writing grants should not be the building-base personnel’s job. She explained that although it was not in their job description, she and technology leaders wrote grants because they were passionate about the project. The principal also added that they did not have a broader support at the district level to help them with grants. Based on the lessons learned, the current school principal said that they are creating a grant coordinator position that is expected to be effective next year. The grant coordinator’s job will be to “find money to sustain the initiative” and “figure out how to tap not just the educational funds but also corporate dollars” (Interviewee 7).

Summary

The general financial state of the school highlighted the funding difficulties the school experienced due to multiple reasons, which are illustrated in Figure 4.1. In the figure, the factors that impacted the initiative negatively are indicated in red, while the precautions taken to minimize this negative impact are showed in green. The first reason was the end of the state grant
as illustrated on the right corner of Figure 4.1. In order to undo the limitation the end of the state grant caused, the school sought for new funders and collaborated with a public broadcasting company. The school also created a new personnel position with the primary responsibility to apply for grants, which will be in effect in 2012.

![Figure 4.1: Financial factors and their current state](image)

The school’s financial state was further limited by the lack of sustainability plan that would take effect following the end of the state grant, as represented on the left corner of the figure. In order to recover from this financial limitation, the school principal has been working on creating a sustainability plan for next principals. The school was able to save money for the sustainability plan thanks to having freedom from the district on their budget.

Another financial factor that negatively impacted the school finances was the national economic crisis. Unfortunately, this limitation was beyond the school’s power to recover. The only potential solution the school had to recover from the national crisis and the shrinkage of grants was creating a new grant writing position to seek federal as well as private funding.
Finally, in order to continue the laptop initiative, school leaders considered multiple solutions. For instance, the school considered using cheaper portable technology along with computer labs, instead of using expensive MacBooks. One of the lessons learned was demanding financial or equipmental support from the computer vendors before finalizing a deal.

Although the initiative faced serious financial problems, currently the laptop initiative is temporarily stabilized, and the school leadership seemed to be determined to sustain the initiative. However, there are still multiple technical issues that need urgent attention. In the following section detailed information about the technical state of the program is discussed.

Technical Factors

Technical factors described by participants during Interviews were all abiotic factors and included having sturdy laptops and laptop carts, well-structured systems, reliable internet, and software programs. While each participant mentioned almost all the technical factors in the interviews, the emphasis varied among participants. Community, school, and technology leaders highlighted having proper infrastructure, rules, and expectations in place. On the other hand, academy leaders and academy coordinators mentioned factors that were related to using and monitoring laptops. Students focused on the rules around using laptops and the consequences of not following the rules. ESL teachers emphasized having laptops in working condition and accessing subscription based software products purchased by the school and non-subscription based programs laptops offer such as iMovie and GarageBand.

While the technical factors were important for all students, factors identified specific to ELL students were subscription based software programs the school purchased, such as Rosetta Stone. All participants mentioned Rosetta Stone as a crucial factor for ESL students. In addition to Rosetta Stone, ESL teachers mentioned LCD projectors, document reader, and iPad as critical
for their ESL students. While explaining each factor, their current state as well as how they are used in ESL classrooms will be presented through interview and observation data.

Laptops and Laptop Carts as Abiotic Factors

In a school implementing a laptop initiative, one of the critical factors was “obviously computers.” Interviews indicated that the MacBooks were chosen for three main reasons: sturdiness, user-friendly interface, and readily available programs. The previous school principal and technology leaders explained that sturdiness of Apple computers extended the length of the initiative. MacBooks’ user-friendly interface was stated to be important for teachers, rather than students. A school leader explained that since students are digital natives and their learning curve is faster than adults, user-friendly interface was more crucial for the teachers. Finally, the third reason for choosing MacBooks were the programs it provided such as iMovie, iWeb, and GarageBand, through which students created movies, presentations, and music for their projects.

Despite their sturdiness, user-friendly interface, and various programs, after six years of heavy use MacBooks reached and even exceed their shelf time. A teacher explained that “some of them [laptops] are missing keys, or half of the keyboard is not working, it is a real mess sometimes” (Interviewee 5). Another teacher explained that laptops’ battery life is so short that some of them have to stay plugged in to work. Classroom observations confirmed the battery related issues mentioned in interviews. Another teacher explained that some of the laptop screens were so loose that they did not stay up when students lifted the laptop screens.

The technical problems experienced with the laptops started to impact their use in ESL classrooms. An ESL teacher explained an incident when the technical issues inhibited using laptops in her classroom as:

I have ESL curriculum that has independent practice on CD ROM and I discovered that all the kids’ CD ROMs were not working. So it kind of ruined that whole day, so then I
was able to work around it but I recognized that I am not going to be able to use those if not all the laptops are working (Interviewee 1).

Another ESL teacher explained that she wanted to use videos from Khan Academy in her class; however, since only a few student computers worked, she was not able to show the videos. Therefore, a common factor teachers mentioned was having access to laptops in working condition, which supports earlier research. In a case study Morrell (2002) conducted, he investigated factors that influence meaningful integration of technology into high school curriculum. One of the crucial factors his study indicated was teachers’ access to working computers and equipment (Morrell, 2002). While previous research also suggests that availability and access to computers and resources are important in technology integration (Hohlfeld et al. 2008; Inan & Lowther, 2010; Norris et al. 2003), the findings of this study, as well as Morrell’s (2002), specifically highlight the fact that the condition of laptops are important for their instructional use.

Another critical factor commonly discussed by academy leaders and ESL teachers was laptop carts. Laptop carts were used to charge laptops overnight and to transport them from their secured locations to classrooms during the school day. Each class had their own cart that travelled with the class. When students went from a class to another class, they either moved with their carts or put their laptops into their laptop bags and carried them with the bags. It was very important to have carts that properly charged laptops so that they would have enough battery life as students used them in various classes.

However, similar to the laptops, the technical issues with carts increased after six years of use. Carts were reported to break down and leave laptops uncharged. Therefore, students had to frequently use power cords to charge their computers. The interviews and classroom observations revealed that the malfunctioning carts and short battery life of computers was exacerbated by
limited outlets in classrooms. As a result of the limited outlets, students had to move their tables to be able to reach the plugs and take turns staying connected to the power outlets. These technical issues experienced in one-to-one environments are consistent with the research by Dunleavy, Dexter, and Heineke (2007). For instance, in their qualitative case study, Dunleavy et al. (2007) documented use and configuration of one-to-one computing in two schools. They specifically examined the added value and unique challenges the ubiquitous computing offered. They grouped findings related to challenges into two categories: classroom management and hardware issues. While discussing findings about hardware issues, they explained that one of the most frequently observed issues was improperly charged batteries. They also mentioned that in the worst-case scenario, the classrooms did not have properly positioned power outlets or extra computers, which halted the lesson and created disturbance (Dunleavy et al., 2007).

In addition to the outlet problems, some power cords were reported to be broken or lost, which was confirmed by observations. During an observation a teacher from another classroom came to an ESL classroom asking to borrow a few power cords from the cart. The combination of old laptops, short battery life, broken carts, limited outlets, and lost power cords made use of laptops in classrooms more challenging for teachers and students as indicated earlier by Dunleavy et al. (2007).

*Systems as Abiotic Factor*

At the beginning of the laptop initiative establishing necessary systems, such as infrastructure, rules, and expectations, was crucial to establish and sustain a laptop initiative in a non-chaotic way. In order to create the systems, the school and technology leaders answered many questions such as “Who makes the decisions in the school for laptops, what are the rules, what are the regulations? Who are the key players, where is the money, ways for getting it, and the time for everyone to learn.” (Interviewee 10)
Setting rules and expectations about the program were important to ensure that the program worked properly. A technology leader explained the importance of establishing rules as:

You can’t just give people all this technology without structure. They will not know what to do. Items get broken and lost. Having a clear process around what happens when the kids go to the nurse or what happens during a fire drill is important. Those kinds of questions had to be answered. Having that document and presenting it to staff is critical (Interviewee 4).

Another technology leader explained that the rules and expectations created around the use of the machines were not only for school staff, but also for students.

After establishing the rules and expectations, the school staff, especially academy leaders and coordinators, used Apple Remote Desktop (ARD) to ensure proper use of laptops. ARD allowed teachers to connect to specific student laptops and follow what they do on their computers. While teachers can monitor all of their students in their classrooms, academy coordinators can monitor all the laptops in their academy. The ability to monitor how students used their laptops enabled teachers to prevent distractions and manage their classroom while conducting student-centered instruction. ARD was seen as so essential for the laptop program that a technology leader said if he would have to choose between ARD and Smart Board, he would pick ARD. He explained that while Smart Board is good for instruction and lecture, ARD allows for student-centered learning since students use their laptops.

While ARD made student-centered lessons more manageable by enabling teachers to monitor what students were doing on their laptops, it also helped school personnel monitor hacking. An academy coordinator said that they have “some little hackers, who just know how to get pass the system and protections” (Interviewee 3). Although school staff expected such
hackers, they were surprised by how quickly students learned to breach the security measures. A participant expressed his surprise as follows:

Students learned very quickly how to circumvent these systems [firewalls]. As someone who is a tech guy, I was impressed. I think I was not surprised by how could this happen, but it was surprising how quickly the students subvert the rules and regulations.

(Interviewee 6)

The rules and expectations around the use of laptops were well communicated not only to school staff but also to students. While all student participants acknowledged the hacking issues, they also knew that they were monitored by ARD and were aware of the consequences of inappropriate behavior. Hackers identified through ARD were disciplined. All students explained the disciplinary punishments as: losing their laptop for the whole day, writing an essay about the lesson they learned, and promising not to use laptops inappropriately again. When students were asked to make a suggestion to new students, all students made the same suggestion: “you should not go to inappropriate pages. You should only go to pages that your teachers told you to go. Always do the appropriate things. Follow rules, or you will get in trouble” (Interviewee 24).

Participants mentioned that they observed some changes in the systems over the years. One of the changes they stated was about the ARD. Despite the importance of ARD in monitoring students’ laptop use, technology staff and some teachers explained that currently the ARD does not work effectively. Teachers and technology staff explained that there are issues with logging in student IDs, which made the monitoring process “cumbersome” and “annoying”. ESL teachers revealed that they were discouraged to use ARD due to the increasing technical issues and believed that monitoring students by walking around the classroom was more practical than using the ARP. Classroom observation confirmed that ESL teachers did not use ARP in their classrooms and they monitored their students by walking around the classroom.
Participants also declared changes in the rules established around the use of laptops. They explained that the disciplinary rules are not implemented as strictly as they were at the beginning of the initiative. For instance, a teacher said that while the teachers

“really used to be strict about making kids write an essay to get their laptop back and they would not get their laptops back until x number of days depending on the number of offenses, now it does not happen any more” (Interviewee 5).

Finally, a participant indicated that the system about carrying the laptops has also changed. While students had to carry their laptops in laptop bags to each class they attended, currently students do not carry their laptops. The participant explained that some academies changed the system because “a lot of learning time was wasted” in putting the laptops into and out of the laptop bags.

School visits provided mixed information. Observations revealed only one incident when ESL classrooms carried their laptops around. However, non-ESL classrooms were observed to take their laptops to different classes more often. Participants stated that since laptops have battery issues, keeping them with carts was more practical than carrying them in laptop bags.

**Internet as Abiotic Factor**

Besides the laptops, laptop carts, and systems, another technical factor all participants mentioned was the wireless Internet, also called the network. A technology leader emphasized the need for a “really engineered, robust wireless” system in a laptop school. The classroom observations indicated that wireless Internet was necessary in order to use web-based educational programs the school purchased and free educational websites. Students also acknowledged the importance of the Internet to complete teacher assigned tasks.

Despite the importance of the wireless Internet in a laptop school, teachers reported that it frequently had problems and was unreliable. A teacher said, “sometimes it [wireless Internet] might work for 10 minutes, and then it’ll go down for 10 minutes, and it just makes for a lot of
headaches” (Interviewee 19). Observations confirmed teachers’ statements about the Internet. During school site visits, it was announced on three separate occasions that the network was not functioning. In another occasion, while observing an ESL class the network was disconnected. The teacher was using a free educational website to play an online game with the whole class to practice solving math equations. Towards the end of the game, the school network was interrupted and the teacher could not ask the last question. She had to create her own question and wrote it on the board. The frequent network issues teachers experienced impacted their use of laptops and web-based instructional programs such as Rosetta Stone. A teacher explained that sometimes she found using web-based instructional program such as Rosetta Stone “tedious” mainly because of the technical issues experienced with the unreliable network and old laptops.

The Internet related problems uncovered more serious matters between the district and the school. The administrator level participants collectively indicated that they purposefully did not cooperate with the district from the very beginning of the initiative to avoid some of the lengthy bureaucratic procedures. Another reason for excluding the district from the initiative was the limited technical support the district could have offered to the school. A technology staff explained that the district suffers from inadequate number of technical personnel to work with the schools in the district as well as the money to hire more personnel and upgrade their technical equipment. A few participants indicated that the school is technologically more advanced than the district. Despite its advanced technology, since they had to use the district’s network, the school was dependent on the district. This dependence on the district caused some limitations on what was done in the school and what was intended to be done. A school administrator explained the technical superiority of the school to the district and the limitations the dependence on the district caused as follows:
… our district is approximately according to these consultants [consultants from Apple] is 7 years behind our building, so some of the things we wanted to do on technology, we were inhibited based upon the infrastructure and the confines of the district we are connected to. For example, right now our connectivity is down and it goes down maybe 3 or 4 times a month. In my humble opinion it a lot has to do with the district. (Interviewee 7)

Besides the district’s older technology, independent consultants hired by the school informed the school that the infrastructural wiring the district did in the school was insufficient to meet the needs of the school. The insufficient infrastructure jeopardizes the technical sustainability of the program in the long run. Due to the limited technical help the district could offer to the school “most of the things that we [the school] did with technology, all that we can control, we control in the house” (Interviewee 7).

Despite the well-known and commonly experienced wireless Internet issues, the ESL classrooms did not seem to have back up plans for the potential Internet block outs. During the classroom observations, I asked teachers about Ethernet cables and teachers said they do not have Ethernet cables. During an interview a teacher explained that she purchased her own cable. However, another problem that rises with use of Ethernet cables is similar to the power outlet issues. There are not enough Ethernet outlets in classrooms for all students and a teacher further explained that half of the outlets in the classroom do not work properly.

**Software Programs as Abiotic Factor**

A final critical factor discussed related to the technical aspect of the initiative was the educational software programs. Participants mentioned two types of educational software programs; subscription based programs purchased by the school and non-subscription programs. The two subscription based programs ESL teachers and students frequently mentioned were
Achieve 3000 and Rosetta Stone. Some non-subscription programs were iMovie, GarageBand, PowerPoint, and Word. Despite mentioning similar educational software programs, each ESL teacher used different programs. Mrs. Vander’s classroom commonly used Rosetta Stone to practice and develop language skills. Mrs. Cople used free educational programs available online to practice math equations. On the other hand, in Mrs. Frances’s classroom Achieve 3000 was used to differentiate reading levels of texts and to improve students’ reading comprehension. Finally, in Mrs. Yare’s elective ESL classroom, word document and PowerPoint were used to type essays.

Subscription-Based Software Programs. Among the subscription-based programs the school purchased, Achieve 3000 was the most commonly mentioned program. The ESL teachers, academy leaders, and students mentioned using the program that Achieve 3000 prepared specifically for middle school grades, called TeenBiz. The program had texts that could be adjusted to different reading levels, had clickable dictionary embedded into texts, posed reading comprehension questions, and requested open-ended responses. The program recorded student responses and teachers were able to monitor each student’s progress.

Participants praised the program since it enabled teachers to adjust the reading level of texts to appropriate student levels without making students with low-reading abilities feel uneasy or “stigmatized” about their reading levels. A teacher said that she constantly challenges her students by slowly increasing the reading level of the texts without students’ knowledge. The teacher considered challenging students without their knowledge to be important because she believed that this way, students did not become unmotivated to read a text knowing that it was higher than their reading level. Teachers also stated that through Achieve 3000, they saved time from personally differentiating reading texts and gave more thoughtful planning elsewhere.
Another feature Achieve 3000 had that teachers mentioned to use was the Spanish texts the program provided. A teacher discussed the importance of using Spanish texts as, “if students increase their native language, it transfers to how easy they are to develop a new language, so I think that it [Achieve] allows for all of that” (Interviewee 2). Teachers working with ESL students were informed about Cummin’s (1979) language transfer theory. According to the language transfer theory, also known as common underlying proficiency, once something is learned in the first language, it may be transferred to a second language. This is why strong language skills in the native language are associated with successful second language learning and academic achievement (Thomas & Collier, 2002). However, depending on the differences between the first and second language, the transfer may be easier or more difficult. Since the ESL teachers were informed about the potential support first language could provide to the learning of another language, they considered Achieve 3000 important not only to differentiate texts, but also to support students’ development of first language.

Despite the commonly and positively mentioned features of Achieve 3000, classroom observations recorded that it was used only in one ESL classroom. In that classroom, the program was not used to access Spanish texts because students’ native languages were not Spanish. The program was used to differentiate a text to each student’s appropriate reading level. After discussing the content and key vocabulary of the text with the whole class, students read their texts independently at specifically selected levels. After reading the text, they independently answered multiple choice reading comprehension questions and wrote open-ended responses. Students completed the tasks at different times. Students who completed the tasks early continued to read another text and answered its comprehension questions.

While the Achieve 3000 was mentioned as a critical factor for all students, including ELLs, Rosetta Stone was mentioned to be important specifically for ELL students and their
A school administrator explained that the need for Rosetta Stone emerged from the fact that most of the available software programs were for literacy and math at the beginning of the initiative. Using these programs was challenging for the ESL Level 1 and 2 students due to the higher language proficiency these programs required. Beginner level ESL students needed a program that was accessible and was supportive of their second language development. Upon some research, an ESL teacher discovered Rosetta Stone and proposed using it with ESL Level 1 and 2 students. Two years after the beginning of the laptop initiative, in 2008 the school started using Rosetta Stone with beginner level ESL students. An ESL teacher said RS was a beneficial program for ESL students because:

> there is a speaking component, so the kids can talk into the computer, building basic literacy skills, so being able to recognize sight words, a lot of basic grammar that you can teach in class but you do not need to spend a lot of time on. So Rosetta Stone kind of get that into their heads, so you can just go pass that in class. (Interviewee 5)

Many teachers and administrators indicated RS as an essential tool used with beginner level ESL students because RS allowed students to learn new vocabulary through visual aids, listen to word pronunciations, and repeat the pronunciation to the system through a microphone. Another advantage RS provided specifically to teachers was that it allowed them to work with students individually or in small groups while others worked on their listening and speaking skills on their laptops. These advantages teachers discussed related to computers and specific programs are supported by other researchers’ statements (Meskill & Mossop, 2000; Whitehurst & Fischel, 2001). For instance, Meskill and Mossop (2000) argued in their preliminary report on technologies use with ESL learners in New York State that:

> “… computers represent a means of involving learners in activity that suits to their individual language ability and grade level as well as their individual learning needs and
preferences. Thus, teachers can distribute their attention and direct their support to individual learners as they work on skills in environments appropriate to their individual needs” (p. 270).

Besides the teachers and the administrators, the technology director also found RS effective because it was a web-based program and its use was not limited to laptops. Considering that the school started piloting iPads as an alternative to laptop initiative and the laptops are having technical problems due to being old, having such web-based program contributing to ESL students’ language development was considered to be crucial for the future of the initiative.

RS stone was also highly praised by ESL students. All the students expressed that they “learn a lot” through RS and they “get so happy” using it. The students’ motivation in using and learning English through RS “positively surprised” some ESL teachers. A teacher stated that the RS levels “are very, very basic, so I thought maybe they’d become bored by that, they’d think it was too easy. But they really enjoy doing it, and it really does help them practice English” (Interviewee 19). Teachers provided multiple reasons to explain the student interest in using RS. One reason was the points system RS had for each activity. They suggested that the score system turned the learning process into an entertaining experience. Additionally, the point system showed students their improvement in their English proficiency because the scores were saved. Another reason teachers mentioned was the listening and speaking features the program offered. Teachers indicated that practicing their English listening and speaking skills increased students’ comfort and confidence in speaking English, which gave them a sense of accomplishment and opened the path to communicating with their teachers and peers.

Besides its value for ESL students, participants stated that the Rosetta Stone also has been a valuable program for parents and teachers. After its success with students, RS was extended to parents, so that parents could also learn English. RS was also thought to be beneficial
for staff members because they “can also sign up for some foreign language not only because they want to learn another language, but it is great for them to have that experience to see what our new comer students are going through” (Interviewee 12).

One technical issue mentioned related to using Rosetta Stone was the outdated state of headsets and microphones. Interviews and classroom observations indicated that the headsets and microphones students had to use for Rosetta Stone were old and were not working properly. During classroom observations, some students were not using the microphone since it was broken. In other cases, they were not using the headset at all. Since students had to listen and speak to the program to practice their listening and speaking skills, the headset related issues seemed to hinder the software fulfilling its listening and speaking purposes.

Another insight gleaned through classroom observations was that despite all the praise it received in the interviews, only one ESL classroom was observed to use Rosetta Stone. Mrs. Vander used RS specifically with 6th grade ESL Level 1 and 2 students because their English proficiency was at very early stages of proficiency. Mrs. Cople did not use the software because she taught Math. Mrs. Yare expressed her consideration to use RS with her mainstreamed ESL students in the following academic year, but had not used it before. She stated that she did not use RS with her students earlier because she “was not familiar with it” and also because she was informed that her students would be too advanced to use it. However, after examining the software over the summer, she found certain components that her students could use. Finally, Mrs. Frances found the program very beneficial. However, similar to Mrs. Yare, she stated that she did not use it because she was not familiar with it. She mentioned that she would feel more comfortable using it after learning more about how to use the program, how to adjust the level of activities to student needs, and how to monitor the student progress. She expressed the need for a thorough professional development on using RS.
Academy leaders and ESL teachers made two common comments about the subscription-based software programs. The first comment was about the benefits both RS and Achieve 3000 provided to teachers and students. Both programs allowed teachers and students to track student progress. An ESL teacher favorably mentioned the benefit of tracking feature as follows:

… we can track their achievement which is just phenomenal … because I can sit there and read a book with them and listen to them and do speaking assessment, but to do it with 29 kids, it is not manageable. So to have a program that automatically tests these things and I get these instant results, I am like ‘this is fantastic’. (Interviewee 1)

Despite the benefits such educational software programs offered, teachers collectively mentioned that there are not enough programs created specifically for ESL students. The limitation of sources available for ESL students created surprise, even disappointment, among ESL teachers. A teacher stated that she thought “there would just be more specific programs for our students. I just thought it would be easier for me as a teacher, but it’s really not” (Interviewee 19). Especially “for more unique languages it was almost impossible” to find resources (Interviewee 17). Since the school had high numbers of ESL students speaking less common languages, teachers and administrators reported to have difficulty in finding appropriate programs and resources for their students.

