TEACHER PERCEPTIONS OF STUDENT ENGAGEMENT AS RELATED TO TECHNOLOGY
IMPLEMENTATION IN THE CLASSROOM

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The challenges of at-risk students are not new. Newspaper articles from the 1860s presented information about communities seeking to help students to complete school and find employment to provide a livable wage. Today's solutions focus on legislation intended to affect societal change and provide equitable opportunities for at-risk students. Much research regarding how to improve academic outcomes for at-risk students addresses high school level, identifying those factors that encourage secondary learners to remain in school. However, less work has been done investigating whether earlier intervention can obviate later retention efforts by improving students' learning outcomes in the elementary grades. In this vein, engagement is a factor found to positively influence learning, particularly when students are actively engaged with instructional content. Technology can facilitate such interactions between students and content; however, research is needed to better understand the relationship between student engagement and technology, particularly with at-risk students in elementary settings. Seeking to address the gap, this qualitative study examined the occasion of a fifth-grade school that recently implemented 1:1 technology. Using a case study approach, researchers explored the effects of the 1:1 Chromebook implementation on teacher-perceived student engagement at the elementary level. This study sought to better understand how this school technology application influenced student engagement including constructs such as relevance, novelty, and gamification. Teachers in the study expressed that their students' engagement levels increased with Chromebook use. They identified relevance, autonomy, and novelty as reasons for students' engagement with the technology.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>viii</td>
</tr>
<tr>
<td>CHAPTER 1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Background and Context</td>
<td>2</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>4</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>4</td>
</tr>
<tr>
<td>Research Approach</td>
<td>5</td>
</tr>
<tr>
<td>The Researcher</td>
<td>6</td>
</tr>
<tr>
<td>Assumptions</td>
<td>8</td>
</tr>
<tr>
<td>Rationale and Significance</td>
<td>9</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>10</td>
</tr>
<tr>
<td>Delimitations</td>
<td>10</td>
</tr>
<tr>
<td>CHAPTER 2. LITERATURE REVIEW</td>
<td>12</td>
</tr>
<tr>
<td>At-Risk Students</td>
<td>12</td>
</tr>
<tr>
<td>Student Engagement</td>
<td>14</td>
</tr>
<tr>
<td>Technology and Student Engagement</td>
<td>18</td>
</tr>
<tr>
<td>Conceptual Framework</td>
<td>22</td>
</tr>
<tr>
<td>Summary</td>
<td>27</td>
</tr>
<tr>
<td>CHAPTER 3. METHODOLOGY</td>
<td>29</td>
</tr>
<tr>
<td>Introduction</td>
<td>29</td>
</tr>
<tr>
<td>Rationale for the Research Methodology</td>
<td>30</td>
</tr>
<tr>
<td>Setting</td>
<td>31</td>
</tr>
<tr>
<td>Participants</td>
<td>32</td>
</tr>
<tr>
<td>Overview of Research Design</td>
<td>33</td>
</tr>
<tr>
<td>BrightBytes</td>
<td>33</td>
</tr>
<tr>
<td>Teacher Surveys</td>
<td>35</td>
</tr>
</tbody>
</table>
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>BrightBytes Report Types</td>
<td>34</td>
</tr>
<tr>
<td>Table 2</td>
<td>Research Questions and Associated Themes</td>
<td>58</td>
</tr>
<tr>
<td>Table 3</td>
<td>Codes Related to Each Theme for Research Question 4</td>
<td>63</td>
</tr>
<tr>
<td>Table 4</td>
<td>Chromebook Applications and the Ways that They are Used in the Classroom</td>
<td>73</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Model of motivational dynamics (Skinner &amp; Pitzer, 2012, p. 23)</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Teacher parent peer model of motivational dynamics (Skinner &amp; Pitzer, 2012, p. 23)</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>Classroom influences on student engagement</td>
<td>26</td>
</tr>
</tbody>
</table>
“Mrs. Mata, can we use the Chromebooks today?” “Are we doing math on the computer?” “Can we make a presentation for our project on the computer?” These are the questions I heard daily during the past year that I spent teaching mathematics in an at-risk fifth-grade intermediate school. It was these questions and the challenges of working with an at-risk student group that caused me to think about how using Chromebooks for the first time as 1:1 technology in the school affected the students’ engagement levels in the way they interacted with the math content. As teacher and researcher, I wondered if my classroom experiences were similar to those of teachers around me and what past work said about how student engagement is affected by 1:1 technology implementation in the classroom.

This study seeks to provide understanding about the perceived effects of 1:1 technology implementation on student engagement with instructional content. The purpose of this study is to understand, through the lens of teacher perceptions, student engagement and its relationship to the use of Chromebooks in an at-risk fifth-grade classroom. It is hoped that the study provides information for district personnel about the impact of the technology implementation. This study illuminates, for teachers and administrators in similar situations, how student engagement may be affected by using 1:1 technology. The research employed an explanatory case study methodology (Yin, 2014). Using a case study approach allowed for the consideration not only of the phenomena of student engagement related to technology implementation, but also of the contextual factors of interest.

This chapter provides the background and context for the research questions, the statement of the problem, the purpose of the study, and an overview of the research approach.
The chapter also includes a short discussion of my place in the study, research assumptions, and the rationale and significance of the study. Terms like technology and student engagement are defined in several ways by researchers and popular literature. Therefore, the chapter concludes with a definition of terms included in the study as well as delimitations.

Background and Context

With the passage of Title 1 legislation by President Lyndon Johnson in 1965, public schools were challenged with the task of meeting the needs of disadvantaged students (“Title 1-Improving the Academic Achievement of the Disadvantaged,” n.d.). While much has been done politically and economically to address the needs of this group, researchers continue to seek out ways to address the disparity in academic achievement. Past research varied in focus from access to knowledge sources (Brown, 2000), distribution of economic and educational resources within communities (Owen, 1972), and even presence of student grit (Duckworth, Peterson, Matthews & Kelly, 2007). For the educator and administrator, the primary focus is on those factors that can be influenced in the school setting.

Student engagement, distinguished from static characteristics such as race and socioeconomic status, is a mutable factor that may influence student achievement (Skinner & Pitzer, 2012; Reschly & Christenson, 2006; Finn, 1993). Early work by Finn (1989) noted two different areas of student engagement: 1) participation in school and classroom activities and 2) identification with peer and school-related groups. Student engagement continues to evolve as a meta-construct, encompassing autonomy and structure (Skinner & Belmont, 1993), academic, behavioral, cognitive, and psychological elements (Appleton, Christenson, & Furlong, 2008; National Research Council, 2003; Furrer & Skinner, 2003). Within this meta-construct, academic
engagement is that area of student engagement in which the student interacts with academic content during instruction, works with classmates, and completes work independently (Finn & Zimmer, 2012). Behavioral engagement is student participation in social or academic activities related to the school. The psychological elements of engagement may include emotional interactions in which the student connects with teachers and other students, both positively and negatively, within the school context (Reschly & Christenson, 2012).

While researchers seek a clear taxonomy of engagement, there is agreement that a link exists between levels of student engagement and achievement (Appleton et al., 2008; Furlong & Christenson, 2008; Fredricks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003; Marks, 2000; Finn, 1993; Newmann, Wehlage, & Lamborn, 1992). More elusive is the understanding of how to increase student engagement to improve achievement (National Research Council, 2003; Marks, 2000; Newmann et al., 1992).

Technology has been suggested as one means to engage students in the learning process (Yazzie-Mintz & McCormick, 2012; Dede, 2005; Prensky, 2001). With popular literature identifying the Generation Z and their predecessors, the Millennials, as tech-savvy (Rideout, Foehr, & Roberts, 2011) and in need of technology for learning, the pressure grows for schools to provide computers, iPads, and other technologies to students to facilitate their learning (Berk, 2009; Jones, Jo, & Martin, 2007; Shih & Allen, 2007; Dede, 2005). As is often the case, the research into the effects of these implementations lags behind the implementations themselves (Mouza, 2008). What is the effect of technology on student engagement in 1:1 implementations? Specifically, will access to technology like an iPad or a laptop help students who work in a 1:1 implementation setting engage in learning activities and in the school community?
Statement of the Problem

The majority of students (84.6%) at the fifth-grade school in this study is identified by the Texas Education Agency as at-risk of dropping out of high school before completion. While there have been studies to address the problem of dropping out in upper grades, researchers suggest that earlier intervention may be more effective and provide better academic outcomes over the course of the students’ academic careers (Finn & Zimmer, 2012; Rumberger & Lim, 2008; Severson, Walker, Hope-Doolittle, Kratochwill, & Gresham, 2007; Barrington & Hendricks, 1989; Finn, 1989). Specifically, engagement with academic content in the lower grades can improve learning outcomes and positively affect graduation outcomes in upper grades as well (Finn & Zimmer, 2012; Skinner & Pitzer, 2012). For teachers and administrators, the challenge is how to increase engagement for at-risk students in lower grades. Technology may facilitate student engagement with learning activities (Zheng, Warschauer, Lin, & Chang, 2016; Mousa, 2008). However, there is limited research about the effects of technology implementation on the engagement levels of at-risk elementary students. Understanding the role that 1:1 technology implementation plays in student engagement can help the stakeholders in this school as well as other schools facing similar challenges to make informed, strategic decisions about how to effectively use 1:1 technology in ways that may facilitate increased engagement for elementary at-risk students.

Purpose of the Study

The purpose of this study is to determine teacher perceptions of the effects of 1:1 technology implementation on student engagement in an at-risk upper elementary school. With much at-risk research focused on high school and early college levels, and research lacking in the
effects of 1:1 technology implementation on student engagement, this study provides insight into the how technology may affect student engagement in upper elementary classrooms. To shed light on this issue, the following research questions were:

- What are the teachers’ understandings of student engagement and its relevance in the classroom?
- How do teachers define and describe student engagement in their classrooms?
- What are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom?
- Do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity)?

Research Approach

This study is a qualitative, explanatory case study and was concentrated in a dedicated fifth-grade school in a suburban area of North Texas. The school had approximately 450 students and was in its second year of 1:1 technology implementation, with the district providing each student access to a Chromebook for use in the classroom. For the 2015-16 school year, 84.6% of students at this fifth-grade center were considered at-risk of dropping out of school before completion; 87.9% of students were considered economically disadvantaged (TEA Texas Academic Performance Report, 2016). To provide insight into how students relate to the Chromebooks, teachers provided their perceptions of student engagement related to technology use by completing a survey. Participants included classroom, gifted and talented, and special education teachers.

From the survey respondents, I selected teachers to participate in semi-structured interviews about their perceptions of student engagement and its relationship to computer use in the classroom. Participants were chosen from the survey responses, such that I had a continuum
of responses from highly positive to neutral to highly negative as a means to better understand students’ relationship with technology in the classroom. Interviews were followed up with a classroom observation to further understand teacher descriptions of student engagement in their classrooms.

Additional information about student familiarity with and access to technology and internet service at both school and home was provided through the school’s 2017-18 BrightBytes survey results. Students and teachers, district-wide, complete this survey each year. The anonymous digital survey asks students and teachers to share information about their access to technology and internet. Including this information allowed for triangulation of data and provided insight into any connections between accessibility and how students and teachers feel about academic technology use.

To understand the data collected from the teacher surveys and interviews, I coded and analyzed the responses and incorporated the observation record of one of the teachers to look for themes related to student engagement and technology use. I also used the questions and results from the school’s 2017-18 BrightBytes survey to make comparisons with the teacher survey and interview themes to provide a picture of teacher perceptions of student engagement within the context of specific usage and accessibility.

The Researcher

In this study, I was the primary instrument for data collection and analysis, in keeping with qualitative research expectations. Thus, it is important to explain the context and subjectivities of the research instrument being used in this study, and potential biases that should be shared. When this study was originally conceived, I was a classroom teacher in the fifth-grade
school under study. I was a part of the inaugural year of 1:1 Google Chromebook laptop implementation and experienced, as a teacher, the effects of the technology on the math classroom. This opportunity provided me with the unique perspective of knowing many of the individuals participating in the study and understanding some of the challenges of the students in that particular school and district. Currently, I am employed as an online instructional designer at the regional education service center that provides training and resources to this school district and others, directly and indirectly. While no longer in daily, direct contact with the district, I remain active in the educational technology space. Further, as a part of current job duties, I provide learning management system (LMS) support and professional development for the district and, therefore, the school where the study took place.

Both as a teacher and as an instructional designer, I have always been in the position to ask, “To what end” - with regard to technology. Technology is a tool; therefore, I hold the perspective that both teacher and researcher should be tool agnostic, seeking the best outcomes for students or participants using those tools that add to the learning outcomes. Because of this belief, I can critically look at the effects of technology on student engagement, having firsthand experiences on which to reflect and better understand the effects of the 1:1 technology implementation on student engagement. As Flyvbjerg (2006, p. 5) stated, “Context-dependent knowledge and experience are at the very heart of expert activity.”