In addition to the limited number of programs specific to ESL students, another participant complained about “not really having a synthesis of what is best for students with diverse language and cognitive skills in English and in their first language” (Interviewee 14). The teacher mentioned that specific programs such as Rosetta Stone are beneficial for ESL students only when they are used for a specific amount of time. For instance, she explained that using Rosetta Stone less than one hour a week would not be helpful to ESL students’ language development. She stated that there was limited research synthesizing which educational programs
would be beneficial for ESL students and under which circumstances. Therefore, teachers had to make their own synthesis of research. ESL teacher believed that it would be helpful to have more research on specific programs used with ESL students and their effectiveness.

*Non-Subscription Software Programs.* Besides using RS with ESL students, teachers also referenced using non-subscription programs to support ELL students’ language development. One of the programs mentioned to be used was GarageBand. An academy leader explained that before becoming an academy leader she used GarageBand to create audio books for her students. She would read a text from a textbook into GarageBand and then upload it to her teacher website. The audio would help students with limited reading skills comprehend the text better and participate in classroom discussions. When the teacher’s website was inspected to examine the work she mentioned, no links were found for such a project.

Another teacher working with ESL students stated that she asked students to record their voices or make videos through GarageBand and iMovie. She explained that recording their voices or making movies allowed her students to produce language. Facilitating students’ language production is considered to be essential according to the most recent second language research. Earlier second language theories stated that second language acquisition occurs when the input is understandable, which Krashen (1982) called Comprehensible Input Hypothesis. However, most recent second language acquisition theories suggest that input explains language acquisition only partially because language output is also critical (Swain, 1995). According to Swain (1995) communicating in a second language (output) requires a higher level of engagement with the language than simply listening (input). This higher engagement involved in using language raises language learners’ awareness about what they already know and what they need to know to produce the intended language and meaning in the second language (Lucas, Villegas, & Freedson-Gonzalez, 2008).
Being knowledgeable about the critical role producing output has on the language learning process, some ESL teachers in the Park Middle school initiated their students to produce output in their new language by using programs such as GarageBand. A teacher said that students would send their recordings and movies to her. Some students even sent their recordings to their relatives back in their home countries, which was reported to increase their motivation to learn English and be proud of their learning process. Although some teachers mentioned using GarageBand and iMovie with ESL students for language production purposes, classroom observations did not indicate any use of these tools currently.

Some teachers explained that students also used Word and PowerPoint to prepare projects. Teachers mentioned that students used Word to write the results of their research or to narrate what they wanted to present related to their project. PowerPoint was used not only to note important information on the slides, but also to make their presentation visual. Only one classroom observation indicated use of word document and PowerPoint in one ESL classroom. The classroom observations also showed that although teachers mentioned that students use word document for writing, all the student works displayed on the classroom walls were handwritten. Therefore, the information teachers provided about use of Word and PowerPoint programs were not supported by classroom observations.

In general, teachers found access to various tools beneficial specifically for ESL students to complete their projects and presentations. A teacher explained the benefit as:

It allows students to bring another skills set that may cross language barrier, that they may not be very competent in speaking English but can use a computer in any language and can create on these computers. It allows you to see students in a different light. You realize the things they can do. (Interviewee 6)
The teacher’s statement above is important for two main reasons. The first reason is, it states that the technological tools ESL students used, such as PowerPoint, iMovie, and GarageBand, helped them show their knowledge and skills without being limited by their language skills. Secondly, as ESL students were able to complete tasks and express themselves through the help of various technological tools, they were able to show their teachers “the things they can do.” Upon “realiz[ing] the things they can do” teachers considered their students’ existing knowledge and skills as an asset, rather than a handicap.

**LCD Projectors, Document Readers, and iPads as Abiotic Factors**

In addition to the laptops, other technologies such as LCD Projectors, document readers, and iPads were also reported to be important for ESL students. While all teachers in the school had projectors, only ESL teachers had document readers and iPads to use in their classrooms.

During interviews students and teachers mentioned that LCD projectors were used with teacher laptops. ESL teachers explained that since their students are at the beginning stages of their language development, they used LCD Projectors to model and make instruction visual for their students. Teachers also said that when they presented information visually, students were able to understand the content better and stay focused longer and became more engaged in learning. Previous research on ubiquitous computing also reported increased levels of engagement among students (Bebell & Kay, 2010; Lowther et al., 2005; Suhr et al., 2010). However, these studies did not discuss possible reasons. This study may contribute to existing research by suggesting that the potential reason increased student engagement and interest in learning might be related to teachers’ use of laptops and other technologies for visual purposes.

Classroom observations indicated that projectors were used frequently in ESL classrooms and were a daily part of instruction. For teachers, it was such an important tool that an ESL teacher said, “… I do not know how I would teach without a projector” (Interviewee 5). Despite
teachers’ existing efforts to use LCD projectors to make instruction more visual, some students requested more visualization. A student suggested his teacher to “show [them] new vocabulary from websites, photos and videos [so] that [they] can understand better” (Interviewee 22).

Another tool used only in ESL classrooms was Document Reader. Similar to the LCD Projectors, Document Readers were used for visual purposes. An ESL teacher emphasized the crucial role of Document Readers in ESL classrooms as:

I think the document reader is key, because … with English language learners, where you have to be very visual and underline, circling, and moving things around, I think it becomes a great tool for them to see it, rather than say, verbally, “Oh I would underline this word.” They can see it and they can see how it’s done. That takes away the need to translate literally everything. You can just say it in English and do the action and they can interpret. Interviewee 13

Although the school had overhead projectors, the document reader had multiple advantages. A teacher explained the advantages as: “It’s in color. It’s so much better than an overhead, and it costs a lot less money. You just stick something under there.” Since document readers were mainly used to make things visual for students, being able to show documents in color was an advantage over the black and white overhead projectors. Another advantage was that it was cheaper and more practical to use. The document reader did not require acetates since it was able to project information from papers. Another advantage of the readers was the size. Since they were small and light, it was easy for teachers to carry them around the classroom and it did not take up space in the classroom.

However, not all ESL teachers used Document Readers. While conducting some observations in an ESL classroom, I realized that box of a Document Reader was not opened. When I asked if the teacher used the reader, the teacher replied that there was not enough time to
open it and learn using it. During another visit to the same teacher’s classroom, the document reader was opened and was on a table, but it was not used in any of the observation days.

The last tool mentioned to be used specially with ESL students was iPad. ESL teachers mentioned that at the beginning of the semester they received iPads. A teacher explained that she began using the iPad to download audio books for students. She said that listening to audio books from the iPad was beneficial especially for students with attention problems or limited English proficiency. When I asked whether audio books cannot be listened through the laptops, the teacher explained that iPad functioned as a backup because most laptops had issues. During classroom observations, only one of the four ESL teachers was noted to use it with students. The teacher gave the iPad to two students with behavioral issues, sitting next to the teacher desk under teacher’s close monitoring. At the end of the class these students requested her to download some audio books they wanted to listen and she began examining how to buy audio books from iTunes. Other ESL teachers said that they did not even open the packaging of iPads.

Summary

Technology related abiotic factors synthesized from interviews and observations indicated that in a laptop program, laptops, laptop carts, systems, Internet, and various software programs were important for all students, including ELL students. The technical factors are represented in Figure 4.2. Participants indicated that most of the laptops were in bad condition, which is represented by the chipped corner of the box that surrounds the condition of laptops. Laptop batteries quickly died and the situation was worsened by other charging issues such as broken laptop carts and lost power cords. Another factor negatively contributing to the condition of laptops was the systems that were not followed as strictly as earlier. Teachers did not use ARD due to technical reasons and did not strictly implement the consequences for irresponsible use of laptops.
Another factor impacting the use of laptops in ESL classrooms was the Internet. The unreliability of the Internet connection was expressed as a frequently experienced problem. Although the school had freedom in many phases of the initiative, they had to depend on the district for the Internet connection. The district’s understaffing and limited financial budget created a gap between what the school needed and what the district was able to provide. Therefore, the dependence of the school on the district for the Internet inhibited the school from pursuing and accomplishing their forthcoming plans about the laptop initiative.

A fourth technical factor was having access to various software programs. Subscription based software, such as Rosetta Stone and Achieve 3000, enabled ESL students to improve their English language skills and read differentiated texts. Non-subscription based software programs, such as GarageBand, iMovie, PowerPoint, and Word document, were reported to be used for projects. However, observations indicated their limited use in ESL classrooms. The use of these subscription and non-subscription based software programs were negatively impacted by the deteriorating condition of laptops and unreliable Internet as indicated by the chipped upper right corner of the software box.

While the MacBooks and laptop carts were expensive equipments, the school purchased cheaper equipments to support instruction in ESL classrooms. These cheaper technologies were
Document Readers, LCD projectors, and iPad. Although all teachers reported to use LCD projectors and document readers on a daily basis to visualize instruction, only one ESL teacher used iPad. Since the iPad is being piloted in ESL and special education classrooms, it can be used in the future to access educational software programs, which is indicated by the dash line between the software program box and the alternative technologies box.

The technical factors indicate the importance of having working technologies for them to be used for instruction. Teachers were not able to use laptops due to increasing technical issues, which discouraged them to use laptops. An ESL teacher explained this discouragement as:

I think at the beginning of last year the program was in disorder … The computers were getting old and not really functioning. A lot of the programs we were using, not a lot but a few like FastMath, weren't working properly, so I think that discouraged a lot of people from using technology in the classroom at first. (Interviewee 13)

When teachers did not have laptops that worked properly, their instruction was interrupted, and they had to change their instructional plans. Additionally, managing their classroom while trying to solve the technical issues created more difficulties for teachers. Therefore, some teachers found using laptops “sort of overwhelming.” These interruptions to instruction as well as increased classroom management issues the technical issues caused were also reported by Lowther et al. (2003) and Lei and Zhao (2008). The unreliability of laptops and the Internet caused teachers to become pessimistic about laptops and decreased their use of laptops for instruction. However, the arrival of a technology director, who began resolving some long existing technical issues, changed teachers’ pessimism towards laptops. In Chapter 5, factors related to leadership will be discussed in detail and the changes in technical issues will be explained under technology leadership.
Interpretive Summary

This chapter presented findings about the financial and technical factors, their current state, and their interaction within ESL classrooms. Findings were based on interviews, observations, artifacts, and field notes. In this section the factors and their interaction will be interpreted from the ecological perspective. The interpretation will be represented visually and will be compared to existing research. First, a brief explanation about how ecological perspective applies to the school context will be provided.

Components of ecology theory, specifically ecosystems, can be meaningfully applied to the Park Middle School. For instance, biomes in ecosystems are separated into deserts, scrublands, grasslands, forests, and tundras. One of these biomes can be considered as the district the Park Middle School is a part of, and similar to the biomes, some school districts may have richer sources than other districts. The Park Middle School was part of a biome, which was a large urban district with limited resources and served culturally and linguistically diverse students. Within this biome, the Park Middle School is an ecosystem with biotic and abiotic components. The biotic components are living things such as administrators, teachers, technology staff, students, and parents. The collection of these biotic factors is called community. Therefore, when we say school community, we discuss the school members that are living entities in that community.

The abiotic components are nonliving things and major abiotic factors in nature are sunlight, water, and mineral cycles. These abiotic factors can be applied to the school context as funding, technical equipment, and professional development. Since this chapter discussed findings related to financial and technical factors, the professional development will be discussed in Chapter 5 as part of teacher leadership. Among the abiotic factors, which are sunlight, water, and mineral cycles, energy from the sunlight is one of the most important component (Avila,
1995). Without solar energy, water cycles do not occur, which impacts the weather system and ocean currents, which in return affects the fertility of the soil. In barren soil, grass does not grow and this impacts animals that feed on grass. Without animals that feed on grass, animals that prey grass-eating animals go extinct (Avila, 1995).

Similar to energy from the sunlight, in the Park Middle School the most important abiotic factor to establish and continue the laptop initiative was funding. Without enough funding, necessary equipment could not have been purchased, which would have hindered the establishment of the initiative from the beginning. As Boland (2008) has shown in his dissertation, which investigated factors affecting teachers’ technology integration, funding limitations are a potential barrier to the integration of technology. However, besides the importance of funding at the initial stages of technology integration, research also suggests that funding is crucial for sustainability. In their study, Billig et al. (2005) examined the factors that nurtured sustainability of practices associated with technology integration in a socio-economically disadvantaged region of the state of Texas. They stated that, “a continuous funding stream is needed for sustainability” (Billig et al., 2005, p. 994).

Ecosystems in nature evolve constantly depending on the changes in the biotic and abiotic factors. Based on the speed and amount of changes, ecosystems find homeostasis, also called internal equilibrium. For instance, when water resources gradually decrease in a forest, biotic components of the forest may adjust to the new environment. However, when the water resources decrease suddenly, the ecosystem may not have enough time to find homeostasis. The funding and technical abiotic factors and the homeostasis are visually represented in Figure 4.3.

Figure 4.3 explains that the financial abiotic factor was damaged multiple times from various external sources, such as national economic crisis, lacking a sustainability plan, and end of initial funding. Since the homeostasis of the initiative was damaged by multiple factors, the
school struggled finding its financial homeostasis especially in 2010. Overcoming funding limitations and having a stable funding stream to support the initiative was important for the sustainability of the program. Therefore, the school tried to balance its ecosystem by collaborating with new funders, planning a sustainability plan for the future, and creating a new position to find funds for the initiative. However, some factors, such as the economic crisis, were beyond the school’s reach to control. Therefore, the limitation the economic crisis created on the schools’ financial sources could not be fixed.

Figure 4.3: Financial and technical factors in the school

Besides funding, having necessary technological equipment in working condition is crucial for the laptop initiative and is similar to the water factor in ecosystems. If there is not enough water or if the water quality is not good, the living entities cannot hydrate and grow properly. Similarly, without functioning technological equipment, the laptop initiative in the Park Middle School ecosystem would not grow in a healthy manner. The ESL classrooms had access to various technology equipments. As part of the laptop initiative, having laptops was crucial.
However, the condition of laptops deteriorated with heavy use over the years. More importantly, due to the financial struggles, the school was not able to renew the old laptops.

In addition to the laptops, other technical equipment was also negatively impacted by the financial state of the school. The laptops carts, which were important to charge laptops, were broken and could not be renewed. Laptop power cords were lost or broken and could not be renewed. These additional technical issues caused by the financial problems further impacted the already deteriorating condition of laptops. Additionally, the rules established around the use of laptops and the equipment used to monitor proper use of laptops were also impacted by the financial factors. Since the laptops could not be used in ESL classrooms, the rules, routines, and discipline around using laptops became less strict. Besides the financial difficulties that inhibited the renewal of these technological equipments, these equipments were difficult to renew because they were expensive to replace.

The old condition of laptops, which was further damaged by the poor condition of other necessary technical equipment, negatively impacted the educational software programs used in ESL classrooms. Using the educational programs became even more difficult due to the unreliable Internet connection. Although forty-five percent of public schools are reported to have wireless Internet connection (NCES, 2007), there also needs to be reports on the quality of the connections. Since the Park Middle School had the one-to-one laptop program, although they technically had wireless Internet, the quality of the connection was not enough to meet the needs of a laptop school. Therefore, classroom observations indicated limited use of laptops and educational software programs in ESL classrooms.

Laptop initiatives may allow teachers to integrate computers more naturally into their instruction by eliminating computer sharing, computer lab scheduling, student transitioning from classrooms to computer labs, and unequal computer access (Cuban, 2001; Warschauer, Knobel, &
however, as indicated by the findings of this study, without overcoming the technical problems, which are exacerbated by financial issues, this natural integration cannot be accomplished. Instead of laptops, ESL teachers were observed to use LCD projectors and document readers more frequently. Finally, in order to find the homeostasis in the school, cheaper technologies such as iPads began to be explored. In the future, the iPads or other technologies, such as netbooks, might replace the laptops.

The results about the technical factors and their impact on how technology is integrated into classrooms support Zhao et al.’s (2002) findings about dependence. In their study Zhao et al. (2002) explain that one of the three major domains in classroom-level technology integration is innovation, which refers to technology innovation. They explain that within an innovation there are two sub-domains: dependence and distance. Dependence refers to “the degree that an innovation relies on other people or resources—particularly people and resources beyond the innovator’s immediate control” (Zhao et al., 2002, p. 496). They discuss that innovations with low dependence on other people or technological resources are more successful than innovations that require more dependence.

In this study, as the technical issues increased teachers began becoming more dependent on other people and resources for the resolution of problems. Teachers were knowledgeable in solving issues, but the existing technical issues required more technical knowledge than what teachers had. Teachers also became dependent on technologies such as the Internet to be able to use the laptops and software programs. However, since the district was responsible for the Internet, the school was not able to take any steps to decrease the dependence on the district regarding the Internet. Therefore, as the dependence of teachers on other people and technologies increased, the innovation began to suffer (Zhao et al., 2002).
Zhao et al.’s (2002) discussion of dependence on people and resources can also be extended to financial aspects. Although the Park Middle School received more than a million dollars at the beginning of the initiative and was able to use it independently to meet their needs, by the end of the piloting period, the financial sources were withdrawn. Therefore, the school became dependent on funders to financially support the program. This dependence had a chain effect on use of laptops in classrooms. With the withdrawal of money, the old laptops could not be renewed or fixed, teachers became dependent on other people for the resolution of these technical problems, the people teachers relied on also became dependent on funders to find enough money to resolve the technical issues.

Additional to the findings related to factors and their interaction with each other in ESL classrooms, there were also findings regarding use of technology with ESL students. Various educational software programs were used to support students’ reading skills and language development. The school purchased Rosetta Stone specifically for ESL students after the second year of the initiative. This attention given specifically to ESL students indicates that the school considered technology as a resource that can support ESL students and meet their individual needs.

The software programs helped teachers individualize and differentiate reading texts and provide individualized activities. Whitehurst and Fischel (2001) stated that without computer based literacy interventions, “one could never hope to have the teacher-to-child ratios that would allow children to proceed individually at their own pace” (p. 12). The software programs’ tracking system provided students short- and long-term feedback, which gave them a sense of accomplishment. This sense of accomplishment might not have been possible to feel in daily instruction due to ELL students’ developing English language skills. Therefore, as Meskill and Mossop (2000) suggest, ELL students’ “on-line work is an opportunity for them to actually do
something that is both academic and that carries a sense of accomplishment” (emphasize original p. 270). Moreover, similar to what Meskill and Mossop (2000) stated in their preliminary report on technologies use with ESL learners, ESL teachers in the Pilot Middle School were able to work with individual learners while others individually worked on differentiated activities thanks to the software programs and student laptops.

Despite the benefits students and teachers mentioned about the educational software programs, ESL teachers were able to find very few software programs to use with their middle school ESL students who spoke languages other than Spanish and English. Besides the limited amount of programs, research suggests that majority of the available ESL materials focus on drill activities to practice vocabulary and grammar (Meskill & Mossop, 2000; Smith, 1995). Although there are newer ESL packages on the market that are more interactive in that they combine audio and graphics with text, like Rosetta Stone, as Meskill & Mossop, (2000) state, they engage students with language only at superficial levels. Moreover, these software packages are relatively expensive as mentioned by the ESL teachers in the Park Middle School.

Contrary to the educational software programs available for ESL students, products for native-speaker students tend to be rich in content and use of realistic problem-solving strategies and accompanying discourse (Meskill & Mossop, 2000). Unlike the products for ESL students, the products for native speaking students emphasize real tasks that require language use rather than the automatic or metalinguistic knowledge (Meskill & Mossop, 2000). These limitations on the amount, quality, and language variety of available software programs for ESL students indicate the need for programs that: goes beyond practicing the superficial aspects of English, could be used with ESL students who speak languages other than English and Spanish, and target secondary, middle, and high school ESL students.
Teachers also used technologies other than laptops and software packages in their ESL classrooms. These technologies were document readers and LCD projectors and they were used to make instruction visual for students and support students’ comprehension in class. Such visual support is important to lighten the cognitively overwhelming and exhausting process ESL students experience while trying to understand and communicate in another language (Meskill & Mossop, 2000).

Another finding was about how differently teachers used various educational software programs or alternative technologies in their classrooms technologies. Research suggests that an important factor in integrating technology in classrooms is the compatibility between teachers’ pedagogical beliefs and the technology (Bebell et al., 2004; Cuban, 2001; Sandholtz et al., 1997; Zhao et al., 2002). However, this study further indicates that while working with ELL students, who has different needs than native speaking students, ESL teachers choose to integrate different technologies into their classrooms based on their students. While an ESL teacher emphasized using Rosetta Stone, another teacher used Achieve 3000. Therefore, while teacher beliefs about technology and its compatibility with their pedagogies might impact their technology integration, the student population they have could also be a factor influencing how they use or integrate technology into their classrooms.

In summary the ecology theory, specifically the concept of ecosystems, provided a useful lens in explaining the financial and technical factors and the relation between them. The analysis of data indicated that financial factors were similar to sunlight and were important not only to establish the initiative, but also to sustain it. However, the financial homeostasis was unbalanced due to economic crisis, lack of sustainability plan, and end of initial state funds. The financial problems negatively impacted the technical aspect of the initiative, which was compared to the amount and quality of water in an ecosystem. Without enough funding, the school could not
renew its old equipment. These technical issues increased the pessimism about the initiative and decreased the use of laptops in ESL classrooms. In order to resolve this chain of events that originated with financial issues, the school tried to balance its financial homeostasis by creating a personnel position to apply for grants, developing new partnerships, and creating sustainability plan for the next school leaders.
CHAPTER 5
LEADERSHIP BIOTIC AND ABIOTIC FACTORS

Besides the financial and technical factors presented in Chapter 4, participants also discussed factors related to leadership. In this chapter these leadership factors and their current state are discussed in detail. This chapter also explains the interaction between the leadership factors and the factors discussed in Chapter 4. While the financial and technical factors were mainly abiotic factors, leadership factors were discussed as biotic factors. Data analysis revealed that participants identified four types of leaderships as vital for the laptop program in the school: school leadership, technology leadership, teacher leadership, and ESL leadership.