While there is a benefit to my experiences in the district, it is also the case that the former association with the district may influence the way in which the data is collected and interpreted, leading to subjective bias that must be accounted for in the credibility establishment of the research outcomes. To address these challenges, I made explicit my own experiences and position within the research. I also engaged in self-reflection to better understand my own biases.
and experiences related to the research. The study included triangulation of data from different sources and forms of evaluation that employ different participant and analyst perspectives, a common qualitative research practice (Ravitch & Mittenfelner Carl, 2016). This method increases the trustworthiness of the study by allowing a perspective comparison while providing an interpretation check for the researcher.

Assumptions

My experiences were, in part, a catalyst for the study. As a result, there are three assumptions associated with these experiences. First, I believe that the experiences associated with technology impact learning. The exact nature of that impact has yet to be established, particularly on the students in this research. This assumption is guided by my own experience at the school that suggests that technology use provides students motivation, relevance, and novelty in their learning experiences. This assumption is supported by both self-determination theory and current brain research which suggest relevance, novelty, and gamification are motivators that connect students to classroom learning (da Rocha Seixas, Gomes, & de Melo Filho, 2016; Richter, Raban, & Rafaeli, 2015; Barto, Mirolli, & Baldassarre, 2013; Otmakhova, Duzel, Deutch, & Lisman, 2013; Ryan & Deci, 2000). Second, I believe that there are characteristics of at-risk students that are mutable. The categorization of at-risk is not deterministic and may be positively influenced by interventions at various stages. Early work by Finn (1993) suggested increased student engagement, among other factors, may positively influence learning outcomes by encouraging at-risk students to interact with individuals in the school setting and with instructional content. Third, I believe student engagement with the content is crucial for improving learning outcomes. Much focus has been given to at-risk high school students and
retention, with the idea being that helping students to feel a part of the school community can improve their retention rates, and, in turn, improve achievement. However, at the lower grades, it is important that students interact with instructional content to improve learning outcomes, as this may improve the likelihood that students will graduate from high school (Skinner & Pitzer, 2012).

Rationale and Significance

The study rationale stems from my own experiences with the implementation of 1:1 technology in the classroom. Technology can be a motivating way to engage with instructional content. For at-risk students who may have limited access to technology outside of school, it is desirable to know what perceived effect technology may have on a student’s willingness to engage with instructional content. The significance of this study and its contribution to the field directly connects to this particular group. Most research on at-risk students has focused on high school and retention strategies. This study provides a picture of what technological implementation looks like at the elementary level. Study results may help to inform district leaders who decide how and when to implement 1:1 technology, by understanding a specific school’s experiences at the elementary level and serving as a particular case from which they can draw their own parallels and conclusions depending on the degree to which their situation matches the setting described here. As districts move toward personal technology implementation including allowing students to bring and use their own devices, understanding how technology implementation affects student engagement allows for more informed decision-making by administrators and instructors.
Definition of Terms

- At-risk students. Students identified as being at risk of not graduating from high school based on Public Education Information Management System (PEIMS) Data Standards set forth by the Texas Education Agency (TEA). For this study, at-risk students and disadvantaged students are used interchangeably.


- Motivation. Motivation is the internal manifestation of the external action, engagement, and is identified as a precursor to engagement (Christenson, Reschly, & Wiley, 2012).

- One-to-one (1:1) technology. Single, personal technological device used by one student. In the school involved in the study, the 1:1 technology is the Chromebook.

Delimitations

The delimitations of this study were the type of study; the use of teachers to provide data about the students; and the choice of a fifth-grade, single-level school. Inherent in the single case study approach is the inability to generalize across a broad spectrum of experiences (Yin, 2014). I chose to use teacher perceptions of student engagement rather than interview the students. Language barriers in securing parent permissions to interview students, and the Internal Review Board special population status of the students made interviewing students impractical. The population under study was also limited to a fifth grade center with other grade levels not included in the study. In partnership with the district, I studied fifth grade specifically because of
the district’s interest in the technology implementation at that level. Fifth grade was the lowest grade level at which 1:1 technology was implemented.
CHAPTER 2
LITERATURE REVIEW

One need only visit a mall, restaurant, or other public space to see that personal technologies like cell phones and tablets engage the general population. Heads down, focused on screens, people are drawn to the information or activities on their devices. While it is likely that technology use and classroom engagement impacts the general student population, it is how technology affects the engagement of at-risk students that is of interest to this researcher. The school under study has a majority population that has been identified as at-risk. Therefore, this literature review, while providing information on current trends in the study of student engagement and its relationship with technology, also includes a brief historical synopsis of how the challenges of teaching at-risk student population have been addressed previously. Using this same logic, it is beneficial to include a review of the concept of student engagement to provide context for the logic of looking at technology’s influence on student engagement. Together, the literature in these three areas provides a valuable understanding of the intricate relationship between past interventions for the at-risk student and current trends in technology and engagement.

At-Risk Students

In her examination of at-risk student history, Kamenetz (2015) investigated the terms with which society has referred to this student group. As early as 1860, the New York Times featured an article explaining an alternative home and school to address the challenges facing “juvenile delinquents.” While the nomenclature has moved from such culturally charged appellations as juvenile delinquent and dropout, the issue remains (Heppen, Zeiser, Holtzman,
O’Cummings, Christenson, & Pohl, 2017; Masten, Fiat, Labella & Strack, 2015): how does society meet and support disadvantaged students’ academic needs to ensure their educational success? Even in 1860, the primary goal of the alternative school was to support disadvantaged students in such a way that they finished their education and were able to find meaningful work after high school (Our City Charities, 1860).

Since that time, much has been done legislatively to focus on different areas of inequity that may influence student learning outcomes. Legislation of the 1950s and early 1960s addressed segregation and equal access to school services for ethnic minorities (Ready, Edley Jr. & Snow, 2002; Green, 1968; Warren, 1954). During Lyndon Johnson’s administration, the focus shifted from minorities to include individuals living in poverty. Both Head Start and Title 1 (originally called Chapter 1) were designed to reach students whose socioeconomic status negatively affected their ability to succeed in school and achieve gainful employment upon graduation. School finance came under scrutiny with court cases in the 1970s and 1980s that inspected financial inequity between districts. Around the same time, a governors’ summit resulted in the introduction of national standards that would later be tied to federal funding for programs such as Head Start and Title 1 (Ready et al., 2002). Together, these activities pushed for equitable funding among districts, and indirectly related, correctly or incorrectly, failures in student achievement to funding gaps. In a desire to provide accountability and improvement for low performing schools, the No Child Left Behind Act of 2001 (2002) reinforced the federal government’s reach into state education practices, connecting accountability and testing requirements to federal funding, and incentivizing compliance with mandates through educational grants and tax benefits.

In parallel, or possibly in response to activity in the legislature and the courts, researchers
studied student retention as a means to address graduation rates and ultimately impact a disadvantaged student’s ability to achieve a livable wage upon completion of high school (Alexander, Entwisle, & Horsey, 1997; Finn, 1989). Early work sought to delineate factors that influenced a student’s ability and desire to finish high school. Numerous factors have been identified including poverty, minority status (Simons & Burke, 1966), alienation from school (Finn, 1989), drugs (Mensch & Kandel, 1988), poor academic performance, family culture, and parental scholastic achievement (Finn & Zimmer, 2012; Barrington & Hendricks, 1989; Rumberger, 1987; Mare, 1980). For school professionals, grouping these factors by areas over which they have influence can be advantageous as it allows researchers, administrators, and teachers to focus specifically on those areas in which change might be affected.

What is striking in the review of this literature is the span of time in which answers to these problems have been sought. In the New York Times article dated 1860, the author attributes the truant behavior of children served by the reform school to lack of education, lack of parental involvement, and poverty. While the New York Times article is hardly an empirical study, the fact that research literature as current as 2017, covered in the following sections, addresses the same issues, suggests that there is no panacea. Instead, it warrants additional insight into how more current developments, such as student engagement and its relationship to technology, may affect change.

Student Engagement

Student engagement is a concept of particular interest in the education community. Not a new topic, student engagement boasts a robust collection of research literature. From the beginning, discussions of engagement have been concerned with improving student achievement.
With early academic success established as a predictor of high school retention and graduation (Alexander et al., 1997), researchers saw the importance of determining how best to encourage academic success. Engagement with content to achieve this early academic success linked student engagement transitively with student achievement (Finn & Zimmer, 2012; Skinner & Pitzer, 2012). Alexander et al., (1997) expanded this idea stating that “prospects for ‘reengagement’ later are not good when children are plagued early in their school careers by self-doubt, are alienated from things academic” (p.98). The emphasis on achievement remains as researchers continue to look to a variety of influences to understand how best to influence student engagement.

Within the large body of research on this topic, there has been a significant evolution in how education professionals understand the concept of student engagement. The literature provides not only ideas about how engagement should be defined, but also examines those factors that influence student engagement. As noted previously, some researchers define engagement based on a student’s interaction with external constructs. Nystrand and Gamoran (1991) divided engagement into two categories, procedural and substantive. Addressing the level of commitment to the school setting, their concept of procedural engagement defined this type of engagement as related to “an accommodation to classroom rules and procedures” (p. 4). Substantive engagement relates to engagement with and attention to the content under study. Both of these types of engagement were concerned with how the student relates to some part of the curriculum or school structure. Closely related to this idea of academic engagement was “task engagement,” defined as “class engagement in academic tasks” (Hines, 1986, p. 26). Time spent on task became specifically related to student achievement, and as a result, while still related to engagement, became a construct of its own. As a meta-construct, time on task became
defined as instructional time and encompassed allocated time, engaged time, time on task, academic learning time (ALT), transition time, and waiting time (Berliner, 1990).

Relationships, categorized as external influences, affect student engagement (Skinner & Pitzer, 2012). In multiple studies of teacher-student relationships, teacher behavior was viewed as a strong catalyst for student engagement and ultimately student achievement (Skinner & Pitzer, 2012; Berliner & Rosenshine, 1976). In a study of parent-teacher relationships, Hughes and Kwok (2007) noted that the quality of a student’s relationships with both parents and teachers was related to a student’s academic engagement. These findings echo earlier conclusions by Furrer and Skinner (2003) whose study of engagement in third through sixth grade students found that student academic engagement directly related in a positive way to students’ relationships with caregivers such as parents and teachers.

Research has not been limited to external influences but has also considered those characteristics within the learner that may contribute to student engagement. Newmann (1992) suggested engagement is a “psychological investment” on the part of the student (p. 2) and included internal behaviors and motivations to define engagement. Persistence has also been included as an internal factor, defined as sustained engagement despite changing circumstances (Finn & Zimmer, 2012). Grit, an intrinsic measure of perseverance, particularly for long-term goals, may influence engagement behaviors by pushing the student to do those things that may not be of interest but still seem worthwhile as a means to achieve a goal (Duckworth et al, 2007). Self-efficacy, the idea that students’ actions are based on their beliefs about their own capabilities (Bandura, 1986), may influence engagement by contributing to a student’s internal motivation (Schunk & Mullen, 2012).

Other researchers considered engagement to be the result of both internal and external
influences. Finn’s seminal work in 1989 suggested that a student’s participation in school activities and identification with the school contribute to the likelihood a student will remain in school. The motivational model proposed by Belmont and Skinner (1993) suggests that student engagement is both internal and external, defining it as “sustained behavioral involvement in learning activities accompanied by a positive emotional tone” (p. 572). Skinner and Pitzer (2012) suggested, in their model of motivational dynamics, that engagement is the observable manifestation of internal motivational influences. They also recognized that engagement operates at different levels within the student’s environment, encompassing external structures like parent relationships, classroom procedures, and instructional content. Similar to the early models that recognized engagement with academic content as beneficial for increasing student engagement and ultimately student achievement, this model provides for student interaction with different elements that may influence engagement but also recognizes the social constructs in which they occur and the possible outcomes at each level.

Also worthwhile in understanding are the different ways that engagement can be observed or measured. If the desire is to increase engagement as means to positively affect achievement and retention, then it would logically follow that some tools and metrics must be identified to help the researchers, teachers, and administrators determine that an increase in student engagement has occurred. A variety of measures have been employed in the literature, with each study providing a unique understanding of engagement as a means to connect the measure with the characteristics of the definition. Fredricks, McColskey, Meli, Mordica, Montrosse, and Mooney (2011) examined twenty-one different instruments designed to measure student engagement in students from upper elementary through high school. As might be expected, the instruments mirrored research in the engagement constructs, seeking to measure
engagement from behavioral, emotional, and cognitive perspectives (Fredricks et al., 2011). In addition, the instruments measured engagement for different purposes including retention, intervention, research on cognition and motivation, and needs assessment. Types of instruments included student self-reporting, teacher reporting, and observation. While the majority of instruments use student self-reporting, the authors note “no single instrument is good for all purposes” (p. 12). As this study makes use of teacher reporting and observation, it is notable that two of the three teacher reporting instruments were useful for determining student engagement at the class level. The observational instruments were suited for identifying those students at risk for disengagement. While the student self-reporting instruments focused on internal motivational behaviors and feelings, the teacher reporting and observational instruments focused on teacher perceptions of how students related to instructional content and the school environment.

Technology and Student Engagement

Research on student engagement identifies numerous external factors that may affect the level of engagement a student has with the different school constructs. Technology, as an external factor, may impact a student’s level of engagement with instructional content and with others in the school (Zheng et al., 2016; Attard & Curry, 2012; Keengwe, Schnellert, & Mills, 2012). Despite the anecdotal societal evidence that technology appears to affect one’s engagement with content, there are few studies that look at technology as an influencing factor in a student’s engagement in the classroom. Specifically, for the at-risk population in this study, there is very little research that seeks to understand the influence of technology on engagement. Complicating research initiatives is the rapidity with which technology changes. As quickly as a particular technology is introduced in the classroom, another technology may replace it,
hindering an understanding of the full effect of the innovation. The literature reflects this with earlier studies focused on technologies like whiteboards (Glover & Miller, 2001; Hall & Higgins, 2005) and WebQuest projects (Milson & Downey, 2001), and later studies focused on newer technologies such as iPads (Chou, Block, & Jesness, 2014), wikis (Cole, 2008), Twitter (Morris & Parker, 2014), and 1:1 computer implementation (Mouza, 2008).

Electronic search results demonstrate the limited research literature. A Google Scholar search of the combined terms “technology,” “student,” “engagement,” and “at-risk” netted 151,000 results. However, when those are narrowed to the last ten years to focus more specifically on current technologies, the number of hits is significantly less at 20,500. With additional filtering by adding the term “computer” and attempting to limit the articles to those focused on K-12, the number drops to 16,800. Substituting the term “laptop” in place of “computer” yields similar results. Limiting studies further to 1:1 technologies significantly impacted results, providing only 3,400 hits. What is most notable is that even these results, sorted by the relevance of search terms, include only a small number of articles that focus on technology and engagement in a similar context and emphasis to this study. Despite the sparse literature that relates specifically to this study, the past research provides an understanding of previous foci and the current gaps, as well as the approaches researchers have taken in trying to determine the relationship between engagement and technology.

Predominant in the literature is the idea that there are many ways to include technology in classroom instruction. Based on the technology, the effect on student engagement may be different. In their study of how technology affects student engagement, Morris and Parker (2014) noted the effects of using a Twitter feed to encourage increased engagement, ending the article with the admonition that the adoption of a novel technology as a part of instruction does not
automatically increase student engagement. Understanding engagement as active participation in instruction and class discussions, the researchers found a negative correlation with the use of Twitter and the students’ sense of community learning. This matches an earlier finding by Cole (2008) who noted that when adding a Wiki to a university class, student engagement did not increase. Both studies took place in university courses with online delivery as the primary method of instruction. In these cases, the technology consisted of the inclusion of a social media platform to allow students to interact.

Also included in the literature was the concept of affordances. Affordance was a term first used by Gibson (1977) in the field of ecological psychology to describe the characteristics an object offers the user. Greeno (1994) described an affordance as, “whatever it is about the environment that contributes to the kind of interaction that occurs” (p. 338). This idea has been transferred to technology as a way to understand what it is about a technology or how a technology is used in a particular situation that contributes to what occurs during the technology use (Hutchby, 2001). Affordances may be a factor in student engagement by facilitating a particular outcome that is desirable to the students, thus increasing their investment in a task or activity.

In a meta-analysis of 1:1 technology, Zheng et al. (2016) looked at the effects of 1:1 of technology on student achievement and other outcomes using ten research studies from 2001 through 2015. The analysis showed positive effects of 1:1 technology on student engagement. One of the studies included in the analysis specifically noted that student engagement, again identified as time on task, was higher in classrooms where students had access to their own computers as compared to those classrooms in which students shared computers (Russell, Bebell, & Higgins, 2004). Heafner (2004) focused on student engagement with software as students
were tasked with creating a social studies project in PowerPoint. In this qualitative study, Heafner explained that the 1:1 technology empowered students and peaked their interest in the content because they were able to use the technology for their own projects. Donovan, Green, & Hartley (2010) looked at technology and student engagement through the lens of implementation configurations. Engagement in this study was defined as time on task with middle school students each provided laptops to use in the classroom and at home. Study findings suggested that depending on the implementation, access to technology did not ensure engagement. Those students with teachers who used the technology in very limited ways were less likely to be motivated to engage with the curriculum.

Mouza’s 2008 study most resembles the structure of this study. The population for the study was an urban at-risk fifth-grade classroom. Students were provided laptops at a 1:1 ratio. Student access to technology including internet access at home was limited, adding to the novelty of the laptops in the classroom. Mouza (2008) found that the students’ engagement with the content increased with the introduction of the laptops. Although some students had apprehension early in the integration, overall students related positive feelings about using the computers for instruction and class assignments.

For the literature dealing with both engagement and technology, it seems that engagement is most positively affected when the implementation is 1:1 and is used as a meaningfully integrated part of instruction. It also seems to be more influential in cases where a student’s normal access to technology may be limited. Poor implementation, as well as the use of some social media technologies, did not seem to positively affect engagement. Additionally, most studies involved students much older than the population for this study, highlighting the need for work to address the gap in research focused on at-risk elementary students. The
literature also helps frame the methods I chose to use for this study as well as the conceptual lens through which the study was viewed.

Conceptual Framework

To organize behavioral, cognitive, and environmental factors influencing student engagement, Skinner and Pitzer (2012) proposed a framework (Figure 1) to provide for student engagement at different levels of the school institution.

![Model of Motivational Dynamics](image)

*Figure 1. Model of motivational dynamics (Skinner & Pitzer, 2012, p. 23).*
Figure 1 provides a hierarchical view of a student’s level of interaction in the school and identifies possible positive outcomes from increased student engagement at each level. It also demonstrates the focus on the classroom level, where a student interacts with content. Skinner and Pitzer (2012) noted, “Only if students participate in academic activities with both ‘hands-on’ and ‘heads-on’ will the time they spend in classrooms result in the acquisition of knowledge and skills” (p. 22). It is in the interaction with academic activities that I am most interested as it is the area where technology integration occurs and the effects on student engagement may be observed.

Within the classroom experience, the model draws from the theory of self-determination (Ryan & Deci, 2000), seeking to explain not only the different ways that students engage with each of the levels of the school constructs, but also to provide an understanding of how the basic psychological needs of relatedness, competency, and autonomy relate to a student’s interactions with the school (Figure 2).

![Teacher Parent Peer Model](image)

*Figure 2. Teacher parent peer model of motivational dynamics (Skinner & Pitzer, 2012, p. 23).*
This model suggests ways of increasing student engagement by addressing the needs of relatedness, competency, and autonomy, and postulates the intended good effects of student engagement at each level. However, this model does not specifically address the influence of technology in the classroom. In fact, theories and frameworks that suggest how students will respond to technology in the classroom are extremely limited. To add that lens to the conceptual framework, this study pulls from the literature in the research areas of novelty, relevance in learning, and gamification. These research areas correlate with my own experiences and observations on the campus in which the study is based.

Based on these experiences, I propose that 1:1 technology implementation facilitates student engagement in three ways: novelty, relevance, and gamification. First, because the access to personal 1:1 technology for this particular student group is limited in comparison to other demographic groups, the novelty of the technology encourages engagement. Drawing from the field of psychology, novelty is defined as limited or no previous experience with something (Barto et al., 2013). Novelty provides for interest in the technology and potentially the information or experience it provides (Silvia, 2008). One might argue that novelty is only a temporary influence as students’ experience with the technology increases. However, the interaction is not only with the technology, but also with the information and the presentation of that information through the technology, and that is always changing. When novelty and surprise are coupled, the resulting associative novelty, in which what may be familiar is changed somewhat and introduced in an unexpected way, can increase student engagement and have a positive impact on learning (Schomaker & Meeter, 2015; Barto et al., 2013). This novel experience may also provide a type of dopamine stimulus, triggering a reward sensation (Schomaker & Meeter, 2015; Barto et al., 2013). This is easily seen in the anecdotal societal
evidence of the many people in public spaces on their devices. While they have regular access to the devices, it becomes as much about the content and how it is provided as the device itself.

In addition to providing novelty as a facilitator of engagement, the 1:1 technology implementation provides for relevance in learning. The uses and gratifications theory and the theory of diffusion of innovation suggest that an individual’s use of a technology or innovation is directly related to that innovation’s perceived usefulness (Rogers, 2010; Ruggiero, 2000). The idea that students may find the technology relevant or useful to their learning is provided by the outcomes from the Educause Center for Analysis and Research (ECAR) study of undergraduate students and information technology (Dahlstrom & Bichsell, 2014). This annual survey, in its tenth year, collected information about student attitudes toward technology from 75,306 students in 213 higher education institutions across the United States. While the focus of the ECAR study was undergraduate students, some general ideas can be drawn from the study. As it pertains to relevance, 78% of students saw instructional technology as a useful enhancement to their learning (Dahlstrom & Bichsell, 2014). Additionally, 91% of students identified themselves as highly or moderately tech-inclined. For the study, tech-inclined was defined as a having a positive view of technology as it relates to learning. Based on past BrightBytes survey data from the district and campus, these ideas are supported by the surveys more directly related to the campus under study.

A third influence on student engagement as related to technology comes from the area of gamification. Gamification refers to the incorporation of gaming elements into non-gaming settings (Richter et al., 2015; Nah, Zeng, Telaprolu, Ayyappa, & Eschenbrenner, 2014). Closely related to having a positive disposition toward instructional technology and to the idea of novelty, the attitudes of students toward gamified learning, when present as a part of instruction,
can facilitate increased engagement (da Rocha Seixas et al., 2016; Richeter et al., 2014; Barto et al., 2013; Otmakhova et al., 2013). While the research on specific principles of gamification are beyond the scope of this study, incorporating gaming elements using a technology platform such as a 1:1 device, provide for increased motivation and persistence with tasks resulting in engagement (da Rocha Seixas et al., 2016; Hamari, Koivisto, & Sarsa, 2014; Richeter et al., 2014; Barto, Mirolli, & Baldassarre, 2013; Otmakhova, Duzel, Deutch, & Lisman, 2013). With the recent influx of gamified applications like Kahoot, Quizlet Live, and Quizizz available to students and teachers using 1:1 technology, including gamification as a part of the conceptual framework provides a lens through which to view the types of activities that may be included in instruction.

Combining the elements of novelty, relevance, and gamification with the elements from self-determination theory (Ryan & Deci, 2000) discussed in the model of motivational dynamics provides a more complete framework through which to understand the different factors acting on student engagement (Figure 3).

*Figure 3. Classroom influences on student engagement.*
Each of the influences can be present or absent, depending on classroom structure and instructional practices. The framework provides a means to evaluate the presence of the different factors as organized by self-determination and 1:1 technology integration. This study recognizes the impact of factors related to self-determination, but focuses on the additional factors related specifically to technology.

Summary

This study seeks to understand the impact of 1:1 technology on student engagement in an at-risk fifth-grade school. As a result, the literature that frames this study encompasses multiple research areas including at-risk students, student engagement, and the relationship between engagement and technology. The at-risk student population has been exhaustively researched over a period of decades. This study followed, at a high level, the evolution of thought about how to best address the needs of the at-risk student population. Specifically, the literature review determined that there is no single solution for the problems plaguing this group, but identified engagement as a promising area of inquiry influencing retention and achievement. Student engagement is equally well researched; again, the literature review provided a high-level understanding of student engagement as a meta-construct. Acknowledging the broad nature of the construct, I focused on the behavioral engagement in which technology integration occurs. In the area of student engagement as it relates to 1:1 technology implementation, the literature established a research gap. While there are some studies that find positive correlations between engagement and 1:1 technology, they are few and do not focus on either the specific age level or student population.