While discussing the school leadership, participants mentioned not only the previous principal, but also the current principal of the school. School principals were identified to be important because they were the key people putting all the pieces of the initiative together, motivating teachers, and arranging professional development sessions. Analysis indicated that although the current principal is dedicated to continue the initiative the previous principal established, the focus and vision about technology have shifted to instruction and achievement.

Besides the school leadership, participants also discussed the importance of the on-site technology leadership. Similar to school leadership, participants mentioned both the previous and current technology directors. Participant interviews indicated that while previous technology directors were helpful in establishing the systems and infrastructure, the current technology director is helpful in resolving the long existing technical issues. The improvements in the resolution of technical issues helped the school staff became more optimistic about the future of the initiative.

Participants also discussed the importance of teacher leadership because the initiative was lead by a team of teachers. Teacher leaders made decisions about laptops and their use in
classrooms based on their classroom experiences, their teaching needs, and students’ learning needs. The leaders also provided professional development. Analysis of data indicate that the teacher leadership group is currently not convening on regular basis as it did at the beginning of the initiative, which impacts the professional development new teachers receive in using technology for instruction.

Finally, participants discussed the importance of having an ELL perspective through the ELL leadership. However, participants mentioned the importance of ELL director after they were directly asked about the important biotic factors important for ELLs. Analysis of interview data revealed that the ELL leadership was added to the school after the second year of the initiative and contributed to the initiative by bringing the ESL lens to the instructional use of technology.

Lastly, community leadership was mentioned a few times to be crucial for the initiative. However, since their role was mentioned related to financial aspects of the initiative, this aspect was discussed in Chapter 4 under financial factors.

School Leadership Factors

One commonly stated biotic factor mentioned by all participants, even by students, was the school leadership. When participants discussed school leadership, they were referring specifically to the school principal. A parent highlighted the importance of school leadership when she said, “…if the leadership in the school is not on page, it’s not going to happen. Everything stops with the leadership in the school” (Interviewee 15).

*School Principals as Biotic Factor*

Principal’s role was considered to be more important compared to other school leaders, such as the assistant principal or instructional leaders. A participant explained the primary role of a school principal as:
These [one-to-one laptop initiatives] are complex, multifaceted projects that require instructional focus, policy focus, consistency of methods and if the principal is not there pulling off all those things and driving them, the project is not going to be effective even thought there might be strong assistant principal or instructional leaders. If the principal does not own it, I did not find these projects as effective. So I would say the role of the principal is primary. (Interviewee 10)

Related to the crucial role the school principal had in “pulling off” and “driving” different aspects of the initiative, interviewees provided two additional reasons for the importance of a strong principal. One of the reasons was “… [principals] understand their building, understand how to move through the various phases of that building with the human capital that [they] have there” (Interviewee 18). In addition to their knowledge of the building and the human capital, principals were also important due to their ability and skills to promote the initiative among the school staff. A participant said, “[i]f the principal is not able to secure buy in and cultivate shared ownership with their staff around instruction, procedural, policy and practical focus, it [the initiative] is not going to happen” (Interviewee 10). Securing the “buy-in” and cultivating “shared ownership” among school staff was an important responsibility of the school both at the implementation and sustainability phases. This finding about the principal’s important role supports previous studies that present similar findings on the importance of school leadership in one-to-one laptop initiatives (Bebell & Kay, 2010; Drayton et al., 2010; Shapley et al., 2010).

While discussing the school leadership, participants cited both the previous principal, who was important for establishing the program, and the current principal, who is important for continuing the initiative. In the following section, the previous principal’s roles, vision, and relation with the district will be presented. The section on previous principal will be followed by the roles of the current principal and the current vision.
Previous School Principal as Biotic Factor. Participants discussed the previous school principal as a biotic factor important for establishing the initiative. The previous principal discussed four main roles she had during the establishment of the program: mentoring school staff, ensuring the buy-in among teachers, finding money, and encouraging teacher leadership.

The previous principal explained her roles in the initiative as:

One, I was a cheerleader for it [the initiative]: I was excited, I told good stories, I got people amped and I assured them it would be ok. Then I was reassuring folks, who were nervous: ‘you can do this’, ‘we are the right group to try this out’, and very excited. On the other hand, I was also the one who said, ‘you will do this’, so I had this role to get everybody excited and then this role that ‘there is not an option’. (Interviewee 17)

The previous school principal explained that she not only gave support and morale to the school staff to ease the anxiety among teachers, but also built confidence that they were capable of successfully establishing such an initiative. However, while providing this support and morale, she made it clear to the staff that the initiative would be established in the school and there was not any other option.

The previous principal was also responsible for raising additional funds to cover the expenses that were not included in the state grant they received. A teacher leader expressed the principal’s primary role related to finances as:

Behind the scenes, I think [the previous school principal] ran a lot of the grant writing and the money support, that is why I do not know too much about it, but she set us up in a way that a lot of us learn from each other which was helpful. (Interviewee 2)

This quote is informative for two reasons. First, it shows that since the principal was the main person primarily responsible for finding funds, teachers and teacher leaders did not have to work on raising additional financial support. Therefore, they could focus on their instructional and
administrational duties. Second, while the principal worked on financial issues, she created a collaborative learning environment for teachers, so that they would shape the initiative based on their needs. Therefore, unlike traditional hierarchal structure, which follows a top-down approach and emphasizes authority and control (Deal & Peterson, 1994), the initiative in Park Middle School followed a combination of transformational and participative leadership.

Although the traditional hierarchal leadership could be effective because of its efficiency, it may not be effective to lead complex technology initiatives (Riley, 2000; Crowther, 2002; Gurr, 2004) because hierarchal leadership tends to lessen creativity and produce less commitment among staff as the school principal makes most decisions (Deal & Peterson, 1994). In order to ensure the buy-in of teachers, the principal wanted the initiative to be led by teachers. Yukl (2006) describes this type of leadership as transformational leadership, which allows for joint decision-making, power sharing, and decentralization. Transformational leadership inspires and motivates followers especially during times of change through his or her demonstration of commitment and effective communication of expectations (Burns, 1978 as cited in Watts, 2009). Since most urban schools experience educational reforms and changes frequently, this leadership is proved to be effective especially in dynamic, unstable environments like urban schools (Yukl, 2006).

The leadership in the Park Middle School was also participative, because it included people other than the principal in the decision making process (Yukl, 2006). In such leaderships, the quality of decisions, the acceptance and implementation of the decisions, staff morale, and trust increases as a result of joint decision-making (Liontos & Lashway, 1997). In Park Middle School teachers were actively involved in making decisions about the laptop use and procedures based on their and students’ needs. As a result of this joint decision-making, teachers owned the laptop initiative.
While executing the multiple roles she had, the principal received help from a few school personnel to find money and establish the initiative. She received help from the previous technology director in finding appropriate grants to financially support the initiative and providing professional development for teachers. She hired a technology consultant experienced in establishing one-to-one laptop programs to build and execute a Master Plan for the initiative, as well as to write grants. The consultant also delivered basic professional development sessions for teachers.

Although the previous principal received help from various sources, she did not seek the district’s support. During an interview, she explained that she actually avoided asking for the district’s help, because “they were not helpful” and “they were often more of an obstacle than a support” (Interviewee 17). The school leadership also avoided the district’s help in order to skip the bureaucratic procedures and wait time, so that the establishment of the initiative would not slow down. The principal further explained that the only help they received from the district was an improved wireless system because the wireless system in the school was initially insufficient. She reported that in order to receive the help with the wireless Internet, she had to be aggressive since the district initially denied that the wireless system was insufficient.

*Current School Principal as Biotic Factor*

Besides the previous school principal, participants also discussed the current school principal as an important biotic factor. During the first year of the initiative the current principal was an academy leader in one of the four academies in the school. During the second year of the initiative he left the school to work with the district superintendent. He returned to the school in 2010 as the school principal. While the previous principal was mentioned to be important for the establishment of the initiative, the current principal was stated to be important for the
continuation of the program. A participant expressed the important role of the current principal for the continuity of the initiative as:

If [the current principal] feels like the laptops don’t need money then we will not get it. If he feels like it is not important, it is not important, but I think he sees the useful of it.

There are attempts to continue the program, to make sure it is sustainable. (Interviewee 3)

The current principal was important to continue the initiative and he personally expressed his intentions to continue it in an interview. Besides continuing the initiative, the data analysis also indicated that the current principal had three main roles in the school: finding money for the initiative, improving instruction, and increasing achievement.

Similar to the previous principal, multiple participants mentioned that the “[the current principal] is the grant finder and the money finder” (Interviewee 1). After the end of the first wave of state funding, finding money for the initiative became harder for the current principal due to the economic crisis, expensive equipment, and not having sustainability plan as discussed earlier in Chapter 4. Although the current principal is searching for funds to continue the laptop initiative, the vision of the school altered when he arrived to school as principal in 2010. The principal explained the change as:

I know nothing, but instruction. I am an instructional leader. The governing board put me to rave up instruction, that I am going to do. … [T]he day someone says to me ‘I want to see what your teachers are doing based on your scores’ would be a day that I can probably leave or sleep really well because you are not looking at a machine. You are looking at my kids. (Interviewee 7)

While the current principal wanted to continue the initiative, he wanted the school to attract people not solely for its technology, but also for its academic achievement and instructional quality. The change in the school vision and the increased emphasis on instruction was also
clearly expressed by academy leaders and ESL teachers. While comparing the beginning of the initiative with its current state, an academy leader explained the change as:

I think it [the initiative] is different now because we focus on instruction. Our visions have changed for the laptops. … Before it was seen as a pencil. Everything we do included laptop. Now, I am going to teach, teach, teach, and we also have this resource. … Our leadership changed, so we have a new vision for our school. … We had [the previous principal] who was so in love with it and for her it is a tool. For [the current principal] it is a resource. (Interviewee 2)

Analysis of data revealed that multiple participants identified the new leadership in the school as a catalyst for changing the vision for teaching and learning to instruction. As a result of the change of vision, teachers started to approach laptops as a resource they could use when needed, rather than constantly.

One of the reasons for the change in vision and emphasis on instruction was the state of student outcomes, which were not satisfactory for the state and the school personnel. A teacher explained that the school is one of the lowest scoring schools on state wide standardized test. The school met AYP only once in 2010, since its establishment in 2004. The current principal said that since “the tide of our government and the world is changing in terms of competition and achievement,” as reflected in the names of policies such as Race to the Top or Acceleration Agenda, the school had to join the competition and attain the expected scores (Interviewee 7). After conducting observations and analyzing student outcomes, the principal realized that outcomes “do not a correlate with the laptop only. It’s a correlate with good teaching” (Interviewee 7). Therefore, he emphasized instruction and told the school staff that “a fool with a tool is still a fool. A computer is not going to solve everyone’s problems” (Interviewee 7). The
principal stated that sharing his perspective on laptops and instruction “freed teachers to think more creatively on how they’re going to use it, not just to use it” (Interviewee 7).

Interview analysis showed that ESL teachers and academy leaders shared the principal’s vision on instruction and laptops. They said the laptops are not “band-aids” to solve problems and stated the importance of quality instruction, which may not necessarily involve using laptops. Teachers also realized that “a bad teacher is a bad teacher with a laptop or not” (Interviewee 14). Although laptops were considered to be helpful to access sources, having a quality teacher providing students with quality instruction was more important. An academy leader explained that since the shift to an instructional focus, the test scores have been improving. Teachers attributed this improvement to instruction, rather than laptops. Despite the emphasis on instruction, the laptops were not eliminated in the school and the principal told teachers that they could continue to use laptops for various purposes, but “at the end of the day we want students performing” (Interviewee 7).

The second reason for the focus on instruction was the difficulty in raising money for the initiative with low achievement scores. The principal explained that before funding the initiative, funders request a connection between use of laptops and achievement. The principal explained the difficulty in finding funding as a result of low academic results as:

… this is where it’s a challenge because when they [funders and politicians] say to me, “Well, show me the results,” some of the folks who hold the checkbooks, quite frankly, don’t care about the smile on the kids face. They want academic results. They don’t care about the... I mean, they care, but perhaps not enough to write me another check for a million dollars … So what we’re doing now is trying to get results to use them to get more money. (Interviewee 7)
The principal is focusing on instruction and increasing student outcomes because in order to receive funding, the school needs to show funders that laptops contribute to student learning and outcomes. However, providing funders with the requested connection between laptops and student outcomes is a difficult and controversial task. Many research studies show that finding a correlation between technology and achievement is very complex and further state that even if it could be done, results may be invalid due to the misalignment between the skills assessed in tests and 21st century skills acquired through technology (Baker, Gearhart & Herman, 1994; McNabb et al., 1999; Russell, 2002). Related to this misalignment, the previous school leader explained:

> All the 21st century skills don’t get tested including the use of the technology. And the testing they use does not allow technology, which I find incredibly ironic since none of us would write a paper without technology and they are expecting kids to write 4 page essays by hand. (Interviewee 17)

Since the 21st century skills the laptop initiative promoted were not assessed in the state tests, previous leaders considered such tests as “a disadvantage” for the initiative. Currently, in order to overcome this disadvantage, the school stopped using laptops for writing. Students are encouraged to write with paper and pencil to prepare for the test. During interviews students also expressed the shift from technology to instruction in order to prepare for tests and increase scores. A student said:

> I think they [teachers] want us to focus more on the open response comments because they saw that our class got the lowest scores and they do not want us to use many computers. They want us to solve how to answer open response question. (Interviewee 21)

This shift in writing with paper and pencil explains why the classrooms observations and field notes contradicted teacher interviews. Although the teachers had mentioned in interviews that
students use laptops for writing, observations indicated that all the student writing displayed in walls were written by hand. Since the “achievement measures were too narrow” in standardized tests, the school “literally had to stop using the laptops so they can re-acclimate to writing with the pencils so they can take the [test]” (Interviewee 10).

However, asking students, who are used to writing with computers, write with paper and pencil could pose disadvantages, rather than benefits. For instance, in their study Russell and Plati (2002) examined the effect of administering extended composition test items on paper, on computer, or on a portable writing device on 4th and 8th students’ writing performance. They used writing items from a previous state exam for 4th and 8th grades. Similar to their previous studies (Russell, 1999; Russell & Haney, 1997; Russell & Plati, 2001), they found that when fourth grade students, who were accustomed to writing using a computer, generated responses using paper and pencil, their achievement was severely underestimated. The study also showed that when eighth grade students, who were accustomed to writing with a portable writing device, responded to open-ended items through paper, they achievement was also underestimated. As a result of these findings, the authors concluded that state test open-ended sections of the state test “underestimates the performance of students accustomed to writing using a computer by four to eight points on an eighty point scale” (Russell & Plati, 2002, p. n.d.) They recommended that when generating answers to open-ended items in Language Arts on state tests students should have the option to use the writing tools with which they are accustomed to working.

Summary

Results related to school leadership overall indicated that the vision of the previous and current principal is different. The previous principal’s purpose was to establish the program and provide students with 21st century skills. In order to establish the program, the previous principal raised money additional to state funding, hired people who would help her establish the program,
motivated teachers to be a part of the initiative, and created a teacher-led initiative, where teachers would make decisions about how to use the laptops and how to support their teaching. In order to establish the initiative fast and smoothly, without being blocked by bureaucratic issues, the previous principal established the initiative independent from the district. Therefore, the box representing the district is a dash line in Figure 5.1 because the district was not able to offer solid support and resources to the school for the initiative.

While the previous principal’s purpose was to establish the program, the current principal’s purpose is to sustain the program with a focus on instruction. Similar to the previous principal, he is responsible for finding money. As represented in Figure 5.1 the school leadership contributes to the financial factors through funding. However, interviews with academy leaders and ESL teachers indicated that compared to the previous principal, the vision of the school changed with the arrival of the current principal in 2010. The change in the vision is represented by the vision-arrow impacting the technologies used in ESL classrooms.

Figure 5.1: School leadership factor in the school
Previous focus of the initiative was using laptops as an essential part of instruction; however, currently the goal is improving instruction and increasing student achievement. The current principal emphasizes instruction in order to meet the competitive federal mandates, whether it would be with or without the use of technology. Therefore, the arrow emerging from the federal context represents the federal mandates’ impact on the principal and his vision.

Another reason for the shift in the vision was due to the school’s low achievement scores, which made finding funds for the initiative difficult. In order to receive funding, the school had to increase their achievement scores and prove to funders that laptops were beneficial for student learning and outcomes. In order to achieve the instructional and achievement goals, the school began working towards attaining the skills the standardized tests assess.

As a result of the current emphasis on instruction and achievement, Instruction and Achievement box emerged within the Technologies in ESL Classroom Square in Figure 5.1. The new vision and the emergence of Instruction and Achievement box began repressing the use of laptops in classrooms, which is evident from the decrease in use of laptops for writing.

Technology Leadership Factor

Despite the primary importance of the school leadership, data analyses also highlighted the importance of having an on-site technology leadership. All school administrators, academy coordinators, academy leaders, and ESL teachers discussed the technology leadership mainly as a biotic factor and mentioned the previous and current technology directors. In the following section brief information about the previous technology directors and their roles will be provided. The section on previous technology directors will be followed by the discussion of current technology director and his roles. Finally, the current technology director’s need for additional help will be explained by the changing roles of academy coordinators.
**Previous Technology Directors as Biotic Factors.** When the initiative started in 2006, the school principal raised additional funds to hire a technology director to work on the technical aspects of the initiative. However, in addition to working on technology aspects of the initiative, the technology director also arranged meetings, prepared meeting agendas, and ran them with the teacher leader team that led the initiative. He organized the flow of the laptop initiative with the teacher leader team and collaboratively created rules around laptop use, such as how to distribute laptops in the mornings and how to collect them in the afternoons. Moreover, he met with academy coordinators, who were hired to support the technology director by doing routine technical chores, such as ensuring that the machines worked properly or fixing minor problems.

The previous technology director also did some research on educational software programs and web tools to introduce to the school staff. Finally, he was involved in some of the grant writing. Due to the multiple roles the technology director had, another person was hired to help him. The technology director, who was involved in the establishment of the program from the beginning, left the school with the school principal in Summer 2010. When the technology director left, the school did not have a technology director for about nine months until the current technology director was hired in late spring in 2011.

Participants mentioned that while having an on-site technology director was very important, they added that having multiple people responsible for technology sometimes created confusions about who was responsible for solving technical issues. Moreover, limited knowledge previous technology staff had in resolving some technical issues exacerbated the confusion. An academy coordinator explained the confusion and issues as:

*We have struggled with trying to figure out who is going to fix what. It was always just a battle. The staff that we had before with the laptops, … it was just always a struggle.*
Because sometimes we would come to them with questions and they wouldn’t even know the answer. (Interviewee 16)

Compared to the confusion and some unresolved technical issues, the school seemed to have suffered more from not having a director of technology for about nine months. During the nine months without a technology director, technical problems reached its peak due to old equipment and piled-up issues that remained unresolved in the past years. The increasing technical problems in 2010 decreased the laptop use in classrooms and increased doubts about the future of the initiative. The current director of technology indicated that when he was hired in Spring 2011, he found himself facing serious problems that had to be urgently solved before the school started in Fall.

*Current Technology Director as Biotic Factor.* Before working as the technology director in the school, Mr. Atkin worked as IT personnel at a large computer corporation. As the current director of technology, he is responsible for maintaining the infrastructure, such as student and faculty laptops, servers, network, and printers. Similar to the previous technology director, Mr. Atkin continues to provide trainings to the academy coordinators about fixing minor technical issues. He also provides professional development sessions for teachers on how to use some education software programs.

Although Mr. Atkin’s job description did not involve finding funds for the initiative, he developed partnerships with some institutions for financial and technical support. For instance, he partnered with a local public television station, through which the school received some money and desktop computers. He also partnered with a local career-training school, which provided Mr. Atkin with two interns. Due to the partnerships Mr. Atkin created, participants mentioned that the director of technology was also a factor in finding funds.
While the current technology director’s responsibilities were similar to the responsibilities of the previous technology director, there was one important difference. Unlike the previous technology director and school principal, Mr. Atkin began to cooperate with the district’s IT department. Although “there was a lot of animosity towards this school in respect to technology since they went about it [initiative] on their own,” Mr. Atkin began to overcome the animosity and started to build relations (Interviewee 20). Mr. Atkin explained the reason for the cooperation as:

I coordinate with them [the district IT department] since they own the network. That is the only way you can ensure that we can sustain the network operations of the school. I have no ability to maintain the network on my own. They monitor it. … I do not have the ability to administer it here. (Interviewee 20)

Although the school was independent in many of the technical operations they executed, they had to depend on the district for their network operations. Since the continued animosity between the district and the school would not help the school resolve the network issues, Mr. Atkin initiated the cooperation. Although the school principal did not ask the director of technology to take such an initiative to create relations with the district, he was supportive of the cooperation Mr. Atkin started.

*Change from Pessimism to Optimism.* While discussing Mr. Atkin, participants emphasized his effectiveness and deep knowledge in technology. Some participants compared Mr. Atkin’s effectiveness and knowledge to previous technology staff. More importantly, interview analyses indicated that Mr. Atkin’s abilities and knowledge in solving long-existing technical problems promoted hope for the continuity of the initiative.

Participants described Mr. Atkin’s effectiveness by discussing his the level of support, helpfulness, and availability. Besides being available and helpful, Mr. Atkin was also described
as more effective due to making some technical procedures easier. For instance, an academy coordinator mentioned that Mr. Atkin created scannable barcodes for each laptop, which are used to track student laptops. Previously, laptops had small numbers on stickers that coordinators had to manually enter into their computer. Since an academy had about 150 student laptops or more, manually entering the numbers was inefficient for the coordinators. ESL teachers discussed Mr. Atkin’s effectiveness in terms of his constant communication with them and updating them about the status of laptops. Finally, some participants discussed Mr. Atkin’s effectiveness by mentioning that he solved several issues that bothered the school for years.

Mr. Atkin resolved the long-existing issues through his deep knowledge in technology. A school administrator described Mr. Atkin’s level of knowledge and compared it to the previous directors as follows:

He knows it [technology] like the back of his hand. I think that the tech people that were here before, the focus for them was getting the funding, getting the laptops, and getting the program started, and really going out and speaking to other places and going to visit other places. … So we really didn’t have one who knew, who was grounded in technology. … Mr. Atkin can talk the language, and he’s just awesome. So that’s what makes the difference, I think. (Interviewee 9)

The quote above is informative because while comparing Mr. Atkin to the previous technology staff, it reveals the different roles technology directors had at different phases on the initiative. The previous technology directors were hired at the establishment phase to set up systems and organize roll out procedures for laptops. However, at the sustainability phase, hiring a technology director with strong technological knowledge was necessary to properly solve large amounts of serious technical problems. Previous research studies on technology integration indicate the importance of having an on-site technology support to resolve the issues that require high
technical knowledge (Sandholtz et al., 1997; Walker, 2010). Therefore, having on-site technical support personnel to resolve the issues for teachers was critical for the sustainability of the laptop program in the Park Middle School.

Mr. Atkin’s knowledge in technology and effectiveness in resolving some technical issues positively improved the condition of laptops. Multiple participants collectively expressed that 2011 was the only year they observed positive changes in the technical issues they had been experiencing. These positive improvements Mr. Atkin produced changed the school staff’s pessimism about the future of the initiative to optimism. A teacher explained this change while discussing the state of the initiative in 2009 as:

…[in 2009] it was like “we are done with this, we do not want to do this any more, these laptops are terrible, I am done”. … They did not even want to roll the carts anymore. Mr. Atkin came and changed that attitude. (Interviewee 1)

The employment of a knowledgeable technology director changed teachers’ frustration with and attitude towards laptops. Due to the improving attitude towards laptops and the knowledge of having a helpful technology director, a teacher stated, “this year people are a lot more willing to try technology” (Interviewee 13).

Solving technical issues and creating positive changes in staffs’ attitude towards the initiative was not easy to achieve for Mr. Atkin. He worked long hours, which caught all participants’ attention. A teacher said, “… I know he’s here [his office] a lot. He’s there all summer. He’s there 12, 16 hours a day working on things” (Interviewee 6). While working for long hours, Mr. Atkin received minimal technical support. Participants described him as “one-man show,” doing “his best to be in four different places at once” and “doing the work of two or three guys” (Interviewees 6 and 16). Academy coordinators were originally hired to support the technology director. However, their technology related duties decreased over the
years due to changes in their responsibilities. Over the six years, more non-technology related duties were assigned to the academy coordinators and currently they “wear multiple hats.” When teachers have technical issues, their academy coordinator is still the “frontline” person to solve the issues. However, they are also responsible for disciplining students, mentoring them to improve their behavior and attendance, and organizing fundraisers.

An academy coordinator associated the changes in their roles to the technical problems that increased over the years. Solving the increasing and serious nature of technical problems required deep technological knowledge. Academy coordinators were not hired to work on such major issues and were not equipped with a deep technical knowledge to solve the issues. Therefore, over the years their job description changed based on the other needs of the academies.

Another reason given for the changes to the academy coordinator’s role was new instructional vision the new school principal brought. As a result of the changes in academy coordinators’ roles, the current director of technology “found [him]self in a situation where [he] had limited assistance from the academy coordinators” (Interviewee 20).

The school staff acknowledged the limited assistance the technology director had in resolving the technical issues when they said “one guy for 700 laptops, including the teachers, is far too little. Way too little” (Interviewee 13). Mr. Atkin admitted that his responsibilities were “exhausting” and requested more support but due to limited funding “got no response.”

Summary

During interviews participants discussed the previous and current technology directors. Analysis of data revealed the importance of having a dedicated, on-site technology director with deep technology knowledge to effectively and efficiently solve technical problems. The technology director also created collaborations as indicated on the right side of Figure 5.2. The collaborations contributed to the financial and technical aspects of the initiative and the school
received some funding, desktop computers, and interns to help the director. More importantly, unlike the previous technology and school leaders, the director of technology started collaborating with the district’s IT department to resolve the long existing network issues. The technical improvements teachers observed impacted their use of laptops in ESL classrooms positively and the pessimism about the future of the initiative began to become more optimistic.

Despite the resolved technical issues and the increasing optimism, there are still issues that need to be resolved. For instance, teachers stated that they didn’t receive laptops until October in 2011, which negatively impacted their use in classrooms. An ESL teacher explained the situation as:

Basically I think after not having the laptops for a month and a half people get used to not using them in the classrooms. I think this year, even though things were more organized, I think they started too late, so that caused a lot of people to not get into the groove of

![Diagram](image-url)
doing it while last year we had them second week of September. Even though it was a mess, we still had them. (Interviewee 13)

This quote above highlights the importance of not only having functioning laptops, but also having them at the beginning of the semester. A reason for the late distribution of laptops was the amount of work the technology director had to do alone. When the role of academy coordinators changed from supporting the technology director to helping academies with instruction and discipline, the technology director was mostly alone in solving the problems. Therefore, participants discussed the need for additional help for the technology director.

**Teacher Leadership Factor**

In the Park Middle School a team of teachers, who were interested in teaching with technology, directed the laptop initiative. The team discussed how they would use laptops with their students and provided trainings to each other and to other teachers that struggled with using laptops. As a result of the teacher leader team, the laptop program “was really laid out by teachers for teachers” (Interviewee 2). Since the laptop program was established by the decisions the teacher leader team made, one of the most commonly stated factors was the teacher team. Since the members of this team are biotic organisms, the team is identified as a biotic factor.

One of the prominent findings related to teachers was the different stances veteran and new teachers had on the current state of professional development, which was provided by the academy leaders. Veteran teachers mentioned that although there are not as many professional development sessions as before, the sessions for new teachers are helpful. On the other hand, new teachers believed they did not receive enough sessions to learn how to use and integrate technologies into their instructions. In the following section, the teacher team and its roles are described. Then, the previous and current states of professional development are explained.
Teacher-Leader Team as Biotic Factor. The teacher leader team was created when laptops first came to the school in 2006. The previous principal and the technology director explained the importance of creating a teacher team to lead the initiative as:

You cannot go in and dictate, “Hi, everyone is going to do this.” It won’t work, or it won’t have the outcomes you desire. However, if you have a group of teachers who are really pushing the agenda, your chances of succeeding are much higher. (Interviewee 4)

Giving teachers the autonomy to lead the laptop initiative was considered as a way to increase the chances of successfully establishing the laptop program in the school. Therefore, teachers, who were interested in using technology in their instruction, were requested to create a teacher-leader team to lead the initiative. The team was composed of teachers from different grade levels, academies, and content areas to ensure different types of learners and grades were represented. The team made decisions about what teachers were required to do, how professional development sessions would be provided, and what software programs would be purchased to name a few.

The role of the teacher team was very important because as Common (1983) states, when innovation comes from policymakers or nonteaching experts, teachers may resist change. However, “changes that last and make a difference in learning generally come from the inside out rather than the outside in or the top down” (Farrell, 2000, p. 90). In Park Middle School the teacher team became seriously committed to the initiative because they defined what the innovation means for their classrooms and observed that laptops assisted them with teaching to their students. Teachers confirmed the importance of teacher involvement in the initiative. A teacher said:

… When it was teacher led and saying, “this is the way I am using this and its helpful” as opposed to an administrator saying, ‘Oh, here is the new program. This is how you are going to use it.” I think that was important. Because you are talking to a peer that has had
experience and it worked for them and I am going to listen to them. I can trust my peers, right?” (Interviewee 12)

Teachers were more perceptive to receive orders and suggestions from each other since they all worked with students and understood each other’s context. The team was crucial for the program not simply because they made decisions about the laptops, but because it made the direction of the initiative bottom-up, rather than top-down. The bottom-up nature of the initiative encouraged teachers to contribute to the project willingly, take ownership of the initiative, and be more open to suggestions. Mandating teachers to create a teach team and asking them to work collaboratively could have created contrived collegiality, which “consists of administratively contrived interactions among teachers where they meet and work to implement the curricula and instructional strategies developed by others” (Hargreaves & Dawe, 2002, p. 227). However, since the members of teacher leader team were teachers who were interested in technology and volunteered to be member of the teacher team, a “collaborative culture” has emerged. In collaborative cultures the relationships are open, supportive, and are based on trust (Hargreaves & Dawe, 2002). Furthermore, in contrast to contrived collegiality, which enhances administrative control, collaborative cultures foster teacher and curriculum development.

In the Park Middle School, teacher leader team worked collaboratively to enhance the school curriculum by integrating technology and provided training to each other and other teacher to foster teacher development.

While the veteran teachers mentioned the teacher-team as a crucial leadership factor, new teachers did not mention the teacher-team because the team seized meeting in 2009. Despite the crucial role the teacher-team played in the initial phases of the laptop program, upon consulting some teacher leader members, the current principal decided not to continue the team. The main reason for the decision was the serious technical problems the school experienced. Without
resolving the technical issues, the teacher-team’s decisions about use of laptops would not be applicable to classroom practices. Therefore, rather than the teacher-team, new teachers mentioned academy leaders as important biotic factors related to the leadership. Interestingly, the academy leaders the ESL teachers mentioned to be crucial were all members of the teacher team.

*Professional Development as Abiotic Factor.* All school personnel expressed the importance of professional development (PD) in a laptop initiative. Initial PDs were provided by the previous technology director, technology consultant, and principal. When the teacher team was created, the team took responsibility for providing PD sessions.

Participants explained the importance of PDs by three main needs; the need to learn about some basic technical aspects of laptops or software programs; the need to understand how appropriate the available software programs and laptops were for the curriculum; and the need to know how to manipulate the available technologies to meet student needs. Knowing how to manipulate the technologies was crucial especially for ESL teachers. An ESL teacher explained:

> The important things for me would be the specific ‘how to use the technology’ specifically for our students. Like I said, most of these programs can be manipulated in certain ways, whether they take a text from an eighth grade reading level to a third grade reading level. That’s what’s important to me, to figure out how I can take that information, manipulate it, so it can be used by my students. (Interviewee 19)

At the beginning of the initiative the PDs were called Bagels and Laptops (B&L). B&L would meet every Friday morning for a few hours. The purpose of B&L was to highlight various strategies or programs teachers could use in their classrooms. During the sessions, each teacher, who was good at using a program, would show other teachers how to use various programs. The content of the sessions included setting up a website and using software programs such as Achieve, My Gradebook, Excel, Microsoft Word or Garage Band to name a few. However,
besides showing how to use programs, more crucially, teachers would explain how they used it in their classroom for instruction and how it worked.

Despite its effectiveness, when the teacher-team stopped convening, the B&L also stopped. There were multiple reasons for the discontinuation of B&L. One of the reasons was technical issues, such as old equipment and unreliable network, which limited the use of laptops for instruction. The second reason was because the school administrators “have not heard anyone ask for it” (Interviewee 7). Finally, the third reason was the current emphasis on instruction, rather than use of technology in instruction. However, the school administration is planning to restart the B&L sessions because the technical problems are being resolved and new teachers, who are not necessarily informed about integrating technology into instruction, are being hired.

The PDs were stated to be crucial especially for new teachers “because new staff come in and they do not have the same experience in the beginning” as the veteran teachers do and they need support to adjust to the school (Interviewee 2). PDs were important for newly hired teachers to learn about the available technologies in the school, how they can be used with students, and how they can complement curriculum. PDs were also important for new teachers for them to be on the same page with veteran teachers.

Since the discontinuation of teacher leader team, it has been reported that a lot of the professional development happen at the academy level. However, based on the interviews, these academy level professional development sessions are not consistent or coherent. An academy leader explained the professional development in her academy as:

In the past I would spend the whole day on going over how to do all these things, giving teachers time for their websites, what programs they are using, setting up the programs, setting up the passwords for kids, mygrades. This year I have not done it at all. But the new teachers have figured it out by going to the leaders and their colleagues in the
academy in setting that up. There is still support but it is teachers going to teachers.

(Interviewee 14)

Similar to the quote above which explains the inconsistent nature of professional development provided in the academies, multiple academy leaders and some teachers explained that currently teachers learn how to use available technology by “trial and error” and “just by doing.” Although the veteran teachers had consistent PDs every Friday morning, during which they learned from each other, the new teachers did not have access to such consistent PD sessions. New ESL teachers acknowledged that they had some professional development, but they further added that the sessions were very brief and did not explain how the available technologies could be used for instruction. An ESL teacher said:

We got a very quick [training], during our professional development week, “this is what we have,” but nothing in “this is how you use it.” You have to seek that out for yourself and ask veteran teachers how do you use My Gradebook. That is a steep learning curve when you come to this school, that a lot of the things are technology based. (Interviewee 13)

The quote explains that although new teachers were presented with the available technologies the school had, they were not provided with an explanation about how these technologies could be used for instruction. Although new teachers were able to contact veteran teachers for help, this self-pursued quest for help added extra stress to new teachers’ learning curve during their attempt to adjust to their new position.

Due to the lack of consistent PDs, the novice ESL teachers collectively requested to have more PDs to learn how to use the available technologies. In addition, they made specific suggestions about how the PDs should be, such as providing teachers with more hands-on
activities and practice. An ESL teacher expressed this suggestion while discussing the insufficient PDs and the need for more PD sessions as:

I think there’s not enough training for teachers to really use them effectively. … So I think I'm disappointed most about that because every year there's “we got license for this and we have license for this and you can do all these things” and you might go to a meeting and they'll break it down for you in 10 minutes, and then you're off on your own, and for me personally, I need more practice in it. (Interviewee 19)

Similar to an earlier quote, this quote above mentioned that new teachers were presented with the available technologies briefly, but not with how to “really use them effectively.” In this quote the participant additionally indicated that they need more practice in using the available technologies. Research supports teachers’ suggestions that in order for professional development sessions to be high quality, they should be in longer duration so that sessions could provide richer learning experiences, more comprehensive investigation of topics and time for practice and experimentation (Garet, Porter, Desimone, Birman, & Yoon, 2001; Penuel, Fishman, Yamaguchi, & Gallagher, 2007; Smerdon et al., 2000).

A second suggestion for PDs was making them mandatory and a third suggestion was having PDs in a continuous manner and being evaluated on how teachers use it. An ESL teacher explained:

You need to spend 10-12 hours, 16 hours, whatever it is for the first couple of months, and it should be in the first couple of months …and it just has to be this continuous learning process within the first 6 months and then go and use it and be tested on it, come in and ask how am I doing, how am I using it. … (Interviewee 1)

The teacher explains that it would be helpful to receive feedback on how they are using the laptops after receiving PDs. Based on the feedback received, they suggested to receive additional
professional development throughout the semester. Existing research also supports the importance of teachers’ request about receiving follow-up support throughout an academic year to fully acquire and implement new skills in the instructional environments (Bradburn & Osborne, 2007; Garet et al., 2001; Neugent & Fox, 2007).

**Summary**

Results related to teacher leadership indicate the importance of teacher involvement in the initiative, which is represented by the teacher leadership arrow at the top part of Figure 5.3. Through the teacher leadership, teachers owned the initiative, worked on the initiative without being pressured by the administration, and made meaningful decisions and rules around the use of laptops. The teacher leadership was also important in professional development sessions provided to teachers. During the PDs, teachers, who were knowledgeable in specific programs or applications, explained the technicalities of these programs and showed how they could be used for instruction. The laptop program was lead “for teachers, by teachers.”

However, due to technical issues and the new emphasis on instruction the teacher-team ceased to assemble as indicated by the faded arrow impacting the ESL classrooms. With the ceased teacher-team meetings, the nature and frequency of professional development sessions changed. The professional development sessions became shorter and were limited to only the beginning of academic year. The content of the sessions also became introductory, which did not explain how available technologies could be used for instruction. Therefore, while veteran teachers mentioned past professional development sessions favorably, new teachers commented on current sessions less favorably. The seize of teacher team meetings and the changing nature of professional developments increased the emphasis on instruction and achievement as indicated by the increased size of the Instruction and Achievement box in the figure in ESL classroom context.
Analysis of data indicates that novice teachers are interested in using available technologies and request longer professional development sessions that explain how to use specific technologies. They suggest the sessions to continue throughout the academic year. They also want to be evaluated on how they use technology after the sessions and receive more professional development based on the feedback they will receive.

Figure 5.3: Teacher leadership factor in the school

**ESL Leadership as Biotic Factor**

Although participants discussed teacher leadership without being directly prompted, they discussed the ESL leadership when they were posed a direct question about an important biotic factor for ELL students. Upon being prompted, all participants, including the students, identified the current ESL director as an important biotic factor. A participant explained that it was important to have “somebody with a lens, who thinks a little bit differently from us [mainstream classroom teachers] related to the ELL population: someone, who would say ‘yes that is true for general population, but does not work for everyone’” (Interviewee 6). While the ESL leader was
important for bringing an instructional perspective specific to ELLs, she was also important for bringing a technological focus specific to ELLs and “reminding [teachers] their needs and how you can leverage that technology in a very different way for this different population” (Interviewee 17).

State of the initiative before the ESL leader. Despite the importance of having a “lens” for working with ELL students with an instructional and technological focus, when the school opened in 2004 and the initiative started in 2006, the school did not have a personnel specialized in working with ELL students. The ESL teacher was hired in 2008, two years after the laptop initiative started, and later became the ESL director. Analysis of interviews indicated that before the employment of the ESL teacher, mainstream teachers paid attention to differentiating their instruction for the various student-needs in their classrooms. However, despite the differentiation of instruction there “was a general lack of understanding, common knowledge about ELLs” and the different needs of ELLs were not “on the forefront” at the beginning of the initiative (Interviewees 12 and 13).

When participants were directly asked about whether ELL students’ needs were considered from the beginning of the initiative, the community, school, and academy leaders who were involved in the initiative from the very beginning stated that since the initiative was for the whole school, “it wasn't like they were going to single out one group of students. It was for the benefit of all students” (Interviewee 9). As the initiative targeted benefitting all students’ learning experiences, the initiative and funding was not differentiated for the special needs of various student populations. For instance, the teacher-leader team did not discuss whether the educational software programs purchased would be beneficial to ELLs or whether it would be meaningful to use the programs at same frequency with ELLs as with other students.
Although the initiative and funding was not differentiated to different student needs, having teachers in the teacher-leader team representing different student grades, subject areas, and student populations was given special consideration. One of the student population represented in the team was the special education. A veteran teacher explained that the initiative was “planned for all students. But specifically [they] were differentiating learning for special learning kids and there were ELL students in this group. So, by discussing students in this group we were also discussing ELLs” (Interviewee 14). Other teachers also mentioned that the issues related to ESL students were discussed along with the issues of special education students through the leadership of special education teacher leaders. Lack of an ESL specialist working in collaboration with special education specialists may lead to over- or under-representation of ESL students in special education (Artiles & Ortiz, 2002; Barona & Barona, 1987; Geva, Yaghoub-Zadeh, & Schuster, 2000).

*Contributions of the ESL leader as a biotic factor.* After the ESL specialist joined the school, she “brought more attention” to ELL student population and the use of technology with them. When the ESL specialist came to the school, she evaluated whether the existing technologies were applicable to the ELL students. The results of her evaluation indicated that the available technologies were not effective to meet the needs of ESL students who recently arrived to the U.S. Based on the needs of the recent arrival ESL students, the ESL leader explored programs and tools that would meet their needs. Upon completing her exploration, she proposed to the teacher team to purchase Rosetta Stone as explained earlier in Chapter 4. The school and teacher leaders accepted the suggestion and decided to “put some funds into trying to help students learn English” (Interviewee 4). After purchasing Rosetta Stone, the ESL teacher joined the Bagels and Laptops sessions on Friday mornings to show how to use Rosetta Stone and to explain how it would help ELL students’ language development. Alongside providing
professional development, she also taught courses for the teachers to become certified to teach to ESL students and integrated technology within these courses.

After observing the contributions the ELL director made to the initiative, veteran teachers reported the importance of having an ELL perspective in the planning stages and in the teams that are responsible from making decisions about instruction and technology. An academy leader expressed this suggestion as:

I think we could have included all student populations in the conversation. … We did not break down the population. It would have been great to have someone in the table with an ELL lens say “we all have to do this because we all have ELLs in our classrooms.”

(Interviewee 6)

Although the employment of ELL specialist brought more attention to ELL students in the school and the initiative, the focus on ELL population increased more in 2010 with federal mandates. A teacher explained that at the same time with the laptop initiative “the district was scrutinized at the federal level for our ELL programming” (Interviewee 14). Due to the federal mandates, the district became more compliant to follow the federal guidelines in educating ELL students. The school updated its ESL program, re-identified its ELL students, officially trained its teachers to be certified to work with ELL students, included ELPBO standards, and re-categorized its ESL levels from 3 to 5 levels representing various proficiencies. A teacher compared the consideration given to ELLs after the federal mandates as:

I think in the past two years I do feel like they’re trying to keep ELL and the special ed population more at the forefront of their thoughts, but I don't think at the beginning it was a program or a population they were really focusing on. ... I think now schools and districts are starting to think about how they’re servicing those populations. (Interviewee 13)
One way the school showed that they brought their ELL students and their needs to “forefront” was the specific technologies purchased for ESL teachers to use in their classrooms. A teacher explained the technology the ESL teachers received as:

We got the document readers and we got some iPads, to be able to use with our kids. ... I think that was really great. I think that is a smaller recognition of the fact that this kind of technology would be useful in the ESL classroom. (Interviewee 13)

The purchase of specific technologies for ESL classrooms indicate the increased awareness of ESL students, their needs, and how these needs could be met by different technologies as part of the laptop initiative.

Summary

A finding specific to ELLs was that ESL leadership was not mentioned until participants were specifically prompted to provide information about ESL leadership. Analysis revealed that the school did not have an ESL specialist until the second year of the laptop initiative. Therefore, while establishing the initiative, special education teachers represented the ESL perspective, rather than an ESL professional. However, after employing an ESL professional, the school staff understood not only the different instructional needs of ESL students, but also the different technological needs. Therefore, the ESL leadership impacted how instruction was delivered and how technologies were used in ESL classrooms as represented by the arrow on the left side of Figure 5.4.