As a part of the review, I identified a particular framework that connected engagement as
a behavioral construct to interaction with content. This framework provided a starting point to build a conceptual framework that not only includes this interaction with content but also the ideas of novelty, relevance, and gamification from other areas of study. Together, the literature in these areas provides a historical context for this study, a framework to guide the methodology, and a lens through which to view the collected data. This is presented in the next chapter.
CHAPTER 3
METHODOLOGY

Introduction

The purpose of this study is to describe, through the perceptions of teachers, the effects of the phenomenon of a particular one-to-one (1:1) technology implementation on student engagement in an at-risk upper-elementary classroom. For the district under study, this research provides an opportunity to examine the perceived effects of their Chromebook implementation on teacher perceptions of student engagement at the fifth-grade center in the district. For those readers of this research report that are outside of the district, it provides a detailed understanding of the effects of 1:1 technology implementation in this specific situation. This depiction, in turn, gives education professionals some insight into their own technology implementation initiatives and the effects 1:1 technology may have on their own student populations. Because past research has focused more on student retention than on student engagement and has been conducted at primarily the high school level, this study helps to fill a gap by looking at the effects of technology implementation on student engagement through the lens of intervention and at an elementary level. The study addressed the following questions:

• What are the teachers’ understandings of student engagement and its relevance in the classroom?
• How do teachers define and describe student engagement in their classrooms?
• What are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom?
• Do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity)?

This chapter describes the methodology for the study and includes explanations of the following areas: (a) rationale for the research methodology; (b) description of the setting; (c)
description of the participants; (d) overview of the research design; (e) methods of data
collection; (f) process for analysis and synthesis of the data; (g) ethical considerations; and (h)
trustworthiness.

Rationale for the Research Methodology

This research adopted an explanatory case study methodology, defined as “an empirical
inquiry that investigates a contemporary phenomenon (the ‘case’) in depth within a real-world
context, especially when the boundaries between phenomenon and context may not be clearly
evident” (Yin, 2014, p. 16). The appropriateness of this methodology for a situation is
determined by the identification of three conditions that are present in the study: (a) a research
question focused on how or why something has occurred (b) the researcher’s limited control over
behavioral events, (c) and the focus of the research on current events or conditions rather than
historical or past events (Yin, 2014).

This study sought to understand how 1:1 technology implementation affects student
engagement. As an explanatory study, the research questions asked how the technology affected
student engagement, meeting the first condition of the case study conditions. Additionally, I
acknowledge that, unlike an experimental setting, I had little control over behaviors of teacher
and student participants in a naturalistic setting where this study occurred. I did not introduce the
technology as an intervention, but instead solicited the observations of the teachers about the
effects of the technology, thus meeting the second condition. Although the literature review
provided a historical context and research gap for the study, the focus of this study was on the
specific context in which it occurs at the fifth-grade upper elementary school. It was in seeking
understanding of the present situation that we satisfied the third condition for the case study methodology.

The complexity of the research scenario also intimated the appropriateness of the case study. While technology may influence student engagement, many other factors related to the technology may also contribute to any noticeable effects. Accessibility, novelty, and teacher attitudes toward technology are just some of the variables that may blur the edges of the phenomenon of student engagement. A case study design that allowed for surveys, interviews, and observations provided a more holistic view of the topic and offered a way to understand the relationship of technology implementation to student engagement in context. Baxter and Jack (2008) noted the uniqueness of the case study approach in its ability to incorporate quantitative survey data into a qualitative methodology, suggesting it provides a “more holistic understanding of the phenomenon being studied” (p. 554).

Setting

The setting for this study was a Title 1 fifth grade upper elementary school in a suburb of Fort Worth, Texas. Title 1 schools have a population of at least 40% low-income students. The district under study is a small district with 5,500 students in 8 schools. The district introduced 1:1 technology using Chromebooks in the fifth through twelfth grade levels for the 2016-2017 school year. The 1:1 technology implementation initiative continued in the 2017-18 school year as originally implemented. Prior to this time, students at the fifth-grade school had limited access to computers primarily in a small library computer lab shared by the entire school. Technology access also included one class set of iPads shared between the classrooms in the school.
Participants

There were approximately 450 fifth-grade students enrolled in the school during the 2017-2018 school year when data was collected. The school is exclusively fifth grade and under the supervision of a principal and an assistant principal. For the year under study, there were 22 classroom teachers, each teaching multiple sections of a single subject. Student classes rotated between each of three teachers on a team. As of fall 2017, the student population was approximately 54% Hispanic, 38% African American, 5% White, and 1% identifying as more than one race. Forty-four percent of the students are female and 56% of the students are male.

Most students at the school were considered at risk according to TEA standards. For the 2016-17 school year, which was the most current data available, 84.6% of students at this fifth-grade center were considered at-risk of dropping out of school before completion, and 87.9% of students were considered economically disadvantaged (TEA Texas Academic Performance Report, 2016). Factors that may determine the at-risk status at the fifth-grade level include prior poor performance on a TEA recognized assessment, grade level retention, and limited English proficiency (LEP) (At-Risk Indicator Code, n.d.). This report represented information collected in the year prior to the study; however, there is no data to suggest changes in the at-risk student population at the school for the 2017-18 school year.

While the students’ engagement levels were the focus of interest, the study systemically collected, described, and analyzed teacher perceptions of student engagement. Teacher perceptions of student achievement have found to be correlated with student achievement on standardized tests (Südkamp, Kaiser & Möller, 2012; Hoge & Coladarci, 1989; Hoge & Butcher, 1984). It has been noted that these perceptions were based on teachers’ observations of their students’ behaviors and interactions with instructional content. Similarly, the model that inspired
this study’s conceptual framework explains that engagement with instructional content promotes improved learning outcomes (Skinner & Pitzer, 2012). Because of the alignment between previous research and the framework that informed this methodology, examining teacher perceptions of student engagement was an appropriate way to understand the effects of technology on the students’ engagement levels. Skinner and Pitzer (2012) noted that “correlations between teachers’ ratings of engagement and both student ratings and observers’ reports indicate that teachers seem to do this spontaneously and accurately” (p.33). It also allowed me to explore additional contextual factors including the teachers’ understanding of student engagement and attitudes toward technology.

Overview of Research Design

The data for this study came from four sources. The first was survey data from students and teachers that is collected annually by the district using the BrightBytes data management service. This data provided a context for the study. Additionally, I collected data from regular, special education, and gifted and talented teachers using an online survey and semi-structured interviews, as well as an observation in the classroom of a teacher participating in the structured interviews.

BrightBytes

Students, teachers, and parents in the district are asked annually to participate in a voluntary, anonymous, online survey about their technology use. Student questions focused on technology use and availability both in the classroom and at home. Survey questions for the teachers focused on teachers’ personal use of technology as well as their use of technology both
for instruction and as a job tool. Historically, data was collected in four focus areas: classroom, access, skills, and environment, which BrightBytes calls its CASE framework. According to BrightBytes, information is collected from 280 data points and grouped into 82 variables. These variables are then grouped into 21 success indicators and used to provide a numerical score between 800 and 1300 for each of the indicators. BrightBytes provides the data to the district in a digest format. The data was broken out by grade level, allowing me to isolate the specific responses for the fifth-grade school. Information about survey reliability and validity is not publically available. BrightBytes markets their survey as adapted to each district with items drawn from a bank of 300 possible questions. Because the reliability and validity for this survey data are not available to me, this data was used primarily to provide context and support for the additional data sources and did not serve as a primary data source.

Table 1

*BrightBytes Report Types*

<table>
<thead>
<tr>
<th>Report Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum Report</td>
<td>Details student technology skills, their beliefs about using technology for learning, and their confidence in learning new technologies.</td>
</tr>
<tr>
<td>Infrastructure at School Report</td>
<td>Describes the level of technology access that teachers and students have at school, allowing you to better assess the sufficiency of digital learning resources in your organization.</td>
</tr>
<tr>
<td>Infrastructure at Home Report</td>
<td>Describes the level of technology access that teachers and students have at home, allowing you to plan for any time, anywhere learning.</td>
</tr>
<tr>
<td>Supervisory Report</td>
<td>Shares whether your leaders regularly engage teachers in observations, class visits, and discussions about best practices for teaching with technology.</td>
</tr>
<tr>
<td>21st Century Learning Report</td>
<td>Describes the 21st Century Learning opportunities in your classrooms, helping you to track the progress of student learning with technology.</td>
</tr>
<tr>
<td>Professional Development Report</td>
<td>Describes teacher technology skills and interests in professional development topics, helping you create a menu of targeted professional development offerings.</td>
</tr>
<tr>
<td>Technology Support Report</td>
<td>Describes the speed and perceived quality of technology support provided to your teachers. This includes support for problems disrupting instruction all the way through receiving support for learning new technologies.</td>
</tr>
</tbody>
</table>
For the study, this data was collected from the 2017-2018 district survey and retrieved as a series of seven digital reports from the BrightBytes website. Each report focused on a different area of technological skill or integration. Table 1 outlines the content of the reports.

Teacher Surveys

For insight into how Chromebook use affects student engagement, teachers provided their perceptions of student engagement related to technology use through an online survey presented in Appendix A. The survey used in this study is based on the State Educational Technology Directors Association (SETDA) Teacher Survey (Appendix B). SETDA is a national non-profit organization that advocates for equity of access and content as well as the adoption of digital learning practices. The SETDA Teacher Survey was developed as part of a suite of tools to measure state progress on technology-related goals as a part of the No Child Left Behind Act of 2001. The survey was developed by the SETDA Common Elements Committee and aligned with national frameworks including the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS). The survey was validated using the following processes: framework development, item writing, item review, Tier 1 field test (talk-alouds), Tier 2 field test with associated technical review and item revision, and Tier 3 field test with associated technical review and item revision (State Educational Technology Directors Association, [n.d.]). From the SETDA Teacher Survey, I included 16 items that related to student engagement and technology use. In addition, questions were added that related directly to the study research questions. The final survey included 21 multiple choice questions and six demographic questions and space available at the end of the survey for the participant to provide any other information he or she felt was relevant. The survey was peer-reviewed and feedback
regarding simplifying the format was incorporated. This revised survey was emailed to all regular education, special education, and gifted and talented teachers at the fifth-grade campus. The art and physical education teachers did not have 1:1 technology in their classrooms and were omitted from the study.

The survey was open for two weeks with an email reminder sent out after one week. Eleven teachers completed the survey within the time period. Their responses were downloaded into an Excel spreadsheet and analyzed for their descriptive statistics. I also reviewed each survey individually to select those teachers for interviews that would provide a continuum of responses.

Semi-Structured Interviews

From the survey respondents, I selected six teachers to participate in semi-structured interviews (Questions in Appendix C). Participants were chosen from the survey responses, such that I had a continuum of responses from positive to negative to better understand students’ relationship with technology in the classroom. Of the six teachers who were invited, four teachers chose to participate in the interviews. The semi-structured interview questions were selected in coordination with the research study questions in an effort to help teachers share their perceptions and experiences related to student engagement while using 1:1 technology. Additionally, using interviews as a follow up to the surveys allowed for a deeper exploration of the teachers’ perceptions of student engagement. Yin (2014) noted “Interviews are an essential source of case study evidence because most case studies are about human affairs or actions. Well-informed interviewees can provide important insights into such affairs or actions” (p. 113).
Classroom Observations

Following the interviews, I also observed an interviewee’s classroom. The purpose of the observation was to provide a context for the interview response and to further understand the teacher descriptions of student engagement in the classroom. Because the source of data for this study is teacher perceptions, this observation was not recorded. I noted student interactions with technology and used field note techniques to create rich descriptions of student behaviors, relating them to teacher descriptions and perceptions.

Data Collection

Creswell (2007) noted that the research approach often drives the type of data collection. As a case study, this research embraced those data collection methods associated with this type of methodology. Purposive sampling, survey data, interviews, and observations are all data collection methods appropriate for the case study approach (Yin, 2014; Baxter & Jack, 2008; Creswell, 2007; Stake, 1998; Tellis, 1997). Using these methods together in this study allowed teachers to share their perceptions of student engagement and provided for triangulation of data by collecting data from four sources. As a strategy, using multiple sources of data for triangulation enhanced the trustworthiness and reliability of the study. Stake (1998) suggested triangulation as a means to use “multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation” (p. 97).

Phase 1: Survey Data

Phase 1 involved participants answering an online survey. To begin, a total of 22 regular, gifted and talented, and special education teachers at the fifth-grade school were contacted by
email and notified of the survey by the principal. Approximately one week later, I contacted the teachers by email and invited them to participate in the survey. A link to the electronic survey was included in this second email. Participants were informed that they had two weeks to take the survey. Participants were also informed in the consent process that they might be selected for semi-structured interviews and classroom observation based upon their answers to the survey. Approximately one week after the survey link was sent to the teachers, I sent a reminder email to those teachers who had not yet completed the survey. Participants completing the survey were provided with a $5 Starbucks gift card for their participation. The survey was hosted in Qualtrics and asked teachers to answer six demographic questions and 21 multiple choice questions designed to help me understand the teachers’ comfort level with technology and their level of technology integration in the classroom. The survey took approximately fifteen minutes to complete depending on participant answers to the questions. Eleven (11) teachers responded to the survey.