After observing the contribution of the ESL specialist on the laptop initiative, veteran teachers and previous technology staff stated that the ESL specialist should be included in the decision making process from the very beginning of laptop initiatives. Finally, the federal demands increased for the school and the district to provide better instruction to ESL students as represented by the arrow emerging from the federal context as illustrated in the Figure 5.4.
Interpretive Summary

Findings related to leaderships overall indicated that various types of strong leaderships was important in both establishing and sustaining the initiative. School leadership was associated with finding money and defining the vision of the initiative, which changed with the arrival of the current principal. The new vision is improving instruction and increasing achievement. Another type of leadership was on-site technology leadership, more specifically the director of technology. Technology leadership was important to establish the technical aspects of the initiative. However, after the establishment of the initiative, the importance of effectively and efficiently solving technical issues increased. Through the resolution of some problems the school staff become more optimistic about the future of the initiative.

A third leadership factor was teacher leadership. Teacher leadership was mentioned to be important to promote ownership of the initiative among teachers and establish the initiative based on teachers’ and students’ needs in classrooms. Teacher leadership was also crucial for
professional development sessions since teacher leaders provided trainings to their colleagues. Finally, ESL leadership was essential for a school that had a large population of culturally and linguistically diverse student population. At the beginning of the initiative the school did not have an ESL teacher-leader and ELL students were discussed as part of the special education student population. After the arrival of ESL specialist, who made important contributions to the program, participants indicated that such a professional should be involved in the decision-making phases of the initiative from the very beginning.

Leadership Factors

Since the leadership factors were discussed mainly as biotic factors, in this section connections to ecology theory will be made regarding the biotic factors. Furthermore, connections between these biotic factors and the abiotic factors discussed earlier in Chapter 4 will be made. Through the illustrations of these connections, the interaction between different components of the initiative will be demonstrated.

In an ecosystem a group of biotic factors is called community. In the Park Middle School, the community was composed of school administrators, teachers, students, parents, and community leaders. Within each community, based on their numbers, some species are dominant and some are rare species (Zhao & Frank, 2003). In a school ecosystem, since students are in larger numbers compared to teachers and administrators, they would be dominant species. On the other hand, school leaders such as principal or technology director would be considered as rare species because each school has only one principal or technology director.

Each biotic factor’s niche (role) determines its importance for the ecosystem. Therefore, in an ecosystem rare species can be as important as the dominant species if they have critical niches. When applied to the Pilot Middle School environment, both the previous and current principals had crucial roles in the school ecosystem despite being a rare specie. This finding
supports existing research findings about the importance of having informed and committed leadership for the establishment and continuation of a one-to-one laptop integration process in schools (Bebell & Kay, 2010; Drayton et al., 2010; Lei, 2010; Shapley et al., 2010).

Related to the importance of leadership in laptop school, Shapley et al. (2010) further states that at higher implementing schools “… committed leaders, thorough planning, teacher buy-in, preliminary professional development for teachers, and a commitment to the transformation of student learning, were keys to their successful implementation of Technology Immersion” (p. 46). During the establishment phase of the initiative the principal at the Park Middle School demonstrated the features of a committed leader Shapley et al. (2010) stated in their study. The previous principal was committed to integrate technology into the school, promoted teacher buy-in, and arranged the initial professional development sessions. The professional development was later offered solely by a selected team of teacher leaders, who also made decisions about transforming student learning.

Since the initiative was “led by teachers, for teachers,” the teacher leader team was the keystone specie in the school ecosystem. In ecology, keystone species refer to biotic factors that have the most important role in the ecosystem. Although the principal was identified to be important to find funding and create a teacher team to lead the initiative, since it was the teacher leader team that led the initiative, the teacher leader team was the keystone specie. Previous research has also identified teachers as keystone species (Bebell & Kay, 2010; Shapley et al., 2010; Zhao & Frank, 2003). For example, at the end of their study on one-to-one computing Bebell and Kay (2010) concluded that it is “impossible to overstate the power of individual teachers in the success or failure of 1:1 computing” (p. 47) and that “teachers nearly always control how and when students access and use technology during the school day” (p. 47).

Teachers and their support are important for technology initiatives because if teachers do not
value technology or if their pedagogies do not match the pedagogies new technologies bring with them, technology integration in classrooms may not happen (Bebell, Russell, & O’Dwyer, 2004; Garthwait & Weller, 2005; Windschitl & Sahl, 2002).

In nature, ecosystems evolve and during this evolution niches each species have may change. Similarly, in the Park Middle School, the keystone species has changed. The teacher leader team was the keystone specie at the establishment phase of the initiative. However, after the end of the piloting period, the technology leader became the keystone specie because teachers became dependent on the technology director. Zhao et al. (2002) defines dependence as “the degree that an innovation relies on other people or resources—particularly people and resources beyond the innovator’s immediate control” (p. 496). As mentioned earlier in Chapter 4, the technical issues increased teachers’ and teacher leaders’ dependence on the technology director. In order to use laptops without any problems, convene the teacher leader team, and provide professional development sessions, teachers had to rely on the technology director and his knowledge in solving technical problems. As a result of this dependence, the technology leader attained a very important niche in the school ecosystem.

In Chapter 4, it was also discussed that the homeostasis of the ecosystem may change due to abolition of existing components, such as financial support. Besides the abolition of existing components, the homeostasis may also change through introduction of new components. When new species are introduced into an ecosystem they are considered as invaders. The invader interacts with the existing components of the ecosystem trying to establish itself and its role in its new environment (Zhao & Frank, 2003). After the previous principal left the school in 2010, the new principal arrived with a new vision. Therefore, the arrival of the new principal could be considered as an invader, which began to establish itself and its vision into the school ecosystem. Invading species are not necessarily dangerous species because they can contribute to the
ecosystem by attaining essential roles. After arriving to the school, the new principal attained the role of improving instruction and increasing achievement.

In ecology, when invaders interact with the existing species, several consequences may occur. The first consequence is the invader spreads into the new environment and forces existing species to become extinct (Zhao & Frank, 2003). The principal did not force teachers to quit using laptops. He had clear intentions to continue the initiative because the initiative became part of the school’s identity. A second result could be that invader may not survive in the new environment and becomes extinct (Zhao & Frank, 2003). This second result did not happen in the school either because the principal was able to establish himself as a respected leader and the school staff embraced his vision on instruction and achievement.

A third result is both the invader and the existing species evolve and acquire new properties (Zhao & Frank, 2003). The evolution of invader and existing species did not happen due to some external factors, which can also be considered as invaders. Findings indicated that the reason for the principal to emphasize instruction and achievement was because of federal mandates and funding. Since the school had low scores on the state standardized tests, the principal focused on increasing student achievement through improving instruction. Additionally, the focus to increasing achievement was given to be able to find funding for the initiative. Therefore, the pressures federal mandates and funding introduced did not allow the invader and the existing species to evolve and acquire new properties.

Finally, a fourth result that can happen with the introduction of an invader into an ecosystem is both the invader and existing species become compatible and survive, or the ecosystem may become dysfunctional overtime (Zhao & Frank, 2003). Although the principal and his vision could have become compatible with existing species in the Park Middle School, due to the federal mandates and the pressure to find funding, the laptop initiative became
dysfunctional. The pressure felt from the federal mandates and funders to increase student achievement also increased the distance between the original and current purpose of the initiative. In an innovation, distance is defined as “how much the innovation deviated from the status quo” and success of the innovation decreases when the distance increases (Zhao et al., 2002, p. 496).

The original purpose of the laptop program in Park Middle School was to help students attain 21st century and critical-thinking skills, close the digital divide, and provide low-income students with same amount of resources as their high-income peers. Currently, the purpose of the initiative is to improve achievement scores as measured by standardized tests. With the increasing distance between the original and current purpose of the initiative, the emphasis on the innovation and use of laptops has decreased.

**Laptops and Achievement**

The change in the original goal of the initiative could initiate a deeper discussion about the pressure the federal educational policies pose on schools, especially urban schools with diverse student populations. A more controversial discussion is about the misalignment between the skills attained through technology and the skills assessed through tests. ESL teachers in the Park Middle School were observed to have changed their instructional practices and pedagogical approach to laptops due to technical problems and the pressure to increase student achievement scores. For instance, ESL students began writing their open-response writing activities with paper and pen to re-acclimate to testing context. This use of paper and pen for writing could also be due to the late distribution of computers in the semester, which might not have given teachers enough time to use laptops with their students before the classroom observations. However, considering that the new school vision targeted improving instruction and increasing achievement, the use of paper and pen for writing is more likely to be related to teachers’ change in their pedagogical approach with the new vision.
Despite the school personnel’s efforts to increase achievement and find more funds for the initiative by showing that laptops impact student outcomes positively, it has been long discussed that standardized tests do not adequately assess higher-order skills students may attain through constructive use of computers. Researchers argue that since standardized tests attempt to measure a broad domain of abilities, rather than specific skills and critical thinking, such tests present invalid results about student achievement and technology’s impact on student outcomes (Baker, Gearhart, & Herman, 1994; McNabb et al., 1999; Russell, 2002). For instance, Baker, Gearhart, and Herman (1994) studied the effects of computer-assisted instruction in five school sites in California, Minnesota, Ohio, and Tennessee. Findings indicate that computer-assisted instruction in one-to-one environment increased students’ higher-level reasoning and problem solving activities. However, when students’ standardized tests results were examined, researchers found that the one-to-one laptop students did not performed any better than comparison groups and the nationally report norms.

Research suggests that when technology is used in an interactive and constructive way, it provides opportunities for ESL learners to develop cognitive, social, and language skills because computers influence the way students think, learn and solve problems (Becker, 2000; Wetzel & Chisholm, 1998; White & Purdom, 1996). Also, computer technology increases self-expression by providing opportunities for the application of English language skills, and stimulating active learning in ESL learners (Wetzel & Chisholm, 1998). Soksa (1993) and Steinberg (1992) state that educational technologies can help ESL learners develop speaking, reading and writing skills. ESL teachers’ statements about use of laptops and educational software programs support these findings. Teachers stated that their ESL students grew more confident in their listening and speaking skills, became creative, and learned how to think critically, how to synthesize information, and how to present their projects.
Research specific to one-to-one laptop programs also shows some potential advantages laptops could offer to students with their writing. For instance, Jeroski (2003) assessed 6th and 7th grade students’ (n=120) pre- and post-writing. She found that the percentage of students who produced writing samples that met or exceeded writing performance standards for their grade rose from 70% in fall 2002 to 92% the following spring. Similarly, Silvernail and Gritter (2007) found that five years after the statewide implementation of one-to-one laptop initiative, students’ (n=16,251) average writing score on the Maine Educational Assessment (MEA) was 3.44 points higher in 2005 compared to their scores in 2000, with an effect size of .32. Furthermore, Silvernail and Gritter (2007) noted that the average score of students who used a laptop for all phases of the writing process was better than approximately 75% of those students who did not use a laptop for writing. This result indicates that using laptops in the writing process influenced students’ overall writing performance.

These results about the positive influence of laptops on writing could be due to the fact that writing with the computer makes revising easier and encourages productivity by “allowing rapid alternation and manipulation of the text, helping writers sustain the mental images they are trying to capture while experimenting with language” (Simic, 1994 p.1). However, in the Park Middle School due to the testing pressure, teachers stopped using laptops for writing and encouraged students to write with paper and pencil to prepare them for testing. However, multiple studies repeatedly show that when students are not allowed to use the writing tools, which they are accustomed to work with, the state tests underestimate their performance on open-ended items (Russell, 1999; Russell & Haney, 1997; Russell & Plati, 2001; Russell & Plati, 2002).

The ESL students in the Park Middle School initially used laptops with constructive pedagogies for preparing projects. However, with the increased emphasis on instruction and achievement, they began to use laptops to practice basic language skills and to type essays.
Therefore, although the school initially did not fit into the norm, which is typically low-level approaches of technology are used with poor and minority students (Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Zhao & Frank, 2003), with higher levels of achievement press and technical issues, the school seemed to begin confirming researchers’ statements.

Professional Development

In addition to the technical issues and pressure from federal policies, the changing nature and quality of professional development sessions further impacted the initiative that was already becoming dysfunctional. Although the technology director was able to change the pessimism among the school staff, there were still issues waiting to be resolved. Due to technical issues, the teacher leader team stopped convening and providing professional development sessions. The academy leaders began to conduct professional development, but they were not consistent, in-depth, and hands-on. Without in-depth professional development sessions, new teachers did not have enough readiness and technological skills to use available technologies. This finding confirms earlier research investigating the impact teachers’ technology skills and readiness have on their use of technology (Baylor & Ritchie 2002; Drayton et al., 2010; Eteokleous, 2008; Hernandez-Ramos, 2005; Inan & Lowther, 2010; Office of Educational Technology, 2004; Russell et al. 2004; Wenglinsky, 2005).

Research reports that teachers’ preparedness is positively related to the amount of professional development teachers receive (Penuel, 2006; Pogany, 2009). However, similar to Shapley et al. (2010), findings in this study indicate that besides the amount of professional development, the quality and content of these sessions were important. ESL teachers mentioned receiving multiple professional development sessions, but they complained that the sessions were not long, detailed, and hands-on enough to prepare them use available technologies in their classrooms. Therefore, ESL teachers requested continual professional development as opposed to
a one-time session model, where the sessions are differentiated based on teachers’ needs. Jaber and Moore (1999) also highlighted the importance of continued professional development on technology in their study.

*ESL Leadership*

The ESL specialist was hired in the Park Middle School in 2008. The specialist worked collaboratively with other teachers to meet the instructional needs of ELL students. The specialist also adjusted the laptop initiative to ELL students’ needs to enhance their learning experiences. After her arrival, the consideration given to ESL students increased and the school staff became more knowledgeable about ESL students’ needs. Teachers also realized how the laptop initiative should be personalized for the ESL students. School purchased specific software programs and tools to support ESL students’ language development.

The contributions the ESL specialist made to the initiative indicate that schools launching one-to-one laptop initiative, should consider different student populations from the beginning in order to appropriately address the various needs of different student groups. Lack of an ESL specialist knowledgeable in first and second language acquisition processes may lead to serious problems such as over- or under-representation of ESL students in special education services (Barona & Barona, 1987; Geva, Yaghoub-Zadeh, & Schuster, 2000). If mainstream teachers are not knowledgeable in the language learning process of ESL students, some difficulties ESL students experience may be misinterpreted as learning difficulties and they may be wrongfully referred to special education (Case & Taylor, 2005; Ochoa, 2005; Ortiz, 1992). Since laptop initiatives are implemented to support student learning, meeting different needs of various students groups should remain in the center of such initiatives from the very beginning and specialists knowledgeable in various student groups’ needs should be a part of the process from the very beginning.
CHAPTER 6

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The previous two chapters provided detailed information about the findings of this study. Chapter 4 discussed the financial and technical biotic and abiotic factors involved in a one-to-one laptop initiative in an urban school with large ELL student population. The chapter concluded with a conceptual model visually explaining the financial and technical factors and their interaction. Chapter 5 reported biotic factors related to leadership within four categories: school leadership, technology leadership, teacher leadership, and ESL leadership. These leadership factors were embedded into the conceptual model to explain their interaction with other biotic and abiotic factors. This last chapter summarizes the study and restates its importance in the field. Additionally, findings are discussed further by explaining how they contribute to existing research on one-to-one laptop programs. Finally, the last section of the chapter presents conclusions and implications, addresses the limitations of the study, and makes recommendations for future research.

Summary of the Study

The purpose of this qualitative, single-case study was to understand the biotic and abiotic factors involved in the integration and continuation of a one-to-one laptop program in classrooms with large numbers of ethnically, culturally, and linguistically diverse student population within an urban middle school context. An urban middle school, which had large numbers of ELL students and sustained its laptop initiative for more than five years, was the case examined in the study. Various participants representing different perspectives (a parent, community leaders, school administrators, technology staff, ESL teachers, and ESL students) participated in the study to examine factors involved in the program with a special focus on ELL students. The overarching research question was: “How was a one-to-one laptop initiative implemented and
continued in classrooms with high number of ELL students in an urban middle school, which sustained the initiative for more than two years?” Three sub-questions helped define the specific aspects to investigate.

1) Through the lens of school administrators, teacher leaders, ESL teachers, parents, students, technology leaders, and technology personnel, what biotic and abiotic factors contribute to the implementation of a one-to-one laptop program in ESL classrooms in an urban middle school?

2) How do biotic and abiotic factors interact in ESL classrooms in an urban middle school?

3) What is the current state of the one-to-one laptop program in ESL classrooms in an urban middle school?

I started the research process with two assumptions about one-to-one laptop programs. The first assumption was that factors involved in integration and continuation processes of laptop programs interact and impact each other. The second assumption was that laptop initiatives do not give enough attention to ELL students’ specific language needs. Both of these assumptions surfaced in the research findings. However, an unexpected finding was that as the laptop program evolved through the years. Through the years some factors, their roles as well as their importance have also changed. Additionally, a contradiction was identified between the federal and state governments’ attempts to financially support laptop initiatives and their achievement demands specifically on urban schools. Ecology theory, specifically ecosystem metaphor, was a powerful analytical lens for understanding interaction of multiple factors, their evolutions, and contradictions. This chapter presents research findings in conjunction with existing research and explains how they contribute to current research.
Importance of the Study

To prepare technology literate generations, federal, state, and district governments have been supporting integration of technology in schools heavily since mid 90’s. In order to guide the integration process, National Educational Standards for teachers (NETS-T), students (NETS-S), and administrators (NETS-A) have been created (ISTE, 1998; 2000; 2002; 2007; 2009). As the emphasis and investment in technology integration increased, research began to focus on understanding the factors involved in the integration process. While earlier studies investigated technology integration and factors mostly in contexts where multiple students had access to a single computer, current studies examine them in one-to-one contexts (Burns & Polman, 2006; Donovan, et al., 2007; Drayton, et al., 2010; Garthwait & Weller, 2005; Grimes & Warschauer, 2008; Inan & Lowther, 2009; Lei, 2010; Penuel, 2006). However, there are five major limitations of these current studies.

The first limitation is very few studies have examined the factors involved in the technology integration in an interrelated fashion, explaining their relations and the impact they have on each other (Zhao & Frank, 2003). As Zhao and Frank (2003) state, when relations between multi-faceted factors are excluded, integration processes are oversimplified and are presented as isolated and linear entities. Second, limited number of studies on ubiquitous computing programs has investigated programs beyond their first two years of implementation (Drayton et al., 2010; Greaves, 2008; Lei, 2010). Therefore, the factors and their relations with each other are not examined deeply for changes and evolutions they have over the years.

Third, most of the existing studies on one-to-one laptop included limited variety of participants, mostly teachers and principals, to investigate the factors in laptop programs (Burns & Polman, 2006; Donovan, Hartley, & Strudler, 2007; Drayton, Falk, & Stroud, 2010; Garthwait & Weller, 2005). A fourth limitation is that few studies on laptop programs examined factors in
urban schools with diverse student population groups (Danielsen, 2009; Donovan, Green, & Hartley, 2010; Donovan, Hartley, & Strudler, 2007; Dunleavy, Dexter & Heinecke, 2007; Dunleavy & Heinecke, 2007; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010). Finally, among the studies that have been conducted in schools with diverse student populations, very few, if any, have investigated laptop programs in relation to English language learners. Majority of studies have discussed their findings related to students’ racial demographics, rather than their linguistic demographics.

This study addressed the five gaps in the existing one-to-one laptop research by examining a one-to-one laptop initiative in an urban school that continued the program for more than five years. Additionally, the study focused on ELL students. Finally, the study captured different perspectives about the factors involved in the initiative through the involvement of various participants. The results of this study provide a different and fresh perspective to existing literature and could initiate further explorations.

Discussion of Findings

The previous two chapters presented findings of the study within three themes: financial factors, technical factors, and leadership factors. While Chapter 4 discussed the financial and technical factors, Chapter 5 explained the leadership factors within four subtitles: school, technology, teacher, and ESL leaderships. Ecology theory, specifically the concept of ecosystems, was a useful lens to explain the factors and the relation between them. Many of the results support the pre-guiding assumptions mentioned earlier and the findings of existing research studies that investigated factors involved in technology integration in general K-12 contexts and in one-to-one laptop contexts. However, some of the findings of this study were unexpected and contribute to the existing one-to-one laptop literature. In the following section, major findings about the factors and their interaction will be discussed and connected to existing literature.
Financial, Technical, Leadership Factors

**Financial Factors.** In this study, financial factors were compared to the sunlight in an ecosystem, serving as source of energy for the initiative. Analysis of data indicated important financial biotic and abiotic factors to be state legislator, community leaders, and funding. The state legislator and community leaders were mentioned to be important for their political and financial support to establish and continue the initiative in the school. Findings also indicated that the school faced serious financial difficulties due to the end of the state funding after the three-year piloting period, not having a sustainability plan to take effect following the end of the state grant, and the national economic crisis.

These changes in financial factors unbalanced the program’s financial homeostasis. This finding supports previous research showing that limitations in funding could be a potential barrier to the integration of technology (Boland, 2008). Furthermore, research also suggests that “a continuous funding stream is needed for sustainability” of technology integration, especially in socio-economically disadvantaged areas (Billig et al., 2005, p. 994). This study showed that in order to balance the school’s financial homeostasis and establish a “continuous funding stream,” the school leaders developed new collaborations with local organizations, created a new personnel position whose primary responsibility would be to apply for grants, and prepared a sustainability plan for next principals. The school was able to stabilize its budget due to the freedom it had from the district for being a pilot school. Thanks to this freedom from the district, they were able to allocate sources based on their needs, rather than what the district mandated. Although the school has secured its financial state until 2014, the future of the initiative after 2014 still remains unclear.

**Technical Factors.** This study identified the technical factors necessary for the laptop initiative as laptops and laptop carts, systems, the Internet, and software programs. These factors
were compared to water in an ecosystem, whose existence as well as quality was important for biotic factors that were dependent on it. The school had access to various educational technologies, but the most commonly mentioned ones were Rosetta Stone and Achieve 3000. They were stated to improve ESL students’ language development and reading comprehension by providing opportunities to practice language and differentiate reading levels of texts. Additionally, through the use of these technologies, similar to what earlier research suggested, teachers were able to work with their students individually while other students proceeded learning at their own pace (Meskill & Mossop, 2000; Whitehurst & Fischel, 2001).

In addition to their existence, the quality of technical factors was also important. Participants explained the technical quality of laptops and other equipment to be in poor condition. Laptop batteries died quickly, which became worse with broken laptop carts and lost power cords. Some researchers state that laptop initiatives may allow teachers to integrate computers more naturally into their instruction by eliminating computer sharing, computer lab scheduling, student transitioning from classrooms to computer labs, and unequal computer access (Sandholtz, Ringstaff, & Dwyer, 1997; Gulek & Demirtas, 2005; Warschauer, Knobel, & Stone, 2004). However, the findings of this study show that without resolving technical problems, such natural integration cannot be accomplished. Additionally, similar to what Lowther et al. (2003) and Lei and Zhao (2008) presented in their study, this study also showed that due to technical issues instruction got interrupted, teachers had to change their instructional plans, and classroom management became more problematic.

Besides the technical issues with equipment, the Internet was also unreliable. Although reports state that forty-five percent of public schools have wireless Internet connection (NCES, 2007), they do not indicate the quality of these connections. This was the case for Park Middle School; although they technically had the Internet service, it was not enough to meet the laptop
initiative’s network needs. Although the district was in charge of the network, they did not have enough technical equipment, personnel and financial sources to solve the network issues. This limitation was unexpected and shows that it is important to ensure that districts have robust infrastructural equipment and sources to support laptop programs before they are established in schools.

Leadership Factors. While participants discussed the financial and technical factors mainly as abiotic factors, leadership factors were discussed as biotic factors. Research suggests that enhancing technology in schools depends greatly on the capability of building level leadership (Brooks-Young, 2002; Fishman, Gomez, & Soloway, 1999; Haughey, 2006; ISTE, 2005; Kearsley & Lynch, 1994). However, leadership factors are generally discussed in terms of school principals being the sole leader. In this study, data analysis revealed four types of building level leaderships in the Park Middle School that were vital for its laptop program: school leadership, technology leadership, teacher leadership, and ESL leadership.

This variety in leadership within the school shows that the school did not have the traditional, centralized leadership model with a top-down approach that emphasizes authority and control by one person (Deal & Peterson, 1994). Instead, the school blended transformational and participative leaderships (Yukl, 2006). Through transformational leadership, the current and previous Park Middle School principals inspired and motivated the school personnel and communicated their expectations. Additionally, through participative leadership, the school teachers became actively involved in making decisions about the laptop’s use and integration into instruction based on their and students’ needs. As a result of this joint decision-making, teachers owned the laptop initiative.

While discussing the school leadership, participants mentioned both the previous and current school principals for their roles in finding funds and establishing the vision of the laptop
program. Similar to existing research (Bebell & Kay, 2010; Drayton et al., 2010; Lei, 2010; Shapley et al., 2010), this study showed the importance of having informed and committed leaders. Shapley and his colleagues (2010) further state that, “committed leaders, thorough planning, teacher buy-in, preliminary professional development for teachers, and a commitment to the transformation of student learning were keys” to successful implementation of technology immersion (p. 46). The previous principal at the Park Middle School demonstrated the features of a committed leader Shapley et al. (2010) stated in their study. The current principal also demonstrates these features, but with an emphasis on instruction.

The arrival of the new principal is compared to invaders in ecosystems, which are not necessarily dangerous species because they may attain essential roles and make important contributions to ecosystems. After arriving at the school, the new principal attained the responsibility to improve instruction and increase achievement as measured by standardized tests. Although the current principal expressed his intentions and dedication to continue the laptop initiative, because it became the “identity of the school,” funding and achievement pressures changed his priorities.

Besides the school principals, participants also identified on-site technology leadership, more specifically director of technology, as important. Since most one-to-one laptop initiatives focus on teachers, there is limited information about the roles of technology directors. Previous studies mostly discussed technology leadership as school principals’ leadership in technology or briefly mentioned director of technology as part of infrastructural support (Bebell & Kay, 2010; Donovan, Hartley, & Strudler, 2007; Watts, 2009; Zhao & Frank, 2003; Zhao et al., 2002). Analysis of data in this study revealed the importance of having a dedicated, on-site technology director with deep technology knowledge.
Data analysis also showed that technology directors’ roles changed at different stages of the initiative. Previous technology directors were responsible for establishing the initiative. However, the current technology director is responsible for solving technical problems effectively and efficiently. As the current technology director resolved some technical problems, the school staff became more optimistic about the future of the initiative. These findings about technology directors is informative for demonstrating their critical role in laptop initiatives, which should be examined further, rather than simply stating them to be part of infrastructural support.

Another type of leadership participants discussed was teacher leadership because the initiative was “led by teachers, for teachers.” From an ecological perspective, the teacher leader team was considered as keystone specie because they made decisions about the initiative, laptops’ use in classrooms, and professional development. This finding is similar to existing studies that identify teachers as keystone species (Bebell & Kay, 2010; Shapley et al., 2010; Zhao & Frank, 2003). Currently, the teacher leader team does not meet, which impacts professional development new teachers receive in using technology for instruction. Professional development is currently delivered by academy leaders, but it is not consistent, in-depth, and hands-on.

As a result of not receiving appropriate professional development, some of the new ESL teachers did not use available software, e.g., Rosetta Stone, because they did not know how to change levels of the programs. This finding confirms earlier research reporting that teachers’ preparedness is positively related to the amount of professional development teachers receive (Penuel, 2006). It also supports research on teacher skills and technology use (Baylor & Ritchie 2002; Drayton et al., 2010; Eteokleous 2008; Hernandez-Ramos, 2005; Inan & Lowther, 2010; Office of Educational Technology, 2004; Russell et al. 2004; Wenglinsky, 2005) by illustrating that the ESL teachers’ technology use was impacted negatively when they do not have the skills to use laptops.
The current state of professional development indicates that new ESL teachers are not strong in Technology Knowledge (TK) component of the Technological Pedagogical Content Knowledge (TPACK) framework (Koehler & Mishra, 2009). The new ESL teachers indicated that the sessions became quick and introductory explaining the resources of the school, but lacking to provide continuous, in-depth information or discussion about the use of these resources. These findings about the change in the quality of professional developments mirror Shapley et al.’s (2010) findings indicating that besides the amount of professional development, the quality and content of these sessions are important. In order to acquire necessary technical skills, similar to what Jaber and Moore (1999) suggest about continued professional development sessions, the ESL teachers requested continued professional development sessions. Related to professional development, Loucks-Horsley, Love, Stiles, Mundry, and Hewson (2003) also state that “…[p]rofessional development does not come in one-size-fits-all. It needs to be tailored to fit the context in which teachers teach and their students learn.” (p. 53) Similarly, the ESL teachers in the Park Middle School wanted the continuous professional development sessions to be followed by individualized evaluations and feedback sessions. They wanted the information collected from these individualized sessions to inform the content of next training sessions.

Finally, participants discussed ESL leadership. However, participants mentioned the importance of ELL leadership after they were directly asked about important biotic factors for ELLs. Data analysis revealed that the ESL leadership was added to the school after the second year of the initiative. Participants stated that before the arrival of the ESL specialist, ELL students were considered as part of special education student population. Additionally, they stated that the initiative targeted supporting all students and, therefore, the program was not differentiated to specific student populations. As a result of this lack of differentiation, when the ESL specialist first arrived to the school, she realized that available educational tools did not address the
beginner level ESL students’ specific language needs.

However, with the arrival of the ESL specialist, this limited attention given to ELL students changed. The ESL specialist suggested purchasing Rosetta Stone to support ESL students’ language development and provided professional development on how to use it and other available technologies specifically with ELL students. Currently, the school continues differentiating technologies to specific student populations. For instance, iPads are distributed to only special education and ESL teachers to use it with their students.

These findings on ESL leadership partially support my assumptions about the lack of attention laptop initiatives give to ELL student populations. At the beginning of the initiative, the program was targeted for all students, but with the arrival of an ESL specialist, the program was adjusted to accommodate the special needs of ESL students. This finding suggests that having an ESL specialist is important to bring an ESL lens to the instructional use of laptops with ESL students. It also suggests that such specialists and various student groups’ needs should be included in laptop initiatives from early stages.

*Interaction between Financial, Technical and Leadership Factors*

Data analysis on the interaction of factors highlighted three revealing results. One of these results is the change in some biotic factors’ roles as a result of the changes in the phase of the initiative over 5 years. For instance, at the beginning of the initiative, the previous principal’s task was to establish the initiative. However, following the establishment of the initiative, the current principal’s task is stabilizing the financial sources the initiative needs and improving the instruction and achievement. Similarly, responsibilities of the technology directors have also changed. While the previous technology directors’ role was to set the infrastructure and rules for the initiative, the current director’s role was to fix technical issues and keep equipment in working condition. This finding is similar to Lei’s (2010) research results, which is one of the
earliest studies revealing similar changes in factors at different phases of a laptop program.

A second finding was about the domino effect the changes in factors caused on each other. For instance, due to financial limitations, old technical equipment could not be fixed or renewed. When the technical equipment did not work, the teacher leader team did not see it meaningful to continue their weekly meetings. Since the teacher team was responsible for providing professional development, with the cease of their meetings, the nature and quality of professional development sessions changed. The change in trainings influenced how laptops were used in classrooms in return.

While abiotic factors impacted each other, they also directly influenced biotic factors. One of the most prominent examples to how abiotic factors impacted biotic factors was the change in keystone species. During the establishment phase of the initiative, the teacher leader team was the keystone specie. However, when the financial and technical problems were felt intensely, the teacher leader team could not function because laptops were not functioning properly and financial sources were not enough to renew them. While the principal worked on stabilizing the financial state of the initiative, teachers became dependent on the technology director for the resolution of technical problems to resume their responsibilities. As a result of this dependence, the technology leader attained a very important niche in the school ecosystem and became the keystone specie after the establishment phase of the initiative.

Thirdly, this study shows that besides the within-school factors, out-of school forces also influence factors within schools. For instance, the federal mandates impacted the Park Middle School both favorably and unfavorably. The federal government’s favorable impact was on the attention the school paid to its ESL students. As a result of the federal mandates that required providing better instruction to ESL students, the Park Middle School restructured its ESL program and became more aware of ESL students’ instructional needs.
However, the federal mandates also had an unfavorable impact on the laptop initiative by influencing the vision of the school and the laptop program. The school was under pressure to meet the expected achievement demands because it met the AYP only once throughout its nine years of existence as a pilot school. The principal was also under pressure to financially support the initiative, which was inhibited by the school’s low achievement scores. As a result of these achievement and funding pressures, the principal stated, “a fool with a tool is still a fool” and emphasized improving instruction and achievement with or without the use of laptops. These results provide a basis for understanding Schneiderman’s (2004) and Watts’s (2009) arguments, which state that emphasis on testing and achievement press undercuts the potential promise of technology as a teaching and learning tool, and lowers levels of teachers’ technology use.

![Figure 6.1](image)

**Figure 6.1: Technical, financial, and leadership factors and their interaction**

The pressures to meet federal mandates and show funders that laptops contribute to student learning were so strong that they overshadowed some of the financial and technical
improvements the school accomplished. As financial and technical issues started to be resolved, teachers stated that they became more willing to use laptops and were optimistic about the initiative. However, this willingness and optimism were neutralized by the federal demands posed on the school and the school principal.

These results support a major assumption presented at the beginning of the study; I wrote that if school officials, funders, or politicians use standardized test results as correct indicators of technology’s impact on student outcomes, they might be misinformed by the invalid results. I further argued that based on such misinformation they may decide to withdrawal their support from technology initiatives. This assumption also was confirmed as indicated by the hesitation of politicians to financially support the initiative because they did not see its positive impact on student outcomes.

While trying to attain the instructional and achievement goals the federal government and funders demanded, the laptop initiative became dysfunctional. The distance between the original and current purpose of the initiative increased. Zhao et al. (2002) define distance as “how much the innovation deviated from the status quo” and state that success of an innovation decreases when the distance increases (p. 496). The original purpose of the laptop program in the Park Middle School was to help students attain 21st century and critical-thinking skills, close digital divide, and provide low-income students with same amount of resources as their high-income peers. Currently, the purpose of the program is to use the laptop initiative as a resource when, or if, needed to increase students’ achievement scores.

In sum, these results about factors and their interaction with each other demonstrate the complex nature of laptop programs that involve multiple factors influencing each other and are immensely influenced by out-of-school factors. The interaction between out-of-school and within-school factors impacted the laptop initiative and over the years the program began to
confirm the status quo that existing literature discuss about use of computers in urban schools. Existing literature suggest that accountability and achievement concerns educational policies create on urban school teachers limit their technology use to behaviorist approaches and tests preparation (Becker, 2001; Donahue et al., 2001; Lowther et al., 2003). Although the constructive use of laptops at the Park Middle School during the initial stages of the initiative did not approve the statements of existing literature, due to out-of-school factors, they began to confirm the status quo.

Contributions to Literature

Very few studies on one-to-one laptop programs have examined how factors in technology integration interact with each other (Inan & Lowther, 2009; Lei, 2010). Inan and Lowther (2009) examined mainly teacher related factors during the first year of an initiative and did not provide information about how factors evolved over several years. On the other hand, Lei (2010) studied factors involved in a laptop program as well as the changes over four academic years. However, Lei included only teacher and student input and did not provide any information about the school setting and student demographics.

One of the detailed models on technology integration is by Zhao and Frank (2003), who used ecological lens to discuss interaction between factors. Although their model explains the factors and their relation in detail, it examined factors at the initial stages of a technology project and was not in a one-to-one laptop context. This study contributes to existing one-to-one laptop literature in three major ways. First, it examined the laptop initiative in an urban school serving diverse student populations. Second, it added new information to Zhao and Frank’s framework from a ubiquitous laptop context that passed the initial establishment phase. Second, it discussed the importance of ESL leadership that very limited, if any, previous one-to-one laptop studies examined. The following section explains these contributions in-depth.
**Models Explaining Factors in Technology Integration.** Zhao and Frank’s (2003) model provides a detailed explanation of factors needed to integrate technology at school level through an ecological lens. However, this study enhances their model by presenting three new findings Zhao and Frank (2003) do not discuss in their model.

The first contribution is that this study provides a more detailed explanation about the federal government’s impact on laptop initiatives in an urban school. Zhao and Frank (2003) stated that governmental and societal institutions impact technology integration in classrooms by serving as a source of energy. While findings of this study confirm this statement, they also add that the federal government can also inhibit the same technology initiatives they financially support, especially in urban schools. As discussed earlier, the federal mandates and standardized testing changed the goal of the initiative and the vision of the Park Middle School. Zhao and Frank (2003) might not have mentioned these results in their framework because their study was conducted in schools located at middle and upper-middle SES communities, which might not have experienced the achievement pressures that urban schools located in low SES communities with diverse students experience.

Secondly, this study extends Zhao and Frank’s (2003) model by showing that some hierarchical institutions involved in initiatives can be skipped, which may be more productive for some laptop initiatives. In their model Zhao and Frank (2003) explain that school districts are crucial to integrate technology in schools because if they are not compatible with computer use and do not provide sufficient resources, the integration process would not be fast, efficient, and widespread. However, this model is created in middle and upper-middle class districts and do not provide information about what happens to technology initiatives in districts that do not have sufficient resources.
This study demonstrate that while district-level support is important, when a school is given the autonomy and flexibility over their technology integration process, it may overcome the limited resources and support a district may offer. The district, which the Park Middle School was a part of, had limited IT personnel and their equipment was about five years older than the school. Therefore, the school avoided the district in order to skip lengthy bureaucratic procedures. The school also had financial freedom on their budget, which enabled them to manage their money based on the needs of the initiative independent from the district. As a result of this level of autonomy, the Park Middle School was able to establish its one-to-one laptop initiative independent from the district, except for the Internet services.

The significance of these findings is that technology integration models that are created for schools in middle or upper-middle class communities do not necessarily apply to schools located in low SES communities. The major conclusion from this finding is that while districts with abundant resources might positively contribute to laptop initiatives by providing support, establishing an initiative independent from a district might present more productive results for urban schools that have access to more resources than their districts do.

Finally, very few studies explain the interaction between factors involved in technology integration (Zhao et al., 2002; Zhao & Frank, 2003; Inan & Lowther, 2009), and these studies are commonly conducted at the beginning stages of the integration process. Unlike these studies, this study examined factors and their interaction in an environment where the establishment phase of the initiative was completed and the school continued its initiative over 5 years. Only one study was located in literate specific to one-to-one laptop programs that examined factors in an initiative longitudinally for four academic years (Lei, 2010). Lei discussed the factors and how they changed over the years from the perspectives of teachers and students through an ecological lens. However, the researcher did not examine out-of-school factors that impacted the laptop
initiative and did not provide any information about the demographics of the school or students. This study showed that, similar to Lei’s findings, factors involved in a laptop initiative evolve and biotic factors acquire new responsibilities and impact other factors. Different from Lei, this study explained the interaction and evolution of not only within-school but also out-of-school factors from multiple perspectives.

*ESL Leadership.* Besides extending the existing models on technology integration, this study also present a new finding to the one-to-one laptop research field. According to my review of the literature and search of major databases about previous studies on one-to-one laptop research, ELL students and factors related to this student group have not been examined. This study contributes to the field by investigating factors and integration of laptops for ELL students in ESL classrooms. This study’s central findings disclose that ESL specialists and ESL teachers are important for laptop initiatives in schools with large ESL student population to tailor such programs to the specific needs of ESL students.

Data analysis revealed that the Park Middle School did not differentiate its laptop initiative for different student groups because the overarching goal was to support all students’ learning experiences. However, since mid 70’s the U.S. public education is paying special attention to offer appropriate support to students with limited English proficiencies. A well-known example to this attention is the civil rights case, Lau v. Nichols (414 U.S. 563, 1974). Parents of Chinese American students in San Francisco, California, claimed that their children, who had limited English proficiencies, were not receiving the help they needed in school. They argued that under Title VI of the Civil Rights Act of 1964, which bans educational discrimination on the basis of national origin, their children should be entitled to receive the support they need in school. The U.S. Supreme Court ruled in favor of the students and concluded, “[t]here is no equality of treatment merely by providing students with the same facilities, textbooks, teachers,
and curriculum; for students who do not understand English are effectively foreclosed from any meaningful education” (Lau v. Nichols, 414 U.S. 563, 1974).

The Park Middle School seemed to initially consider that providing their students with equal technology tools would be an equal treatment and would support all students’ learning experiences. However, they overlooked the fact that providing same resources to students with limited English proficiencies does not actually offer equal treatment. A reason for overlooking this fact might be due to not having an ESL specialist at the early stages of the initiative to bring this perspective from the beginning.

Data analysis revealed that the Park Middle School did not have an ESL specialist during the first two years of the initiative and considered ESL students as part of special education student population. Research suggests that not working with ESL specialists knowledgeable in first and second language acquisition processes may lead to serious problems such as over- or under-representation of ESL students in special education services (Barona & Barona, 1987; Geva, Yaghoub-Zadeh, & Schuster, 2000). Without an ESL specialist, some language related difficulties ESL students experience may be misinterpreted as learning difficulties and they may be wrongfully referred to special education (Case & Taylor, 2005; Ochoa, 2005; Ortiz, 1992). Additionally, ESL specialists can help mainstream teachers overcome “pedagogically induced” difficulties ESL students experience by working with them on adapting the curriculum to the unique needs of diverse learners (Cummins, 1984). The importance of ESL specialists increases considering that only 12.5% of teachers have participated in more than eight hours of training or professional development on how to work with ELLs (National Center for Education Statistics, 2002).

When the ESL specialist arrived to the school in 2008, she examined the available educational technologies used with ESL students. When she realized that the sources did not
address the needs of students with limited English proficiencies, she proposed purchasing appropriate software programs/technologies and provided professional development sessions on not only how to use the programs but also how to work with ESL students. After the arrival of the ESL specialist, the school realized how laptops and other available technologies should be used to accommodate its ESL students and their language needs.

The contributions the ESL specialist made to the initiative indicate that while launching one-to-one laptop initiatives, schools should consider different student populations from the beginning by specialists so that various needs of different student groups could be addressed appropriately. Since giving equal sources to all students does not necessarily provide equal educational opportunities, meeting different needs of various student groups should be the center of laptop initiatives from the very beginning.

In summary, this study contributes to the one-to-one laptop research field by investigating areas that have not been examined deeply. This study focused on a laptop program that was established and continued in an urban school. It involved input from multiple sources to bring different perspectives. It specifically focused on ESL students to understand how the laptop program was implemented for these students. Finally, it used an ecological lens to meaningfully interpret the findings and understand the relations and evolutions of these factors. Ecology theory, specifically ecosystem metaphor, was a powerful analytical lens that enabled capturing the holistic picture as well as complex nature of factors.

Conclusions and Implications

The purpose of this study is to understand biotic and abiotic factors and their interaction in a one-to-one laptop program in an urban middle school that has been implementing the program for more than 5 years. While investigating the factors and their interaction, the specific focus was on ELL students and various participants’ perspectives. The factors and their
interaction were described and illustrated in detail in Chapters 4 and 5, and were summarized in the discussion section above. This section presents conclusions and implications for teachers, administrators, educational researchers, and policy makers.

Based on the findings related to financial factors, a main conclusion is appropriate funding is key to establishing and continuing laptop programs. The laptop program in the Park Middle School encountered serious financial problems when its initial state funding ended after three years of the piloting period. The school also suffered from not having a sustainability plan and nation-wide economic crisis. The school was able to balance its financial resources temporarily, but the laptop initiative was negatively impacted until the situation was stabilized.

An implication of these findings for policy makers could be that instead of withdrawing financial support suddenly and causing dramatic changes in schools’ financial equilibrium, funding should be retrieved gradually. This gradual cease of funding may give schools enough time to take precautions to balance their budget and adjust to the new financial conditions. Results also showed the need for continuous funding to fix and renew old technical equipment. An implication of this finding for school administrators could be preparing and leaving a sustainability plan for next school leaders to ensure continuous funding to maintain the initiative.

This study’s findings also highlighted the technical issues and challenges, e.g., Internet connection, experienced by the teachers. The school was dependent on the district because the district provided the network. However, the district’s technical equipment, personnel, and sources were not enough to support the school’s needs. Moreover, the school’s technology was more advanced than the district. This finding indicates that although establishing necessary infrastructural systems within schools is important, it is also important to ensure that other institutions schools rely on for laptop programs also have necessary equipment. Therefore, an
implication for district and school administrations would be ensuring that both schools and the institutions schools rely on for laptop programs have necessary infrastructural systems.