Phase 2: Semi-Structured Interviews

Based on the survey results, teachers were selected to provide a continuum of responses and asked to participate in semi-structured interviews. Six teachers were identified from their survey responses and emailed an invitation to participate in the interviews. Four teachers responded and consented to the interview. The interviews took place over a two-week period. I visited with the four teachers after school hours using the semi-structured interview questions (Appendix C). Three of the teachers chose to meet in their classrooms. A fourth teacher chose to meet at a local Starbucks near the campus. Each teacher interview lasted approximately 45 minutes and was recorded as an audio file using Voice Recorder, an iPhone application. The
Phase 3: Classroom Observations

I had hoped to conduct observations with each of the teachers who participated in the semi-structured interviews. However, the time it took to secure permissions and standardized testing schedules made it challenging to conduct the observations before the school year ended. I was able to conduct one observation in cooperation with a teacher who participated in the semi-structured interviews. I worked with the teacher to observe during a class period when the 1:1 technology was in use. The observation took place during the second period of the day in a regular education science classroom. Per the University of North Texas Institutional Review Board (IRB), the observation was not recorded; however, I kept field notes from the observation. I sat at the back of the room and was able to observe the science lesson in which students used individual Chromebooks to access the review lesson. I made notes of the activities in which the teacher and students participated. This included the capture of relevant student behavior in relation to the Chromebooks. Notes were stored on my private, secured computer and were used to provide a thick description of the students’ technology use as a part of the teacher’s interview.

Data Analysis

Creswell (2007) offered six steps common to qualitative data analysis. These steps include organizing data, reading through the data to determining the initial codes, and describing the case in its context. From there, I aggregated the data to indicate themes, interprets those
themes, and uses them to provide a picture of the case in detail. While not a narrative study, the case study does “make use of deep and complex interpretation, and presents an in-depth picture of the case (or cases) using narrative and visual representation (tables, charts, figures, etc.)” (Bloomberg & Volpe, 2012, p. 177). Data analysis occurs simultaneously with data collection. In the first phase, online survey data was collected from nine regular education teachers, one special education teacher, and one gifted and talented teacher. Of the 27 questions, six questions collected demographic information and 21 questions were multiple choice and short answer. These questions provided data that was quantitative in nature. The responses were tabulated to provide an overall picture of the teachers’ technology use both personally and in the classroom as well as the teachers’ comfort levels with technology. Since the survey was also a tool to determine which teachers should be interviewed, I looked at the survey results as individual pieces of data, choosing teachers that represented a continuum of responses. Those teachers whose surveys were selected were asked to participate in Phase 2, the semi-structured interviews.

I made recordings of each of the semi-structured interviews. To prepare for coding, these recordings were transcribed using a paid online transcription service. I listened to the recordings, read the transcriptions, and made corrections necessary so that the transcriptions accurately reflected the recordings. The recordings were transferred to spreadsheets with one spreadsheet for each interview. Teachers’ names were removed and replaced with a pseudonym to distinguish between the interviews. The teacher and researcher utterances were then labeled with the appropriate pseudonym. I read and re-read the interviews, initially for meaning and understanding. Throughout later readings, I coded the utterances. In its coding, this study adopted Saldana’s (2009) definition, understanding that “a code in qualitative inquiry is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing,
and/or evocative attribute for a portion of language-based or visual data” (p. 3). I read the interviews repeatedly over a period of six weeks continuing to refine the codes and draw meaning from the teachers’ thoughts, in keeping with Grbich’s (2013) idea that the data analysis is an “iterative or recursive one, involving you becoming familiar with your completed database through moving backwards and forwards across it reading, re-reading, and comparing aspects until you are sure of what it contains” (p. 261). While I viewed the interviews through the lens of the literature and the research questions, I was open to the development of themes emerging from interviews.

During the analysis, the codes were shared with two additional researchers not directly associated with the district or research study. The team met weekly via a distance meeting platform for a period of six weeks. During this time the researchers reviewed the interviews six additional times, adding additional codes per the discussion with the team. The review times were not governed by process but rather by Glaser’s (1965) concept of theoretical saturation that suggests analysis continue until no new codes appear and the concepts within the data have been fully developed. The primary researcher shared the codes with the secondary researchers to check for variances in opinion and to come to an agreement on the codes that the data reflected. Using comparison analysis allowed me to chunk the data into smaller meaningful pieces. The pieces were compared to one another throughout the analysis to ensure the same codes were being used for chunks of data with similar information (Leech & Onwueguzie, 2007).

Once saturation was reached within the coding, two types of activities were performed. First, descriptive statistics were calculated using the codes and utterances to determine the percentage of the utterance represented by the codes. This information was recorded in a new spreadsheet. Second, the codes were examined to determine similarity to other codes. Similar
and overlapping codes were combined. Codes with four or fewer utterances were set aside unless their relationship to the topic of inquiry was significant or needed further exploration. I grouped codes into categories based on their relationship to each other and to the topics of inquiry. These codes were listed under categorical headings in the new spreadsheet. These categories were then associated with the topics of inquiry as part of understanding the themes in the data.

The data from the observation was paired with the respective interview data to increase the thick description of the particular teacher’s experiences. The data from the surveys as well as the themes from the interviews and observations were analyzed for patterns and overarching themes with regard to student engagement and technology. This data was also compared to student and teacher responses from the BrightBytes survey. While the surveys from BrightBytes lack the desired reliability and validity, the information generated by those surveys provided some additional support for the themes as a secondary data source. The analysis process was ongoing throughout data collection in an effort to capture the essence of the case. As a verification strategy, this adds to the trustworthiness of the study. Morse, Barrett, Mayan, Olson, and Spiers (2002) point out the importance of “the mutual interaction between what is known and what one needs to know” (p.18). This interaction is best achieved when data collection and analysis occur simultaneously.

The conceptual framework provided the lens through which the data was coded and themes were developed. The concept of student engagement as an overarching theme with the elements of novelty, relevance, and gamification as contributors guided my thinking about the data as it was examined. I was open to other elements or patterns that were visible within the data, but were not part of the conceptual framework. This process supported the explanatory case approach adopted by this study. As an iterative approach, this single case study provided the
opportunity to compare the results of the data analysis with the propositions suggested by the conceptual framework. However, I acknowledge that this provided only part of the explanation; comparison with other cases may be warranted and is discussed as a part of recommendations for future research. Yin (2014) suggested “as the case study evidence is examined, explanatory propositions are revised, and the evidence is examined once again from a new perspective in this iterative mode. If you were doing a single-case study, the procedure would not end conclusively, but it could become more compelling” (p. 150).

Ethical Considerations

In any study involving human subjects, being mindful of proper and ethical procedures regarding the treatment of those subjects is of great importance (Stake, 1998; Creswell, 2007; Yin, 2014). In this study, the participants with whom the primary interactions occurred were the teachers. As participants who were sharing their opinions in the workplace, the anonymity of their responses was protected to minimize any risk to their job security or interactions with co-workers and employers. Only the primary researcher had access to the identities of the teachers in relation to their responses on the surveys, interviews, and their activity during the classroom observations. While a copy of the study has been shared with district personnel, no teachers were identified by name or descriptive identifier that would cause their anonymity to be compromised. Data will be stored and maintained for five years on the supervising professor’s university computer.

While not primary participants, the fifth-grade students at the elementary school were also part of the study and were protected by procedures included in the data collection and analysis. The classroom observation was not recorded in any way. I took field notes, and student
first names used in the notes were removed for the study. Only the primary researcher had access to identifiers in the notes. Further, for both groups, all surveys, interview questions, and procedures have been reviewed by the University of North Texas Internal Review Board and have been approved as appropriate ethical measures to use when working with these participant groups.

**Trustworthiness**

In quantitative research, the study relies on the numbers and algorithms, the types of tests run and the values they generate, as well as the interpretations of the researcher to convey measures of reliability and validity. In qualitative research, the impetus is on the researcher to provide, through transparency, the ways in which trustworthiness is established. Broken down, the concept of trustworthiness includes the credibility of the researcher’s methods and analysis, the dependability of the study, and its transferability (Bloomberg & Volpe, 2012). Each area relies on the ways in which the researcher makes the processes and biases known so that the reader can determine, in essence, that the researcher did what he or she said they would throughout the study. It allows the readers to decide if they trust the conclusions of the researcher based on the process and analysis provided.

**Credibility**

Credibility relates to the ability of the researcher to share accurately the thoughts, feelings, and actions of the participants (Bloomberg & Volpe, 2012). As a former colleague and employee at the school, I bring some inherent biases that must be addressed. As a classroom teacher who was a part of the inaugural Chromebook implementation, I had some experience
with the Chromebooks and the student population involved in the study. It would not be unnatural for me to view the data through the lens of that classroom experience. I participated in continual personal reflection during the study through reflective field notes to help to separate personal experiences from the data. I also participated in conversations with the other coders to ensure that the codes reflected only low-level inferences and not personal experiences.

While my experiences with the district were addressed as a source of potential bias, the experiences themselves also contributed to the credibility of the study because of my time spent in the district. I worked with the district as a contracted instructional designer and teacher for 4 years. During that time, I was able to interact with the community, the faculty, and the student population and had a working knowledge of the challenges in the district and in the classroom. Previous relationships established with three of the interviewees contributed to the teachers’ willingness to share candidly about their experiences with technology.

The multiple types of data and the comparisons between them provide for credibility. Using existing survey data, collecting original survey data, interviewing teachers, and observing in the classroom each provided a different perspective and a different type of data for comparison. Using multiple coders provided a level of peer debriefing in the analysis that allowed the reader to more easily trust the proposed themes and the conclusions. Together these measures act to triangulate the data and again demonstrate credibility. Yin (2014) noted, “Any case study finding or conclusion is likely to be more convincing and accurate if it is based on several different sources of information following a similar convergence” (p. 120).

Dependability

Dependability relates loosely to the idea of reliability in quantitative research. Yin (2014)
referred to this a maintaining “a chain of evidence” (p. 127). The researcher is tasked with making sure that the decision points in the research study, as well as the processes used, are visible to the reader. This allows the reader to follow the logic to determine if the data has been used appropriately and if the conclusions purported by the researcher are reasonable. In this case, I made the decision points and the data visible to the reader by providing a thorough discussion of the data collection, analysis, and means by which trustworthiness was established. This transparency continued throughout the findings and discussion.

Transferability

While transferability is sometimes compared to generalizability in quantitative work, it was not my expectation that a study, particularly a single case study, would be generalizable to a larger or different population (Dale Bloomberg & Volpe, 2012). However, it is my hope that the work is transferable. This means that the reader is able to take from this study lessons that may be useful in other settings. For this study, the literature indicated the lack of focus on the effect of 1:1 technology implementation at the elementary level, particularly for at-risk students. Because of that, the results of this study are immediately valuable to the district in which the study occurred. For the reader, the explicit descriptions of the decision points and process used in the study provide the opportunity to take away some ideas about the potential impact of technology integration on student engagement in their own situations. This transferability also helps to address an established gap in the literature regarding research in this area.

Summary

This chapter provided an explanation of the methods employed in this explanatory single
case qualitative study. A qualitative case study approach provided me the opportunity to examine a specific situation in an area that has received little research attention. Further, the case study was appropriate as an approach in this situation because it provided a means to explore the complexities of the situation and determine technology-related factors that may affect student engagement in a specific group of students. This study of teacher perceptions of student engagement related to a 1:1 technology implementation took place in a suburban fifth-grade school. The student population is primarily at-risk. The data came from surveys, interviews, and observations allowing for triangulation of data. As an analytic tool, comparison analysis allowed me to compare themes between data sources. Using multiple coders for peer comparisons, keeping a researcher reflection journal, and being explicit about decision junctures and processes were some of the ways I established trustworthiness within the study. Additionally, the transparency of the processes and the results of the study provided understanding for the district about the effects of 1:1 technology implementation on student engagement at the fifth-grade level as well as provide a measure of transferability for those readers contemplating similar research questions in their own situations. The next chapter reviews the findings from this study.
CHAPTER 4

FINDINGS

Introduction

This study examined the effects of a 1:1 Chromebook implementation on student engagement in an at-risk, Title 1 fifth-grade school. The study did so by analyzing teacher perceptions of student engagement to understand what effects, if any, the Chromebook use had on levels of student engagement in the classroom. I believe this study provides the district with valuable information about how their fifth-grade students responded to the Chromebook implementation and contributes additional research to the gap in the literature that examines student engagement and its relationship to technology. This chapter shares the findings from surveys and interviews conducted with the fifth-grade classroom teachers who used Chromebooks with their students.

Through in-depth interviews with four teachers, I was able to better understand, through the perceptions of the teachers, what the effects of the Chromebook use were on student engagement. Teachers were asked to share their understanding of engagement and its role in the classroom. They were also asked to discuss their views of technology, both educational and personal, as well as their usage. I sought to capture the types of activities involving the Chromebooks and understand the teachers’ reasoning behind why they incorporated the activities that they did. This information, together with teacher surveys and technology usage data collected on behalf of the district, was used to create a snapshot of the effects of 1:1 technology usage in this at-risk fifth-grade school. The topics of inquiry included the following:

- What are the teachers’ understandings of student engagement and its relevance in the classroom?
- How do teachers define and describe student engagement in their classrooms?
• What are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom?

• Do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity)?

Overview

This study grew out of my own experiences in the classroom and desire to better understand how 1:1 technology usage may play a role in engaging students with content. Because of existing research linking engagement with content and increased achievement, it seemed that understanding technology’s relationship with engagement was a worthwhile topic of inquiry, particularly when research about the effects on elementary at-risk groups is so limited.

As a result, this study took place in my previous district and school where Chromebooks had only recently been introduced school-wide. Using a case study model allowed me to understand the phenomenon of student engagement in a situation where boundaries between the phenomenon and the contextual factors like accessibility and novelty may not be clear (Yin, 2014). Informed by Skinner and Pitzer’s (2012) model of motivational dynamics that identified student engagement with content as an important element in learning, the study focused on topics of inquiry that captured the teachers’ understanding and personal definitions of engagement as well as their perceptions of the relationship of 1:1 technology with their students’ levels of engagement.

The study was conducted at a fifth-grade elementary school in a suburban school district. The Texas Education Agency considers the school population to be at-risk of not graduating, and the school receives Title 1 funds based upon student status. Teachers were invited to participate in the study by first completing an online survey. As part of the consent, they were made aware
that they may be invited to participate in an interview about student engagement and its relationship with technology. Eleven (11) teachers completed the survey, and four (4) teachers participated in the interviews. One classroom observation was conducted in coordination with a teacher interview. In addition to interview and survey data, I used information from the district’s BrightBytes 2017-2018 technology survey, an annual survey completed by teachers and students to provide a picture of technology skill and usage. This chapter provides general demographic information about the students in the school as well as specific demographic information about of each of the teachers who were interviewed. The chapter concludes with the findings of the comparative coding analysis for the interviews and the connections between the multiple data sources.

Demographics

The Students

While the students were not active participants in the study, the teachers were asked to provide their perceptions of engagement levels of the students. In addition, the literature review established the gap in academic research related to student engagement, technology, and at-risk elementary population. Thus, it is important that the student demographic information is included in the demographic descriptions.

There were approximately 450 students enrolled in the fifth-grade school under study during the 2017-2018 school year. In the fall of 2017, 93% of the population was minority with 54% reporting Hispanic, 38% African American, and 5% White. 1% identified as more than one race. Fifty-six percent of the student population was male and 44 % female. The population is considered at-risk. “At-risk” is a Texas Education Agency designation that calculates the
likelihood that a student drops out before completing high school and identifies those students at a disadvantage due to economic circumstances. Other factors that may contribute to at-risk status include prior poor performance on a TEA recognized assessment, grade level retention, or limited English proficiency (LEP) (At-Risk Indicator Code, n.d.). For 2016-2017, the most recent report school year, 84.6% of students at this fifth-grade center were considered at-risk of dropping out of school before completion and 87.9% of students were considered economically disadvantaged (TEA Texas Academic Performance Report, 2017). I expected that the 2017-2018 percentages of at-risk for drop out and economically disadvantaged are similar.

The Teachers

Twenty two teachers were invited to take the survey including 18 females and four males. The teachers represented the regular education, special education, and gifted and talented programs. The teaching staff at the school is diverse, approximating the makeup of the student body. Eleven teachers responded to the online survey, varying in ages and years of experience.

Of the 22 teachers, seven were between the ages of 25 and 34; one was between the ages of 35 and 44, and three were over the age of 45. Two of the teachers were in their first or second year of teaching, while six of the teachers had between three and five years of experience. Just one teacher had between six and ten years of experience, and two teachers had more than ten years of experience. Only two of the teachers were new to the school. Six teachers worked at the school between one and two years, while one teacher worked there for three years. The sample of teachers represented a variety of subjects; five teachers reported teaching science, three teachers reported math, one teacher taught English language arts and reading (ELAR)/special education, another taught math for special education, and one taught gifted and talented self-contained.
From the surveys, six teachers were invited to participate in the in-depth interviews, and four accepted. To protect their anonymity in the transcripts, I assigned each teacher a pseudonym. The pseudonym replaced their names within the transcripts and this document.

Wendy

Wendy is in her twenties and has been teaching for approximately four years. She and I taught together in the elementary school for one year. She is currently a gifted and talented teacher but has also taught regular education science classes and done remediation with students who did not pass state assessments. She is invested in the district and sponsors extracurricular sports activities for students. Wendy reported being an active user of technology both in her personal and academic life.

Anne

Anne is also in her twenties. She has been teaching for three years and has been with the district for two of those three years. She and I taught together for one year in the elementary school. She is a regular education science teacher and has experience teaching science in middle school. When interviewed, Anne had recently completed her master’s degree in public health and had enrolled in a doctoral program. She is a user of technology, but expressed, during the interviews, that she was most motivated by need and, therefore, if a technology did not provide an obvious service or improvement, she was not inclined to use it.

Helen

Helen previously served in my classroom as an instructional aide while she finished her
teaching preparation and certification. When interviewed, she had finished her certification and had been hired as a regular education English, Language Arts, and Reading (ELAR) and special education teacher. She split her classroom time between one section of regular education students who came to her classroom for ELAR and two sections of special education students who needed additional support for ELAR. Helen is in her forties. According to her interview responses, she is comfortable with or without technology. However, she did state that classroom technologies have provided her with the opportunity to efficiently and effectively meet the needs of her students.

*Erin*

Erin is a first-year teacher who came into the classroom mid-year. She is not acquainted with me. She shared that she is from a family of teachers, and, although she contemplated other careers, teaching was a natural choice for her. She teaches regular education science. She shared during the interview that she is highly comfortable with technology. Despite these feelings, she stated that her students often were more successful in learning when they were not using classroom technologies.

**Personal Technology**

In their interviews, I asked the teachers about their views and usage of personal technologies. I did not specifically define these technologies, but provided the opportunity for the teachers to share how they defined the technologies. From the interviews, these technologies were defined as computers, laptops, cell phones, iPads, other tablets, applications, extensions, and even online services. The teachers expressed both a variety of views toward the different
technologies and a variety of usage patterns. The teachers’ usage of the technologies seemed to be directly related to their views about the technologies.

Wendy spoke about her reliance on personal technologies. When asked about personal technologies, she shared that she would not be able to function without technology. She stated, “For personal technology? Um, I think they're very handy. And I use it in almost everything.” She uses technology to keep in contact with family members over long distances. As a youth sports organizer, she uses it to communicate with parents and players about game times and schedule changes, explaining, “I need to be able to be in contact with like 500 parents at all times.” She emphasized choosing the technologies that are useful and avoiding those that do not meet her needs. Speaking of Snapchat, she indicated, “I don't use Snapchat because I think it's ridiculous. Um, people taking pictures of themselves all day long while they're out with you.” She also expressed a strong sense of self-efficacy about her skill level with technology, noting her lack of need for training with new technologies.

Anne did not express the same reliance on technology. What was noteworthy about her views was the emphasis she placed upon the usefulness of a technology driving its adoption. When discussing extensions on the Chrome browser, she noted, “If I don't have a need for something I don't use it.” While she owned or used most of the technologies on the list, she had only recently acquired an iPad as a birthday gift. Previously, she had not seen the need to own or use one. Her views about the Apple watch mirrored those about the iPad. She did not own one because it did not seem useful to her. She questioned the perceived duplication of affordances, noting, “When the iWatch or, I know, the Apple Watch came out, I was like, OK, if you have a cell phone, what do you need a watch for?” In addition to her usage-driven adoption, she also was siloed in her technology use, explaining, “And so I do certain things on certain products.”
She used her cell phone for calls, her iPod for music, and her laptop for schoolwork. As with Wendy, Anne was confident in her skill level, but unlike Wendy, was measured in her decision as to whether to adopt a technology.

Helen was less enthusiastic about her technology use. She admitted using it frequently in her daily life, including paying bills online and ordering pizza. However, she reminisced about times without technology and even mourned the loss of human contact that has come from using the internet to pay a bill or order food. In speaking about paying a bill, she shared about the lack of choice she felt saying that, “It's like sometimes I feel like I don't have an option.” She noted that she could wait for a representative to “try to get some human contact.” However, in the end, she acquiesced and decided, “Forget it. I'll look on their website.” These actions seemed to be related to her sense of pride in not necessarily needing technology. She expressed confidence in her abilities to understand and use technology; however, she was equally as confident in her ability to function without it. She shared an example of using the calculator on the phone, explaining, “No calculator on your phone? I can pull out a pencil or use my fingers and figure the- figure out the tax would be [sic], tip or whatever.”

Like the other teachers, Erin indicated a strong belief in her technological abilities. She shared that she was very comfortable with technology, even acting as a “tech guru” for her family members and assisting them with their technological issues. She suggested that she could see both the positive and negatives of technology use, although highlighted how technology made activities more expedient, such as waiting in a line, “I don't have to go to the bank to deposit something. I can just take a picture of it, and I'm done.” She used technology for convenience, including an Amazon Kindle application on her phone that made reading a book more portable.
Educational Technology

I asked the four teachers to share their views on educational technology and their comfort level with using the technologies in their classroom. For the most part, teachers’ views of educational technology mirrored their views about personal technologies. Again, educational technology was not predefined; the teachers were given the freedom to share their ideas about what educational technology was.

Wendy stated that she viewed educational technology and personal technology similarly. She found educational technology to be indispensable in her teaching and included cell phones, Chromebooks, software, and browser extensions in her definition of educational technology. Sharing her reliance on both, she said, “I wouldn't know how to teach without it at this point. I grew up with technology. And so, I don't know how to not use it in everything and anything.” As with her personal technology, she relied on educational applications to communicate with parents and students. She used platforms like Remind and Google Classroom and gave some examples, sharing, “A lot of times if a kid doesn't understand something, they will text me and ask me at night, and I'll just check back. Same thing with what time is our soccer game.” Her initial responses about educational technology focused on communication, but in a later response, included other technologies used for instruction.

Anne was interested in using educational technology in her classroom. She expressed that there were so many different programs and applications that could be used in the classroom and that sometimes it felt overwhelming. She set as a goal, to include new technologies every year, sharing, “I remember telling myself I'm going to go to each and every one of these sites and I never did because I noticed you have to work it into your lesson plans.” Even with a willingness to incorporate technology, Anne felt it was challenging to accomplish.
Helen, while pleased at her ability to function without technology, stated that educational technologies allowed her to better meet her students’ needs by providing her with a way to individualize instruction for her students. She shared, “I have experienced both sides of it, and now that I've worked, now that I'm working like my SPED kids, it's so helpful to have it.” She recognized Chromebooks, online platforms, and applications as educational technologies and used them primarily for instruction.

Erin questioned the effectiveness of educational technology. She incorporated the technologies in her classroom, using them for both management and instruction. She also noted the challenges of using technology with students, including cyberbullying and students’ off-task use in the classroom, explaining that when she was in school “there was no bullying on social media.” Despite this, she identified the positive effects of the Chromebooks on her students’ engagement and viewed educational technology as positive “if just used right.”

Findings

Themes

Seven themes resulted from the teachers’ interviews. They related to teachers’ understanding of engagement, their decision-making processes about using the technology, the relationship of the Chromebook to student engagement, and the factors affecting student engagement with Chromebooks. Of the seven themes, six related directly to the research foci: (1) teachers’ understanding of student engagement; (2) teachers’ understanding of student engagement related to the Chromebooks; (3) teachers’ use of Chromebooks in the classroom; (4) students’ activities using the Chromebooks; (5) engagement with content vs. engagement with technology; and (6) influences that affect student engagement. Two research questions were
addressed by one theme. While teachers were asked about student engagement in general terms, most spoke more to the definition of student engagement than specifically to its relevance. Their responses indirectly address Question 1 by illuminating the teachers’ understanding of student engagement as behavioral. However, there was insufficient information from the teachers to establish a stand-alone theme. As a result, Theme 1, Teachers’ understanding of student engagement, is recorded under Research Question 1 and Research Question 2. Table 2 shows the themes and their relationship to the research questions.

Table 2

*Research Questions and Associated Themes*

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<th>Research Question 1</th>
<th>Research Question 2</th>
<th>Research Question 3</th>
<th>Research Question 4</th>
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<td>What are the teachers’ understandings of student engagement and its relevance in the classroom?</td>
<td>How do teachers define and describe student engagement in their classrooms?</td>
<td>What are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom?</td>
<td>Do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity)?</td>
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<td>Teachers’ understanding of student engagement</td>
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<td>Teachers’ understanding of student engagement related to the Chromebooks</td>
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<td>Teachers’ use of Chromebooks in the classroom</td>
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<tr>
<td>Students’ activities using the Chromebooks</td>
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<td>Engagement with content vs. engagement with technology</td>
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<td>Influences that affect student engagement</td>
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The seventh theme, teachers’ decision-making about how to use educational technology in the classroom, did not fit neatly within the research foci. This emerging theme is addressed
individually as an area of future research.