Another implication is the flexibility schools should have in establishing and financing their laptop programs. The Park Middle School had freedom on their budget and used it based on its needs. The school also established the laptop program and the infrastructure independently from the district by using its own sources. Therefore, although the district had limited sources, it did not inhibit the school from establishing the laptop initiative. For that reason, when schools have access to more sources than their districts, they should be given the flexibility to lead the initiative without the limitations hierarchical management may cause.

Another finding about technical equipment specific to ELL students was that ESL teachers were not able to find enough software programs to use with their middle school ESL students that spoke languages other than Spanish. Besides the limited amount of programs available in languages other than Spanish, research suggests that majority of the available ESL materials focus on drill activities to practice vocabulary and grammar (Smith, 1995; Meskill & Mossop, 2000). Although there are newer ESL packages on the market that are more interactive, most still engage students with language only at superficial levels (Meskill & Mossop, 2000).

These limitations on the amount, quality, and language variety of available software programs for ESL students indicate the need for programs that: goes beyond practicing the superficial aspects of English, could be used with ESL students who speak languages other than Spanish, and target secondary, middle, and high school ESL students. There are some institutions emerging, such as Center for Applied Special Technology (CAST), that produce such needed educational programs. Policy makers could encourage such organizations and educational researchers to create software programs based on educational theories and research to meet the ESL teachers’ and students’ need for quality programs available in various languages.
This study also concludes that the proper functioning of the one-to-one initiative depend on multiple leaderships within the school. The school also implemented transformational and participative leadership models, rather than following a hierarchical, top-down leadership model where the authority rested on one person. This blend of transformational and participative leadership model employed at the Park Middle School could be informative for other urban schools planning to implement similar laptop initiatives. Researchers studying laptop programs can examine what type of leaderships laptop schools have and how these leaderships impact laptop programs in more detail.

A prominent finding of this study related to school leadership suggested a conflict between the federal government and the original goal of the laptop program in the Park Middle School. Although the federal and state governments financially support integration of technology into classrooms, their accountability policies may also hinder it especially in urban schools with low achievement record. Previous research explains this conflict by the misalignment between the skills measured in standardized tests and the 21st century skills technology use could promote, (Baker, Gearhart, & Herman, 1994; Grimes & Warschauer, 2008; McNabb et al., 1999; Partnership for 21st Century Skills, 2006; Russell, 2002).

This misalignment between the skills measured in standardized tests and the skills acquired through technology offers invalid results for policy makers and educators, which may impact technology integration efforts poorly as observed in the Park Middle School. This misalignment highlights the need for creating new measurement tools that assess not only the skills expected by the federal policies, but also the 21st century skills (Partnership for 21st Century Skills, 2006). Therefore, alternative evaluation methods and instruments such as essays or portfolios should be used to evaluate student learning with technology (Lei & Zhao, 2008). Assessments could also be project-based requiring the use of content knowledge to solve
problems in real life contexts. Educational researchers could examine the results of these various tests assessing not only the knowledge of core subjects but also the 21st century skills. Educational reformers and politicians should inform educational policies based on these evaluations by researchers.

Another conclusion emerging from this study is that financial and technical problems may affect the quality of professional development. An implication of this conclusion for school administrators is providing continued professional developments that are hands on especially for new teachers. Moreover, teachers, who are already familiar with the school culture and laptop programs, should receive individualized sessions based on their needs and skills. Even though technical problems might impact laptops’ use in classrooms poorly, weekly meetings should continue with experienced and novice teachers. Researchers state that regular opportunities for interaction with colleagues are important for a successful work environment (Purkey & Smith, 1983) and essential to create professional school cultures (Lieberman, Saxl, & Miles, 1988; Miller, 1988). These weekly meetings may initiate more interaction between new and expert teachers around laptop use and other school issues.

Finally, this study showed that at the beginning of the laptop initiative the Park Middle School did not differentiate its laptop program to the needs of various student groups. ESL students were considered as part of special needs students, and when the ESL specialist arrived to the school, she could not find tools that could be used with limited English proficient students. These findings have important implications for school administrators and teachers. School administrators and teachers should implement laptop programs considering the diverse needs of various student groups. In order to do that the expertise of specialists should be used from the early stages of laptop initiatives. While differentiating use of laptops to ELL students’ needs, school administrators and teachers could use current research-based theories such as Universal
Design for Learning (UDL). UDL calls for multiple means of representation, expression, and engagement during students’ learning process, all of which offers opportunities to use technology.

Limitations of the Study

A potential limitation of this study could be related to the depth of data collection. This study sufficiently met the breadth of sampling by accounting for a wide range of experiences. However, this breadth in sampling might have endangered the collection of in-depth data. This limitation was minimized by conducting 40 minutes interviews, which gave participants enough time to discuss the prompted questions in-depth. Additionally, interviews were set up at participants’ convenient times and it was ensured that a longer period of time beyond 40 minutes was reserved in case interviews would take longer. Furthermore, multiple data collection techniques were used (Yin, 2003) to increase the depth of data collection.

Another unforeseen limitation that was out of the researcher’s control was the decreased use of laptops in ESL classrooms as a result of deteriorating state of financial and technical factors. This decrease in technology use in ESL classrooms might have poorly impacted the breath and depth of data collected through classroom observations. In order to overcome this limitation, teachers were asked questions about their current use of laptops to collect more information about their use of laptops. However, most teachers indicated that they did not use laptops as often they used to use them.

It should be also considered that the data is collected and interpreted by a single researcher, which may be another limitation. In order to address this limitation, I had member checks with participants and sent interview transcripts for corrections and expansions. Additionally, upon some participants’ request, I sent direct quotes I used from their interviews and explained how I interpreted these quotes. The feedback I received from participants helped me interpret the collected data in the best manner possible.
This study has two additional limitations related to an interview conducted with a parent and frequency of classroom observations. These limitations will be discussed in the next section where recommendation for future research is made because these limitations can guide future research. Despite the limitations discussed above, I took precautions to overcome these limitations in the best manner. I believe the research design sufficiently addressed the research questions of interest. The goal was to investigate biotic and abiotic factors and their interactions in a laptop program with a specific focus on ESL classroom in an urban school. The methodology used in this dissertation met this goal.

Recommendations for Future Research

This study investigated a one-to-one laptop initiative from multiple perspectives, by including various participants such as school administrators, teachers, and students. However, only one parent was interviewed to represent the parents’ perspective. The inclusion of one parent was not addressed as a limitation in the previous section. This omission was intentional because this limitation could inform the direction of future research. The study originally planned to survey parents of the interviewed students. However, there was not enough interest in the survey. Therefore, three parents who served on the school committee were contacted for an interview and one parent volunteered for the interview. An additional limitation was that the parent’s and her child’s native language was English. Therefore, although the parent provided helpful information as a knowledgeable person about the school and the laptop program, her views might not necessarily represent the views of parents with children who are ELLs. In the light of these limitations, future studies should include more than one parent to accurately represent parent view and should ensure that these parents represent ELL parents.

Another recommendation for future research also stems from a limitation of this study. This study originally planned to conduct classroom observations for 5 consecutive days in each
ESL classroom to capture a fluid representation of how laptops were used in classrooms. However, based on teachers’ suggestions and availability, observations were conducted for 3 days on Mondays, Wednesdays, and Fridays. This interrupted nature of the observations might have endangered capturing a fluent and holistic representation of how laptops were used in classrooms. In order to overcome this limitation one ESL classroom was observed four days rather than three days to capture 3 consecutive days of laptop use. Additionally, during school visits teachers were asked whether they were going to use laptops on the days when the observations were not conducted. Only one teacher mentioned using laptops on the days when observations were not conducted. Despite these attempts to overcome the limitations of observations, it might still have impacted the results. Therefore, research in the future should design studies that would collect data longitudinally because as Lei (2010) states, most studies capture a snapshot of the one-to-one laptop by conducting research in a short and limited time frame.

Finally, this study is one of the earliest research studies that investigated a one-to-one laptop initiative with a focus on ELL student population. While the results might have provided helpful information, there is need for more research to confirm the findings of this study and offer new findings. This study might be important to bring specific student groups’ and their needs to forefront in laptop initiatives. However, the results of this study may not be in-depth enough. Therefore, more studies should investigate the implementation of laptop programs with various student groups such as ELL and special education students.
Closing Comments

The Nobel-prize winner physicist Albert Einstein stated: “I never teach my pupils. I only attempt to provide the conditions in which they can learn.” I found this statement to be true when I completed this study. I gained invaluable learning experience because I had necessary conditions for learning such as personal motivation, supportive dissertation committee, collaborative school willing to participate in the study and its members interested in sharing their insights. However, I began to wonder if Einstein’s statement could also be applied to school contexts. Do schools provide conditions in which their students can learn? More importantly, who decides what conditions are necessary for learning?

After observing the flexibility the Park Middle School had on its laptop initiative, my ideas about giving public schools and teachers more voice in making decisions about learning conditions necessary for their students is confirmed. Rather than creating educational policies that dictate schools and teachers what to teach and how to teach, making decisions in collaboration with them and using their knowledge about their student population may provide better learning conditions for students. Following such a collaborative approach may also help educational policies overcome a common critique they receive for implementing a “one size fits all” approach. Finally, while making decisions about the essential conditions necessary for learning, policy makers, schools, and teachers should focus on the quality of conditions, rather than quantity. For instance, instead of using various educational technologies simply to use them, they should be used meaningfully to enhance their instruction. A collaborative work with an emphasis on quality may change learning conditions in schools for the better.
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Appendix A

Boston College Lynch School of Education

Informed Consent for Participation as a Subject in
“Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms
with English Language Learners in an Urban Middle School”

Investigator: Guliz Turgut

Student Interview Assent Form 2 (Ages 12-17)
Date Created: February 6, 2011

You are invited to participate in a project about how the laptop program is used for English language learners in your school and classroom. You are selected for the project because your classroom is taking part in the study. We need your help to understand what students think about the laptop program in your school. The study will collect data for a doctoral dissertation at Boston College. Please read this form and ask any questions you may have before you agree to be in the study.

If you agree to be in this study, we will have an interview with you in your school only once. The interview may take from 30 minutes to one hour at a time that is good for you. If you agree, we will record the interview. The interview is not an evaluation of you. Your responses will help us improve research and understand what students think about the laptop program.

Your participation in the study is voluntary. You can decide not to be in this study, or decide to stop participating at any time. You will not be punished for rejecting or deciding to stop participating in the study. There are no expected risks in taking part in this study. There may be unknown risks. There are no personal benefits for taking part in this study. You will not be paid for taking part in the study and you will not have to pay to participate in this study.

Your answers to interview questions will be kept private. We will not use your name or anyone else’s name in any documents. If we have to use names, we will erase the real names and use a different names. Research records, surveys, and audiotapes will be kept in a locked file and they will be destroyed 24 months after the completion of research. Only the researcher can access these records and audiotapes. However, the researcher’s faculty advisor as well as the Office for Research Protections at Boston College may review the study records. Any references to you and your school within the transcripts will be replaced with pseudonyms and all identifying features that could possibly put your anonymity in danger will be removed.

The researcher conducting this study is Guliz Turgut. For questions or more information about this study you may contact her by phone (617-319-3707) or email (turgutg@bc.edu). If you believe you have suffered from this research or have any questions about your rights as a research subject, you may contact Office for Research Protections, BC at (617) 552-4778 or irb@bc.edu.
Boston College
Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School

Statement of Consent:
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I understand the possible risks and benefits of the study. I know that being in this study is voluntary and I agree to be in this study. I know that I can stop being in the study at any time. I have received (or will receive) a copy of this form.

___ Place a check here if you give permission for the interview to be digitally recorded.

___ Place a check here to agree that you have been given a copy of this form to keep for your records and future references.

Study Participant (Print Name): ___________________________________

Study Participant (Signature): __________________________ Date

___________
Appendix B

Boston College Lynch School of Education

Informed Consent for Participation as a Subject in
“Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School”

Investigator: Guliz Turgut

Student Interview Parental Consent Form (English)

Date Created: February 6, 2011

Your child is invited to participate in a research study about how the laptop program is integrated for English language learners into his/her school and classroom. Your child is selected for the study because his/her classroom is taking part in the study. We need your child’s help to understand what students think about the laptop program in their school. Please read this form and ask any questions you may have before agreeing for your child to be in the study.

If you agree for your child to be in this study, we will have an interview with him/her in his/her school for once. The interview may take from 30 minutes to one hour when it is a good time for your child. If you and your child agree, the interview will be digitally recorded. The interview will not evaluate you or your child. Your child’s answers will be used to improve research and understand what students think about laptop program in their school.

Your child’s participation in the study is voluntary. You and your child can decide not to be in this study, or decide to stop participating at any time. You or your child will not be punished for rejecting or deciding to stop participating in the study. It will not affect your child’s grades in school. There are no expected risks in participating in this study. There may be unknown risks. There are no personal benefits for participating in this study. You will not be paid for taking part in this study and you will not pay to take part in this study.

The records of this study will be kept private. We will not include your name, your child’s name or anyone else’s name in any documents. Your name, your child’s name, and your child’s school name will be erased from all documents and we will use different names. Research records, surveys, and audiotapes will be kept in a locked file and they will be destroyed 24 months after the completion of research. Access to these records and audiotapes will be limited to the researcher only. However, the researcher’s faculty advisor as well as the Office for Research Protections at Boston College may review the study records.

The researcher conducting this study is Guliz Turgut. For questions or more information about this study you may contact her by phone (617-319-3707) or email (turgutg@bc.edu). If you believe your child has suffered from this study or have any questions about your rights as a study subject, you may contact Office for Research Protections at (617) 552-4778 or irb@bc.edu.
Boston College
Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School

Statement of Consent:
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I understand the possible risks and benefits of the study. I know that being in this study is voluntary and I agree for my child to be in this study. I know that my child can stop taking part in the study at any time. I have received (or will receive) a copy of this form.

_____ Place a check here to agree that the researcher can digitally record the interview.

_____ Place a check here to show that you have a copy of this form to keep for your records and future references.

Your Child’s Name (Print Name): ________________________________

Parent/Guardian (Print Name): ________________________________

Parent/Guardian (Signature): ___________________________ Date

____________
Appendix C

Student Interview Parental Consent Form (Spanish)

Boston College Lynch Escuela de Educación

Forma de consentimiento en la participación sobre
“el uso de una perspectiva ecológica para explorar un programa de computadoras en clases de estudiantes de inglés en una escuela media en una zona urbana”

Investigadora: Guliz Turgut

Entrevista a estudiante consentimiento paterno
Fecha: 6 de Febrero, 2011

Esta es una invitación a su hijo a participar en un estudio que investiga el uso de un programa de portátiles en clases de estudiantes de inglés en la escuela de su hijo. Su hijo ha sido seleccionado para este estudio porque su clase toma parte en el estudio. Necesitamos la colaboración de su hijo para entender lo que piensan los estudiantes acerca de este programa de computadoras portátiles en su escuela. Por favor, lea esta forma y haga las preguntas que considere oportunas antes de firmar.

Si está de acuerdo con la participación de su hijo en el estudio, nosotros lo entrevistaremos en su escuela una vez cuando sea conveniente para su hijo. La entrevista durará entre 30 minutos y una hora. Si usted y su hijo están de acuerdo, la entrevista será grabada. Pero esta entrevista no evalúa a su hijo de ninguna manera. Las respuestas de su hijo se utilizarán para mejorar este programa sobre el uso de portátiles en la escuela.

La participación de su hijo es voluntaria. Ustedes pueden decidir no participar en el estudio, o interrumpir su participación en cualquier momento. Esta decisión no afectará las notas de su hijo. Este estudio no implica ningún riesgo conocido. No existen beneficios personales por participar en el estudio. Y no recibirá ninguna compensación económica.

Sus respuestas serán privadas. Su nombre, el de su hijo, y la escuela a la que asiste serán borrados de todos los documentos y usaremos nombres diferentes en el estudio. Las muestras de la investigación, las encuestas, las entrevistas, y videos serán mantenidas en la privacidad y al cabo de 24 meses serán destruidas, una vez que termine el estudio. Tan sólo el investigador tendrá acceso a estas muestras. Sin embargo, la Universidad de Boston puede revisarlas en un futuro.

La investigadora de este estudio se llama Guliz Turgut. Si tiene preguntas o quiere más información sobre este estudio puede contactarla a su teléfono móvil (617-319-3707) o a su email (turgutg@bc.edu). Si en el futuro sintiera que hubiera sufrido algún perjuicio o si tuviera preguntas sobre el tema de la investigación, puede contactar la oficina de protección de investigaciones en la universidad (617-552-4778) o irb@bc.edu.
Boston College

El uso de una perspective ecológica para explorar un programa de computadoras en clases de inglés en una escuela media en una zona urbana.

Forma de consentimiento:
He leído los contenidos de esta forma de consentimiento. He recibido respuestas a todas mis dudas y preguntas. Entiendo los posibles riesgos y beneficios del estudio. Entiendo que puedo dejar de participar en cualquier momento. He recibido o voy a recibir una copia de esta forma.

___ Por favor firme aquí si aprueba que la investigadora grabe la entrevista.

___ Por favor firme aquí si usted tiene una copia de esta forma.

Nombre de su hijo/a (Nombre impreso): ___________________________________

Padre or guardián (Nombre impreso): ___________________________________

Padre or guardián (Firma): __________________________ Fecha ____________
Appendix D

Boston College Lynch School of Education

Informed Consent for Participation as a Subject in
“Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School”

Investigator: Guliz Turgut

Parent Survey Consent Form (English)

Date Created: February 6, 2011

You are invited to participate in a research study about how the laptop program is used for English language learners in your child’s school and classroom. Your child’s school is the best school for the purpose of this study. We ask you to take part in the study because your child is selected to take part in the study from his/her classroom. We need your help to understand what parents think about the laptop program in your child’s school. Please read this form and ask any questions that may have before agreeing to be in the study.

If you agree to be in this study, we will ask you to complete a 30-minute survey at home either in English or Spanish. You can take the survey in either paper or electronic form. If you want to take the survey in paper form, we will send it to you with your child. If you want to take the survey in electronic form, you need to give us your e-mail address. The survey does not evaluate you or your child. Your answers will be used to improve research and understand what parents think about the laptop program.

Your participation in the study is voluntary. You can decide not to be in this study, or decide to stop participate at any time. You or your child will not be punished for rejecting or deciding to stop participating in the study. It will not affect your child’s grades in school. There are no expected risks in participating in the research. There may be unknown risks. There are no personal benefits for participating in this study. You will not be paid for taking part in this study and you will not have to pay to take part in this study.

Your answers to the survey questions will be kept private. Your name, your child’s name and your child’s school name will be erased from all the documents and we will use a different name. Research records, surveys, interviews, and audiotapes will be kept in a locked file and they will be destroyed 24 months after the completion of the research. Only the researcher will access to these records and audiotapes. However, the researcher’s faculty advisor as well as the Office for Research Protections at Boston College may review the study records.

The researcher conducting this study is Guliz Turgut. For questions or more information about this research you may contact her by phone (617-319-3707) or email (turgutg@bc.edu). If you believe you have suffered from this research or have any questions about your rights as a research subject, you may contact Office for Research Protections, BC at (617) 552-4778 or irb@bc.edu.
Boston College

Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School

Statement of Consent:
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I understand the possible risks and benefits of the study. I know that being in this study is voluntary and I agree to be in this study. I know that I can stop being in the study at any time. I have received (or will receive) a copy of this form.

___ Place a check here if you want to get the survey in electronic form through e-mail. If you do, please write down your e-mail address so that we can send it to you.

___ Place a check here to agree that you have been given a copy of this form to keep for your records and future references.

Which language do you want to take the survey? (Please check only one)

___ Spanish       ___ English

Study Participant (Print Name): ________________________________

Study Participant (Signature): ________________________________  Date __________

Study Participant (E-mail): ________________________________
Appendix E

Parent Survey Consent Form (Spanish)

Boston College Lynch Escuela de Educación

Forma de consentimiento en la participación sobre
“el uso de una perspectiva ecológica para explorar un programa de computadoras en clases de estudiantes de inglés en una escuela media en una zona urbana”

Investigadora: Guliz Turgut
Fecha: 6 de Febrero, 2011

Consentimiento del padre a participar en un estudio de investigación sobre el empleo de una perspectiva ecológica para la integración en las aulas de un programa de computadoras con estudiantes de inglés en escuelas de nivel medio en zonas urbanas.

Le estamos enviando esta carta para invitarle a participar en un estudio de investigación de cómo un programa de computadoras se utiliza con estudiantes de inglés en la escuela de su hijo. Esta escuela es la mejor para el propósito del estudio. Le pedimos que tomo parte en el estudio porque su hijo ha sido seleccionado para participar en este estudio. Necesitamos su colaboración para saber su opinión sobre el programa de uso de computadoras en la escuela de su hijo.

Si decide participar en el estudio, tiene que completar una encuesta de 30 minutos más o menos que puede hacer en casa en español o en inglés, como usted prefiera. Y puede completarlo en papel o en forma electrónica. Si desea completar la encuesta en papel, se la enviaremos por su hijo. Si prefiere la forma electrónica, necesitamos que nos facilite su correo electrónico. Esta encuesta no las evalúa ni a usted ni a su hijo. Sus respuestas no ayudarán a mejorar los estudios y conocer los pensamientos de los padres acerca del programa de computadoras.

Su participación en el estudio es voluntaria. Puede decidir no participar o parar de participar en cualquier momento. No serán penalizados de ninguna forma y no afectará a las notas de su hijo. No hay ningún riesgo de participar en el estudio. Tampoco existen beneficios personales por su participación. No recibirá ninguna compensación económica y usted no tendrá que relaizar ningún pago.

Sus respuestas serán privadas. Su nombre, el de su hijo, y la escuela a la que asiste serán borrados de todos los documentos y usaremos nombres diferentes. Las muestras de la investigación, las encuestas, las entrevistas, y videos serán mantenidas en la privacidad y al cabo de 24 meses serán destruidas, una vez que termine el estudio. Tan solo el investigador tendrá acceso a estas muestras. Sin embargo, la Universidad de Boston puede revisarlas en un futuro.