**Theme 1**

Research Question 1: What are the teachers’ understandings of student engagement and its relevance in the classroom?

Research Question 2: How do teachers define and describe student engagement in their classrooms?

I asked each of the teachers about her understanding of student engagement and the manifestation of engagement in the classroom. Teachers described engagement in terms of student behavior. While three of the teachers described student behavior, Wendy described her own behavior, as well as the behavior of her students. When I asked Wendy to define engagement, she noted that it was high in her classroom. When asked to elaborate, she identified engagement as on-task behavior, noting, “Where they're actually doing the assignment and I don't have to walk around and go, ‘Hey, get back to work.’ Like I don't need to tell them to do it because they want to do it.” While her comments indicated that student engagement was desirable, she did not explicitly speak to its relevance. Anne also spoke of engagement in behavioral terms, also not explicitly noting its value, but hinting at its desirability in her description. She stated, “So I mean I, I know my engaged students, but because they'd never take their eyes off me; they're responding to my questions. They're answering my questions, and so it has to be an active participation.” Erin responded similarly, indicating that engagement was manifested in how students paid attention. She described engaged students as “constantly raising their hands” and “wanting to answer the questions.” She contrasted this description with the behaviors of unengaged students, stating, “The ones that aren't engaged much- I, they're the ones that tend to be my over-talkers. My discipline people.” For each teacher, their definitions consisted of lists of desirable and undesirable behaviors.
Helen spoke of student engagement in terms of the behavior students exhibited when the teacher included Chromebooks in instruction. She described how students acted when they knew the Chromebooks were part of the lesson using phrases such as “chomping at the bit” and “excited.” Later, she elaborated by contrasting the engaged student with the unengaged student. For example, she described the engaged student as so involved that his/her response at the end of class was “I really want to do more of this. I want to finish this.” Comparatively, she characterized unengaged students as “They’re gone. They’re doing something else.” Helen responded similarly in her valuation of student engagement. She indicated her positive view of engagement when she described the engaged students, saying, “That's where I like it to be. Hey, I really like it to be like, ‘I'm not ready to move on.’” In contrast, her remedy for the unengaged student was to intervene “and get them on track.”

Since this study used teacher perceptions, it is helpful to see how teachers determine if students are engaged. Whether describing student behaviors, teacher behaviors, or behaviors with Chromebooks, all teachers described engagement as observable activities such as being on task, raising hands, or answering questions. The teachers associated higher student engagement with positive behaviors and less engagement with negative behaviors that required classroom disciplinary action resulting from students talking too much or not paying attention. While teachers did not speak specifically to the relevance of engagement, they reported valuing student engagement in their statements.

Theme 2

Research Question 3: What are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom?

In relation to Research Question 3, I asked the teacher about the relationship of the
Chromebooks to student engagement. The teachers shared the ways they used the Chromebooks in their classrooms, the types of Chromebook-based activities, and their perceptions of the effect of the Chromebooks on their students’ engagement levels. Specific activities and factors influencing the Chromebook-facilitated engagement are discussed as a part of Research Question 4. For this section, the findings are only related to the effect of the Chromebooks on engagement.

Wendy shared that engagement was high “when the Chromebooks came out.” When I asked her to contrast instruction with Chromebooks versus instruction without Chromebooks, Wendy stated that engagement was higher when the Chromebooks were used in instruction. She connected the Chromebook use to students’ enjoyment, explaining “it’s always more fun to be on the computer than it is to be writing on paper.” Anne echoed similar thoughts, describing the level of student engagement as higher when the Chromebooks were used. In her words,

It's engaging, period, because they like being on the Chromebooks. So, therefore, it is just, when you say Chromebooks, I mean, there's just this rousing excitement they express because they like being on it. […] They are definitely are engaged when they use technology. I mean there's no question about it, and when you, like I said, when I mentioned the Chromebooks, they get excited.

When describing Epic, a reading program that the students use, she pointed out the differences between students reading paper copies of a book and those reading online. She explained that when they had paper copies, “They're not really reading. They’re playing, but then they'll ask, can I get on Epic? And so therefore they're actually reading it, and I can see that they are reading.”

Helen spoke about Chromebooks in her definition of engagement. When I asked her later in the interview about any relationship between the Chromebooks and engagement, she described how quickly students want to log on to their Chromebooks. She observed, “But it's
almost like if I say, OK, go ahead and log into one time, say log into – [and] they're ready to go.” Later in the interview, she discussed that sometimes she was not sure if students would be interested in a particular topic. She noted, “Even if it may be something like, I didn't really know that they would be that excited about it, but just having that Chromebook, it, it just, it opens up something.”

Erin observed similar behaviors in her students when the Chromebooks were used for instruction. She even shared that she used the Chromebooks as her Engage activity as part of the 5E instructional model. She stated that as soon as the activity was pulled up on the Chromebook, “They're just instantly in. And I love that because they are engaged with it.” However, she noted that she thought it was related to how well the students liked what they were doing. Referring to their engagement on the Chromebooks, she said, “So they're excited about it. And if I keep them excited about it, on technology, then they're perfect.”

But commenting on activities that the students did not prefer, she said, “Sometimes when it's not what they want to do, it's kind of in the middle.” This is consistent with her earlier views on educational technology, finding both positive and negative aspects of using it with instruction.

**Themes 3-6**

Research Question 4: Do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity)?

Four of the seven identified themes relate to Research Question 4: (3) Teachers’ use of Chromebooks in the classroom, (4) Students’ activities using the Chromebooks, (5) Engagement with content vs. engagement with technology, and (6) Influences that affect student engagement. Multiple codes supported each theme as seen in Table 3.
Table 3

Codes Related to Each Theme for Research Question 4

<table>
<thead>
<tr>
<th>Theme 3: Teachers' use of Chromebooks in the classroom</th>
<th>Theme 4: Students’ activities using the Chromebooks</th>
<th>Theme 5: Engagement with content vs. engagement with technology</th>
<th>Theme 6: Influences that affect student engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher: Chromebooks used to establish behaviors, routines, and keep people informed</td>
<td>Students: Chromebooks used to do activities otherwise inaccessible</td>
<td>Student engagement with content</td>
<td>Student access to technology</td>
</tr>
<tr>
<td>Teacher: Chromebook makes teachers job easier (efficiency)</td>
<td>Students: Chromebooks used to do research</td>
<td>Student engagement with technology</td>
<td>Student feelings about Chromebook use</td>
</tr>
<tr>
<td>Teacher: Chromebook used for instruction</td>
<td>Students: Chromebooks used for gamified learning</td>
<td></td>
<td>Technological affordances</td>
</tr>
<tr>
<td>Teacher: Chromebooks used for differentiation/to support lower learners with reading issues</td>
<td>Students: Chromebooks used for independent learning (autonomy)</td>
<td></td>
<td>Types of novelty: Short term Sustained/related to structure</td>
</tr>
<tr>
<td></td>
<td>Students: Chromebooks used to share learning (students as contributors)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specific applications used by students

Teachers’ Chromebook use included codes related to direct instruction, classroom management, efficiency, and differentiation, with some overlap between the codes. Students’ activities using Chromebooks included codes that dealt specifically with the activities students participated in while using the Chromebooks. This theme also included a code that identified specific applications students used in the classroom. The theme, engagement with content versus engagement with technology, included codes that identified the elements within the Chromebook activities that captured the students’ attention. The final theme, influences that affect student Chromebook use and engagement is broad and captured codes related to each of
the identified influences on Chromebook use and engagement. This theme also included codes for two different types of novelty that were suggested by the literature review. Codes included students’ accessibility to technology, students’ attitudes toward Chromebook use, and technological affordances that teachers and students identified as influential.

- **Teachers’ Use of Chromebooks in the Classroom**

  The theme, teachers’ use of Chromebooks in the classroom, included not only professional use which includes those activities related to the teachers’ administrative duties, but also those teacher-led activities that involved students and were related to their own learning. Teachers shared in their interviews that they used the Chromebooks to establish behaviors and routines and to keep both students and parents informed. Wendy stated that using the Chromebook was part of her classroom routine, explaining, “It’s part of our procedures in my class. They come in: they get on their Chromebooks. They go to Google classroom, and they look up their objectives. They write down their objectives and their ledgers.” Talking about the same procedures, Wendy also shared how she manages students with the Chromebooks, explaining, “While they’re doing that, any kids who write their objective quickly, they can always get onto the Quizlet link for that week.” Using the Chromebooks this way informs students of the objectives and also provides students who work more quickly an opportunity to play Quizlet, a game and study application that gives them additional practice. Anne spoke about managing student behavior with the Chromebook, saying, “Sometimes I use it to encourage them to, as far as behavior, you know, like, ‘If you can do these things for me, then you know, you can get on the Chromebook.’” In addition, to manage off-task behavior with the Chromebooks, she
indicated her inclination to use the Chromebooks punitively, sharing, “I really feel like taking away their privileges.”

Speaking to the challenges of managing students in the Disciplinary Alternative Education Program (DAEP), Helen shared how she uses the Chromebooks. She explained that when her students are on an alternative campus she is able to, “put stuff on there, set up a classroom specifically for either a group that's over there or specific students and keep them connected to what to do and not just have to rely on just making them a big packet of worksheets.” In this way, she used the Chromebooks for communicating about what work was required. She also spoke about increasing student motivation to persevere through a lesson by allowing students to use the Chromebook for a review game at the end of the lesson. She shared from the student perspective, saying, “So, let me do the big work and get the payoff at the end and what's in it for me.” This use connects to the idea of gamified learning, discussed later, but also speaks to Helen’s Chromebook use to influence behavior. Erin identified managing DAEP students using the Chromebooks and that using the Chromebooks in that way was successful. She noted that students could have Chromebooks in DAEP, which provided the opportunity for her to “assign it to one student and have them do it and they seem to do just fine with it when I looked at it.” She mentioned using Chromebooks to encourage good behavior, telling the students, “‘You can have free time on the Chromebook just during study hall. You focus when we get this done,’” adding, “They’re staying really engaged.”

Teachers also identified Chromebook-based practices that made their jobs more efficient. While this code did not specifically relate to student engagement, it contributed to the picture of how the Chromebooks were used in the classroom, and ultimately, their role in student engagement. Using the Chromebooks to provide work for the DAEP students is both a way to
communicate with students and a way to make a teacher’s work more efficient. In relation to managing student work, Helen noted that it made differentiation easier, describing it as, “Not piece of cake but much, much more doable work.”

Teachers spoke a great deal about the ways they used Chromebooks for instruction. Again, this provides an understanding of how the Chromebooks were used in the classrooms.

As a lesson format, the teachers in this school use the 5E model to structure their lessons. The Es stand for Engage, Explore, Explain, Elaborate, and Evaluate (Bybee, Taylor, Gardner, Van Scotter, Powell, Westbrook, & Landes, 2006). Wendy noted that she used the Chromebook for all of the Es, though not always in a single lesson. She spoke about using the Chromebooks for individual or group work, explaining, “…for a while they'll be on their own, then we'll come back, and then I'll put them back on their own.” Anne also used the Chromebook in the 5 E model. Speaking specifically about Nearpod, an application that allows students to access content and respond to it in a whole class setting, she shared that “it could be used for any E whenever we would do the Nearpod.” She used the Chromebook in her classroom for direct instruction and described a lesson this way:

And so, I am facilitating because I'm explaining the question and then, sometimes I'll do the simulation practice with them. So, I have the same thing on my screen, but are still-they have their own assignment and so they're responsible for what they put in.

Helen vividly described how she used the Chromebooks for instruction during a Nearpod lesson. The lesson featured a type of virtual reality video that allowed students to experience incarceration through the eyes of an inmate. She noted that it gave them the opportunity to understand different perspectives, sharing, from the students’ initial viewpoint, “You do something: you need to go to jail.” After their Chromebook experience, Helen shared that the students learned, “that not everybody who has been sometimes in jail are bad guys.”
Summarizing her experience, she explained, “I think the technology really drove me to reach them with that Nearpod experience, and they get it and draw their own conclusions.” Helen also described using the Chromebooks to check for understanding. She described wanting to avoid just reading a slide to students and instead seek their participation. To address this, she used a rolling chat room on the Chromebook, allowing students to add their opinions in real time during a lesson. Erin echoed many of the methods shared by the other teachers. She incorporated the Chromebook as part of the 5E lesson model, tending to use it for the Engage, the beginning part of the lesson designed to get the students’ attention. She also spoke about Nearpod, which uses an interactive PowerPoint-style application. Because students respond in the Nearpod application, she monitors achievement on Nearpod, explaining, “You can see what each kid has done and even pull grades from it.”