La investigadora de este estudio se llama Guliz Turgut. Si tiene preguntas o necesita más información sobre este estudio puede contactarla a su teléfono móvil (617-319-3707) o a su email (turgutg@bc.edu). Si en el futuro sintiera que hubiera sufrido algún percance or si tuviera preguntas sobre el tema de la investigación, puede contactar la oficina de protección de investigaciones en la universidad (617-552-4778) o irb@bc.edu.
Boston College

El uso de una perspective ecológica para explorar un programa de computadoras en clases de inglés en una escuela media en una zona urbana.

Forma de consentimiento:
He leído los contenidos de esta forma de consentimiento. He recibido respuestas a todas mis dudas y preguntas. Entiendo los posibles riesgos y beneficios del estudio. Entiendo que puedo dejar de participar en cualquier momento. He recibido o voy a recibir una copia de esta forma.

____ Por favor firme aquí si quiere recibir la encuesta por correo electrónico. Si fuera así escriba también su correo electrónico para que se la envíemos.

____ Por favor firme aquí si quiere recibir una copia escrita de la encuesta para sus referencias futuras.

En qué lengua quiere realizar la encuesta? Elija una opción.

____ Español   _____ Inglés

Participante (Imprima su nombre): ______________________________

Participante (Firma): __________________________   Fecha ___________

Participante (E-mail): __________________________
Appendix F

Boston College Lynch School of Education

Informed Consent for Participation as a Subject in
“Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School”

Investigator: Guliz Turgut

School Principal Consent Form

Date Created: February 6, 2011

Your school is invited to participate in a research study about how the laptop program is integrated for English language learners into your school and classrooms. We ask you to read this form and ask any questions that may have before agreeing to be in the study.

The purpose of the study is to understand and describe the 1-to-1 laptop program integration in an urban middle school with a high English Language Learner (ELL) student population from the perspectives of district- and school-level administrators, teachers, students, parents, and technology personnel. Your school has been identified as the ideal school for the purpose of this study as it has been implementing the 1-to-1 laptop program for more than two years and is located in an urban environment with a high ELL student population. The study will collect data for a doctoral dissertation at Boston College.

If you allow your school to participate in the study, data collection for the study will include the following items. First, I will invite you and other school administrators to have an interview to describe the one-to-one initiative from administrators’ perspectives. Second, I need to interview some teachers who have been working in the school for at least two years, integrated the laptop program into their classrooms, and have ELL students. This will reflect teachers’ perspectives on the laptop program. Third, I need to interview technology coordinators and teacher leaders to include their perspective in the study. I will also need access to classrooms to conduct a few classroom observations to examine the use of technology in the classroom context with ELL students. Finally, I will randomly choose and interview some students and survey their parents about the laptop initiative to bring student and parent perspectives into the integration process. I anticipate each interview will take approximately 30-minutes to one-hour to complete. Interviews will be held individually and will be set up at participants’ convenience.

Participation in the study is voluntary. You can decide that your school not be in this study, or decide to stop participating at any time. Your school will not be penalized for rejecting or deciding to stop participating in the study. It will not affect your school’s position in your district or connections with Boston College. There are no expected risks in participating the research. There may be unknown risks. There are no personal benefits for participating in this study. There will be no payments for your school’s participation in the study and there is no cost to your school to participate in this research study.

Participant Initials: __________
The records of this study will be kept private. In any sort of report we may write, we will not include your school’s name or anyone else. Research records, surveys, and audiotapes will be kept in a locked file and they will be destroyed 24 months after the completion of research. Access to these records and audiotapes will be limited to the researcher only. However, the researcher’s faculty advisor as well as the Office for Research Protections at Boston College may review the study records. Any references within the transcripts to your school will be replaced with pseudonyms and all identifying features that could possibly jeopardize its anonymity will be removed.

The researcher conducting this study is Guliz Turgut. For questions or more information about this research you may contact her by phone (617-319-3707) or email (turgutg@bc.edu). If you believe you have suffered from this research or have any questions about your rights as a research subject, you may contact Office for Research Protections at (617) 552-4778 or irb@bc.edu.

Boston College

Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School

Statement of Consent:
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I understand the possible risks and benefits of the study. I know that being in this study is voluntary and I give my consent for the Lilla G. Frederick Pilot Middle School to take part in this study. I know that I can stop the study to be conducted in the school at any time. I have received (or will receive) a copy of this form.

[ ] Place a check here to indicate that you have been given a copy of this form to keep for your records and future references.

School Principal (Print Name): __________________________

School Principal (Signature): __________________________

School Name (Print Name): ____________________________ Date

Participant Initials: ________
You are invited to participate in a research study about how the laptop program is integrated for English language learners into your school and classrooms. You were selected as a possible participant due to your administration position in the school. We ask you to read this form and ask any questions that may have before agreeing to be in the study.

The purpose of the study is to understand how the laptop program is integrated in an urban middle school with an English Language Learner (ELL) student population from different perspectives. The school in which you are working is selected as the ideal school for the purpose of this study. You have been selected for the study due to your administrative position in the school to represent the administrators’ perspective of the laptop program. The study will collect data for a doctoral dissertation at Boston College.

If you agree to be in this study, we would ask you to take part in a one-time, 30 minute to one-hour interview. The interview will be conducted in your school at a convenient time for you. With your permission, the interview will be digitally recorded. The interview is not an evaluation of you or your school. Your responses will be used to advance research and hopefully provide an understanding of laptop programs from administrators’ perspectives.

Your participation in the study is voluntary. You can decide not to be in this study, or decide to stop participating at any time. You will not be penalized for rejecting or deciding to stop participating in the study. It will not affect your position in your school or connections with Boston College. There are no expected risks in participating the research. There may be unknown risks. There are no personal benefits for participating in this study. There will be no payments for your participation in the study and there is no cost to you to participate in this research study.

The records of this study will be kept private. In any sort of report we may write, we will not include your name or anyone else’s name. Research records, surveys, and audiotapes will be kept in a locked file and they will be destroyed 24 months after the completion of research. Access to these records and audiotapes will be limited to the researcher only. However, the researcher’s faculty advisor as well as the Office for Research Protections at Boston College may review the study records. Any references within the transcripts to you and your school will be replaced with pseudonyms and all identifying features that could possibly jeopardize your anonymity will be removed.

Participant Initials:
The researcher conducting this study is Guliz Turgut. For questions or more information about this research you may contact her by phone (617-319-3707) or email (turgutg@bc.edu). If you believe you have suffered from this research or have any questions about your rights as a research subject, you may contact Office for Research Protections at (617) 552-4778 or irb@bc.edu.

Boston College

Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School

Statement of Consent:
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I understand the possible risks and benefits of the study. I know that being in this study is voluntary and I agree to be in this study. I know that I can stop being in the study at any time. I have received (or will receive) a copy of this form.

Place a check here to indicate that you give permission for the interview to be digitally recorded.

Place a check here to indicate that you have been given a copy of this form to keep for your records and future references.

Study Participant (Print Name): ___________________________________

Study Participant (Signature): ___________________________ Date

Participant Initials: ______
Appendix H

Boston College Lynch School of Education

Informed Consent for Participation as a Subject in
“Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School”

Investigator: Guliz Turgut
Teacher Interview Consent Form
Date Created: February 6, 2011

You are invited to participate in a research study about how the laptop program is integrated for English language learners into your school and classroom. You were selected as a possible participant because you have been suggested by the school administration as you have integrated laptop program into your classroom and have ELL students. We ask you to read this form and ask any questions that may have before agreeing to be in the study.

The purpose of the study is to understand how the laptop program is integrated in an urban middle school with an English Language Learner (ELL) student population from different perspectives. The school in which you are working is selected as the ideal school for the purpose of this study. You have been selected for the study based on the suggestions of the school administration to represent the teacher perspective of the laptop program. The study will collect data for a doctoral dissertation at Boston College.

If you agree to be in this study, we would ask you to take part in a one-time, 30 minute to one-hour interview. The interview will be conducted in your school at a convenient time for you. With your permission the interview will be digitally recorded. The interview is not an evaluation of you. Your responses will be used to advance research and hopefully provide an understanding of laptop programs from teachers’ perspectives.

Your participation in the study is voluntary. You can decide not to be in this study, or decide to stop participating at any time. You will not be penalized for rejecting or deciding to stop participating in the study. It will not affect your position in your school or connections with Boston College. There are no expected risks in participating in the research. There may be unknown risks. There are no personal benefits for participating in this study. There will be no payments for your participation in the study and there is no cost to you to participate in this research study.

The records of this study will be kept private. In any sort of report we may write, we will not include your name or anyone else’s name. Research records, surveys, and audiotapes will be kept in a locked file and they will be destroyed 24 months after the completion of research. Access to these records and audiotapes will be limited to the researcher only. However, the researcher’s faculty advisor as well as the Office for Research Protections at Boston College may review the study records. Any references within the transcripts to you and your school will be replaced with pseudonyms so as to remove all identifying features that could possibly jeopardize your anonymity. Identities of participants will be kept confidential in any writing for a wider audience that may take place.
The researcher conducting this study is Guliz Turgut. For questions or more information about this research you may contact her by phone (617-319-3707) or email (turgutg@bc.edu). If you believe you have suffered from this research or have any questions about your rights as a research subject, you may contact Office for Research Protections at (617) 552-4778 or irb@bc.edu.

**Boston College**

**Using Ecological Lens to Explore a One-to-one Laptop Program Integration in Classrooms with English Language Learners in an Urban Middle School**

**Statement of Consent:**
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I understand the possible risks and benefits of the study. I know that being in this study is voluntary and I agree to be in this study. I know that I can stop being in the study at any time. I have received (or will receive) a copy of this form.

___ Place a check here to indicate that you give permission for the interview to be digitally recorded.

___ Place a check here to indicate that you have been given a copy of this form to keep for your records and future references.

Study Participant (Print Name): _________________________________

Study Participant (Signature): ________________________________ Date

____________

Participant Initials: _____
Appendix I

Classroom Observation Protocol

1. Setting

Date: _________________________  Classroom: _________________________

Visit #: _________________________  Teacher: _________________________

Grade: _________________________  Subject: _________________________

Number of Students: ______  Observation Start time: ______  End time: ______

2. Room description and student characteristics:

3. Student groupings (check all observed during the period):

   ____ Individual student work  ____ Small groups
   ____ Student pairs  ____ Whole class
   ____ Other (please comment):

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2 Adapted from the free ISTE Classroom Observation Tool (ICOT®) retrieved from http://www.iste.org/icot.
4. Teacher roles (check all observed during the period):

____ Lecturing
____ Facilitating/Coaching
____ Interactive direction
____ Modeling
____ Discussion
____ Other (please comment):

5. Learning activities (check all observed during the period):

____ Creating presentations
____ Test taking
____ Research
____ Drill and practice
____ Information analysis
____ Simulations
____ Writing
____ Hands-on skill training
____ Other (please comment):

6. How essential was technology to the teaching and learning activities?

____ 1. Not needed; other approaches would be better.
____ 2. Somewhat useful; other approaches would be as effective.
____ 3. Useful; other approaches would not be as effective.
____ 4. Essential; the lesson could not be done without it.

Comment:
7. Technologies used by teacher (check all observed during the period):

___ Calculator  ___ Presentation
___ CD-ROM     ___ Science Probe
___ Database    ___ Shared Editor (wiki)
___ Desktop Computer  ___ Simulation
___ Digital Camera  ___ Spreadsheets
___ Drill/Practice  ___ Tablet Computer
___ E-mail       ___ Video Camera
___ Graphics     ___ Videoconferencing
___ Handheld Computer  ___ Web Authoring
___ Laptop Computer  ___ Web Browser
___ Library Database  ___ Web Log
___ Outliner    ___ Word Processing
___ Podcast   ___ Other (please comment):

8. Technologies used by students (check all observed during the period):

___ Calculator  ___ Presentation
___ CD-ROM     ___ Science Probe
___ Database    ___ Shared Editor (wiki)
___ Desktop Computer  ___ Simulation
___ Digital Camera  ___ Spreadsheets
___ Drill/Practice  ___ Tablet Computer
___ E-mail       ___ Video Camera
___ Graphics     ___ Videoconferencing
___ Handheld Computer  ___ Web Authoring
___ Laptop Computer  ___ Web Browser
___ Library Database  ___ Web Log
___ Outliner    ___ Word Processing
___ Podcast   ___ Other (please comment):

<table>
<thead>
<tr>
<th>Problem 1</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Nature of Problem</td>
<td></td>
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<tr>
<td>Time of the problem</td>
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<tr>
<td>Impact of the problem on teaching</td>
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<tr>
<td>Solution to the problem</td>
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<table>
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10. **Barriers encountered by students while using computers during classroom time.**

<table>
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<td>Solution to the problem</td>
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## Appendix J

### Interview Protocol with Principal and Assistant Principal

<table>
<thead>
<tr>
<th>Question</th>
<th>Designed to find out …</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is your position or connection with the school?</td>
<td>Participant background; specific information</td>
</tr>
<tr>
<td>a. How long have you been with the school?</td>
<td></td>
</tr>
<tr>
<td>2. Can you compare the school before and after the laptop initiative?</td>
<td>Historical information on the initiative; current state of the initiative</td>
</tr>
<tr>
<td>3. How would you describe your role and contribution in the laptop initiative?</td>
<td>Reflection on past experiences; self-perceived role</td>
</tr>
<tr>
<td>4. What unexpected outcomes have occurred as a result of the laptop initiative?</td>
<td>Unexpected results in general and specific to ELLs</td>
</tr>
<tr>
<td>· What unexpected outcomes have occurred specific to ELLs?</td>
<td></td>
</tr>
<tr>
<td>5. From the administrator perspective, <strong>who</strong> would you describe as critical participants for the effective implementation of the initiative?</td>
<td>Identification of biotic participants in the integration of the initiative in general; identification of their roles; identification of relations</td>
</tr>
<tr>
<td>a. Could you please describe these participants’ <strong>roles</strong> and how they contributed to the initiative?</td>
<td></td>
</tr>
<tr>
<td>b. How would you describe the <strong>relation</strong> between these participants and their roles for the successful integration of the initiative?</td>
<td></td>
</tr>
<tr>
<td>6. From the administrator perspective, <strong>who</strong> would you describe as critical participants for the effective implementation of the initiative <strong>for ELLs</strong>?</td>
<td>Identification of biotic participants in the integration of the initiative for ELLs; identification of their roles for ELLs; identification of relations for ELLs</td>
</tr>
<tr>
<td>a. Could you please describe these participants’ <strong>roles</strong> and how they contributed to the initiative <strong>for ELLs</strong>?</td>
<td></td>
</tr>
<tr>
<td>b. How would you describe the <strong>relation</strong> between these participants and their roles for the successful integration of the initiative <strong>for ELLs</strong>?</td>
<td></td>
</tr>
<tr>
<td>7. From the administrator perspective, <strong>what</strong> are critical factors for an effective implementation of a one to one initiative?</td>
<td>Identification of abiotic factors in the integration of the initiative in general; identification of their roles; identification of relations</td>
</tr>
<tr>
<td>a. Could you please describe these factors’ <strong>roles</strong>?</td>
<td></td>
</tr>
<tr>
<td>b. How would you describe the <strong>relation</strong> between these factors?</td>
<td></td>
</tr>
<tr>
<td>8. From the administrator perspective, <strong>what</strong> are critical factors for an effective implementation of a one to one initiative specific to ELLs?</td>
<td>Identification of abiotic factors in the integration of the initiative specific to ELLs; identification of their roles specific to ELLs; identification of relations specific to ELLs</td>
</tr>
<tr>
<td>a. Could you please describe these factors’ <strong>roles</strong> specific to ELLs?</td>
<td></td>
</tr>
<tr>
<td>b. How would you describe the <strong>relation</strong> between these factors specific to ELLs?</td>
<td></td>
</tr>
<tr>
<td>9. If you had the knowledge you now have about the integration process of one-to-one laptop program, what would you have done differently that other schools should consider?</td>
<td>Suggestions to other schools about the initiative and the integration process</td>
</tr>
<tr>
<td>10. Do you have any other additional thoughts to share?</td>
<td>Closure; additional information</td>
</tr>
</tbody>
</table>
# Appendix K

## Interview Protocol with Academy Coordinator, Teacher Leader, Teachers, and Technology Personnel

<table>
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<tr>
<th>Question</th>
<th>Designed to find out …</th>
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<tbody>
<tr>
<td>1. What is your position or connection with the school?</td>
<td>Participant background; specific information</td>
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<td>a. How long have you been with the school?</td>
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<td>2. Can you compare the school before and after the laptop initiative?</td>
<td>Historical information on the initiative; current state of the initiative</td>
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<tr>
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<td>Unexpected results in general and specific to ELLs</td>
</tr>
<tr>
<td>a. What unexpected outcomes have occurred specific to ELLs?</td>
<td></td>
</tr>
<tr>
<td>5. From the teacher/academy coordinator/teacher leader perspective, who would you describe as critical participants for the effective implementation of the initiative?</td>
<td>Identification of biotic participants in the integration of the initiative in general; identification of their roles; identification of relations</td>
</tr>
<tr>
<td>a. Could you please describe these participants’ roles and how they contributed to the initiative?</td>
<td></td>
</tr>
<tr>
<td>b. How would you describe the relation between these participants and their roles for the successful integration of the initiative?</td>
<td></td>
</tr>
<tr>
<td>6. From the teacher/academy coordinator/teacher leader perspective, who would you describe as critical participants for the effective implementation of the initiative for ELLs?</td>
<td>Identification of biotic participants in the integration of the initiative for ELLs; identification of their roles for ELLs; identification of relations for ELLs</td>
</tr>
<tr>
<td>a. Could you please describe these participants’ roles and how they contributed to the initiative for ELLs?</td>
<td></td>
</tr>
<tr>
<td>b. How would you describe the relation between these participants and their roles for the successful integration of the initiative for ELLs?</td>
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<tr>
<td>7. From the teacher/academy coordinator/teacher leader perspective, what are critical factors for an effective implementation of a one to one initiative?</td>
<td>Identification of abiotic factors in the integration of the initiative in general; identification of their roles; identification of relations</td>
</tr>
<tr>
<td>a. Could you please describe these factors’ roles?</td>
<td></td>
</tr>
<tr>
<td>b. How would you describe the relation between these factors?</td>
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<td>8. From the teacher/academy coordinator/teacher leader perspective, what are critical factors for an effective implementation of a one to one initiative specific to ELLs?</td>
<td>Identification of abiotic factors in the integration of the initiative specific to ELLs; identification of their roles specific to ELLs; identification of relations specific to ELLs</td>
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<tr>
<td>a. Could you please describe these factors’ roles specific to ELLs?</td>
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<td>b. How would you describe the relation between these factors specific to ELLs?</td>
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<td>Suggestions to other schools about the initiative and the integration process</td>
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<tr>
<td>10. Do you have any other additional thoughts to share?</td>
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</table>
Appendix L

Interview Protocol with Parents

Date:  
Name:

<table>
<thead>
<tr>
<th>Question</th>
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</tr>
</thead>
<tbody>
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<td>1. What is your position or connection with the school?</td>
<td>Participant background; specific information</td>
</tr>
<tr>
<td>a. How long have you been with the school?</td>
<td></td>
</tr>
<tr>
<td>2. Can you compare the school before and after the laptop initiative?</td>
<td>Reason for choosing the school</td>
</tr>
<tr>
<td>3. How would you describe your role and contribution in the laptop initiative?</td>
<td>Self-perceived role</td>
</tr>
<tr>
<td>4. Did you observe unexpected outcomes of the laptop initiative in your child?</td>
<td>Unexpected results in general and specific to ELLs</td>
</tr>
<tr>
<td>5. From the parent perspective, <strong>who</strong> would you describe as critical participants for the effective implementation of the initiative?</td>
<td>Identification of biotic participants in the integration of the initiative in general; identification of their roles; identification of relations</td>
</tr>
<tr>
<td>a. Could you please describe these participants’ <strong>roles</strong> and how they contributed to the initiative?</td>
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</tr>
<tr>
<td>b. How would you describe the <strong>relation</strong> between these participants and their roles for the successful integration of the initiative?</td>
<td></td>
</tr>
<tr>
<td>6. From the parent perspective, <strong>who</strong> would you describe as critical participants for the effective implementation of the initiative <strong>for ELLs</strong>?</td>
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<td>7. From the parent perspective, <strong>what</strong> are critical factors for an effective implementation of a one to one initiative?</td>
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<td>a. Could you please describe these factors’ <strong>roles</strong>?</td>
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Appendix M

Interview Protocol with Students

Date:  
Name:  

<table>
<thead>
<tr>
<th>Question</th>
<th>Designed to find out …</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What grade are you in? Do you have your own laptop? How long have you had it?</td>
<td>Participant background; specific information</td>
</tr>
<tr>
<td>2. Why are you attending this school?</td>
<td>Participant background; specific information</td>
</tr>
<tr>
<td>3. Did you have computer in your previous school?</td>
<td>Previous experiences using laptops</td>
</tr>
<tr>
<td>4. Before attending this school have you heard about the laptop program in this school?</td>
<td>Possible impact of laptop initiative on school decision</td>
</tr>
<tr>
<td>· Did this play a role in your decision?</td>
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</tr>
<tr>
<td>5. Do you think you helped the school or your teachers when you use laptops? How?</td>
<td>Self-perceived role</td>
</tr>
<tr>
<td>6. How do you and your teachers use laptops in class?</td>
<td>Use of laptops in class</td>
</tr>
<tr>
<td>7. <strong>Who</strong> do you think are the important people to use the laptops?</td>
<td>Identification of biotic participants in the integration of the initiative;</td>
</tr>
<tr>
<td>· Why do you think they are important?</td>
<td></td>
</tr>
<tr>
<td>8. <strong>What</strong> do you think you need to have to use laptops?</td>
<td>Identification of abiotic factors in the integration of the initiative; relations</td>
</tr>
<tr>
<td>· Do you think these things are connected to each other?</td>
<td></td>
</tr>
<tr>
<td>9. Now that you have experience with a laptop program in your school, what do you think other students should know/consider when their school also uses laptop computers?</td>
<td>Suggestions to other student about the initiative and the integration process</td>
</tr>
<tr>
<td>10. Do you have any other additional thoughts to share?</td>
<td>Closure; additional information</td>
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