Helen spoke most specifically about differentiation using the Chromebooks. As an ELAR teacher, she had one section of special education students and two sections of regular education students. She described the challenge of the different reading levels noting that one student may be on a kindergarten level while another might be on fifth-grade level. She explained, “Before there was more frustration, where I can now use the technology to show one group a video and one group another video, and they can manipulate ideas in different ways with it like that.” She shared that the Chromebooks allowed students to research and complete the same project but at different levels of ability. Describing students with reading challenges, she explained, “You may not be able to read it all, but you can understand. I like that they want to know something, and the technology has helped them.” As noted previously, she also described differentiation on the Chromebook as “doable” and contrasted it with the time before Chromebooks were available.
Students’ Activities using the Chromebooks

In thinking about how different types of activities on the Chromebook may affect student engagement, a theme that emerged from the interviews was student activities using the Chromebooks. The codes supporting that theme included the types of activities that students participated in on the Chromebooks with otherwise inaccessible activities, research, gamified learning, independent learning, shared learning, and specific applications used by students. Three teachers commented specifically that the Chromebooks allowed their students to have access to experiences that might otherwise be inaccessible. Wendy, a science teacher, spoke about this, stating, “A lot of the simulations are, you know, you can't do that outside of the Chromebook.” Anne spoke in more general terms, discussing student exposure to both technology and the internet because of the Chromebooks. Seeing this positively, she stated, “I think having the Chromebooks here exposes them to something they would not have had at home and therefore when they do go to college, thankfully they will have had some experience with technology.…” Helen shared about the activity where students virtually experienced incarceration. About the effects of that experience, she noted, “They really experienced it; it became more real for them.”

Three teachers discussed how their students used the Chromebooks to do research. Describing the students’ activities on the Chromebooks, Wendy shared, “We use it for a lot of research purposes in science.” Helen described a project where students researched historical figures to make a life-size poster and an oral presentation. Students used the Chromebooks to gather information and organize it. She even spoke about helping students learn to evaluate sources. Speaking as though she were talking to the students, she said, “Let's look at…learn about different sources. Just because you read it on Wiki doesn't mean it's 100% reliable information.” Erin, also a science teacher, described a project where students researched an
animal and its adaptations. Using the information, they created presentations in Google Slides. Describing how she structures the research activities in her classroom, she explained, “I usually let them go with it. So, I tell them what their topic is, what they're supposed to do and the guidelines and they run with it.” Anne spoke about research, but shared that she did not feel that her students knew how to do it properly. Therefore, they did not use the Chromebooks regularly for research.

Students participated in gamified learning activities on the Chromebook. This code captured those instances where student activities on the Chromebook included a gaming element. This code relates to literature that suggests gamification positively influences student engagement. Wendy spoke about including games as part of the science lessons and shared that she knew students were engaged when they came to her asking, “Can we do this again or can I get on that game that we played yesterday?” She also described a specific game that was popular with students, explaining, “So, there's a game in particular that lets you build different adaptations and see if you survive environmental changes. And everyone's always super excited to play that one because it's a game.” About the students’ feelings toward different activities on the Chromebooks, she stated, “I mean they like to play the games. And then behind that, they don't particularly like to use the study resources. If it's not a game, they don't want to play it.” Reiterating this sentiment later when talking about the Google suite, she said, “You know, when it comes to playing Quizlet or making a Google slide, they'd rather use it for the games.” While she expressed that students were motivated by the games, she did share that students had preferences regarding the different types of games. Describing her perceptions of the students’ preferences, she explained,

A lot of the kids really enjoy the life science games, but they don't like the physical properties games. Um, when it comes to, you know, is, is it magnetic, they just don't care.
But then when you get to decorate your bird to see if it's going to survive, you know, ecosystem failure, they like that better.

This idea of preference is also related to the theme of content versus technology and is discussed within that theme as well.

Helen referenced gamified learning differently. In her class, students participated in instruction or other activities before the game. She incentivized that participation by letting them know there would be a game on the Chromebooks and that their participation would make them more successful in the game. She described it this way:

But before we get into the game, I do like flash cards. Then I tell them go get your journal and, I know, let's go back over some of our antonyms and synonyms because I may let you use that, those notes with the technology. You never know, right? If you don't have your notes, you won't be a winner in this game.

She acknowledged the impact of the game on engagement in the way that she chose to use the game.

Anne and Erin recognized the relationship of the gamified learning with engagement. They shared that their students were excited to play the games and very competitive. However, Anne brought up gamified learning when asked about the Chromebooks as distractions. Her concern was that students focused more on the competitive elements of the game than on the content. She explained that, “if they're more focused on the game itself, then they're not learning because it's like, OK, they should have been able to tell me what they literally just saw on the screen.” She elaborated further, saying, “They're more looking at who's in first place and they're not even retaining what they just read. Anne identified that students were unable to transfer learning from the game to real world application. Erin shared similar concerns, noting that students may be more engaged with the game than with content. She described it as “They're
super competitive. So, when you do a game, they're all like, yes, we're doing a game, but then it'll get to the point where they're like, I'm tired of doing science questions.”

Teachers also described instances where students worked independently using the Chromebooks. They related the effect of working independently on their students’ engagement. When asked about student engagement while using the Chromebooks, Wendy gave autonomy as a reason she believed engagement increased. She explained, “The second thing is a lot of kids like that able to work on their own, and they don't like to have to wait for other people, necessarily. So, just for them to get a Chromebook and to be able to go into their own work, I think they enjoy.” Helen noted students’ feelings about being able to work independently and shared about students who had previously struggled to be successful. Describing how they used the technology now, she said,

With the technology, I've been able to work with some kids who, just getting their names typed in to use this technology was a challenge getting them there. And now they're able to work more independently and feel that sense of accomplishment so that technology has been an invaluable asset to doing that.

Anne shared that students received satisfaction from working on their own, stating, “It gives them more independence… I've noticed that the Chromebook really gives them the independence to really take ownership of their learning.” However, Anne and Erin expressed concerns about independent work on the Chromebook. Anne felt that to get the results she sought regarding her students’ learning outcomes, it was better to be involved in their learning, even on the Chromebook. She explained,

I think it really depends on what you want at the time. If you want just some brief independent time or just quick vocab review that they can do independently then depending on the student, they're responsible enough, they may focus a little more diligently, but if you really want results as far as assessment goes, I think there should be some teacher facilitation.

Erin provided some opportunities for students to work independently. She noted that
when students were involved in research, once the project had been introduced, the students “run with it.” However, she also shared that in some activities, like Nearpod, she had the ability to keep them all on the same slide even on their own Chromebooks. She preferred this strategy to keep them on task.

Another student technology use that some teachers described was shared learning or students as contributors. Students found activities and extensions on the Chromebook that they shared with the teacher or classmates. Students also used the Chromebook to present information that they researched or slide decks they created. Wendy spoke about having her students bring in Google Chrome extensions for the class to use. She explained, “Some of the gifted and talented kids will bring me extensions that I think are really cool and I'll add it to the lesson plan.” Her students also created slides on a topic to share with their classmates. She described not only what they did but how they felt about the opportunity, saying, “They'd rather do a slideshow because they can research it online and then they can grab pictures and videos and, you know, decorate it themselves. And so, they really enjoy the individuality there.” She used Flipgrid, a platform that allows students to video themselves answering a question. Describing how students used Flipgrid, she said,

It's more fun when, you know, they get to do the Snapchat thing where they take videos of themselves explaining why an answer is what. And then the class gets to vote on whoever's the best. So, they really liked the ability to do that.

Students in Helen’s class also used the Chromebooks to share their learning. She spoke about using Flipgrid, and the enjoyment students had in recording their own answers and shared how she allowed students to create presentations and collaborate about their content. As mentioned previously, students also shared their ideas and questions about a particular lesson using a rolling chatroom, which is a backchannel device that allowed student responses to be
available to the entire class in real time. While the other teachers spoke briefly about using
Google Slides, they did not elaborate on how their students shared their learning.

The specific applications that teachers used were similar. This may be due in part to the
fact that the teachers worked in the same school and had access to the same software. Three of
the teachers teach science which may also contribute to their overlap in their choices. Teachers
identified Nearpod, Stemscopes, Flipgrid, Quizlet, Kahoot, Study Island, and the Google Suite as
applications that they regularly used in their classrooms. Additionally, some teachers referenced
Quizziz, Flipaclip, Read 180, Epic, Prodigy, and Liberty Kids. Table 4 shows the types of uses
for each application as well as the content area served by the application. The products within the
Google Suite are grouped together.

Table 4

*Chromebook Applications and the Ways that They are Used in the Classroom*

<table>
<thead>
<tr>
<th>Platform</th>
<th>Subject Area</th>
<th>Deliver Content</th>
<th>Presentation</th>
<th>Drill and Practice</th>
<th>Assessment</th>
<th>Allow Student Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nearpod</td>
<td>All</td>
<td>●</td>
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<tr>
<td>STEMscopes</td>
<td>Science</td>
<td>●</td>
<td>○</td>
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<td>●</td>
</tr>
<tr>
<td></td>
<td>Math</td>
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<tr>
<td>Flipgrid</td>
<td>All</td>
<td></td>
<td>○</td>
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<td>●</td>
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<tr>
<td>Quizlet</td>
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<td>○</td>
<td>●</td>
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<tr>
<td>Kahoot</td>
<td>All</td>
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<tr>
<td>Quizziz</td>
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<tr>
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<tr>
<td>Google Suite</td>
<td>All</td>
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<tr>
<td>Flipaclip</td>
<td>All</td>
<td></td>
<td>●</td>
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</tr>
<tr>
<td>Read 180</td>
<td>ELAR</td>
<td></td>
<td>●</td>
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<tr>
<td>Epic</td>
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<td></td>
<td>●</td>
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<td>●</td>
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<tr>
<td>Liberty Kids</td>
<td>Social</td>
<td></td>
<td>●</td>
<td></td>
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<tr>
<td></td>
<td>Studies</td>
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<td></td>
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<tr>
<td>Prodigy</td>
<td>Math</td>
<td></td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

73
Those applications under the “Deliver Content” heading can push instruction to the students. Applications listed under “Presentation” can be used by the students to create presentations. “Drill and Practice” indicates those applications used to review or practice with content and may include gamified or non-gamified applications. “Assessment” applications provide a means to assess learning. The “Allow Student Response” heading indicates that students have the means to answer on their own. Of the applications, Nearpod was mentioned most frequently by the teachers. It can be used for instruction as well as assessment and provides students the opportunity to interact with the content and with each other. It allows the teacher to push a particular slide to all Chromebooks and prevent students from advancing beyond a point determined by the teacher. Table 4 includes information about Chromebook applications.

- **Engagement with Content vs. Engagement with Technology**

  Theme 5 developed from teacher observations of student engagement looking to understand if students were engaging primarily with technology or with the content. This was important to understand because the literature suggested that student engagement with content is positively associated with improved student achievement (Appleton et al., 2008; Furlong & Christenson, 2008; Fredricks et al., 2004; Jimerson et al., 2003; Marks, 2000; Finn, 1993; Newmann et al., 1992). I coded utterances for student engagement with technology and student engagement with content.

  I asked each teacher about the idea of students engaging with the technology versus the content. Wendy noted that while students prefer games over other types of activities on the Chromebooks, they showed preferences between the games. She attributed this to the content included in the games and not the games themselves, explaining, “I think the technology
increases engagement as a whole, but the content engagement still matters.”

When asked to elaborate further, she stated, “They'd prefer to have a game overall. But if you give them the options between two games, the content still matters, and they'll pick the one that they like better.” She also related engagement with content to the teacher’s own level of enthusiasm with the content. The teacher noted her own dislike for units on physical properties and landforms because they were “super boring” and described student engagement levels as lower during those units. Anne suggested that initially students might be engaged with technology. However, she felt that if the teacher were involved and facilitating the use as she did with her Nearpod lessons, that students would be pushed to engage with the content. She stated, “I think you'd get more results as far as staying engaged if the teacher's directing it. So, we have to facilitate, if we want them to stay focused and on task to the content.” Helen emphasized that the technology was a tool. As a result, her feeling was that it was a means to interact with the content and that students should be directed to use it that way. She described a history project where students researched a figure and did a life-size poster, explaining,

They weren't engaged in just the Chromebook; they were engaged in ‘What am I going to wear? What kind of outfit can I do for this or what colors should I use?’ We did make, I mean, everything, but the technology was just a tool.

When asked about engagement with technology versus content, Erin shared that she felt she couldn’t separate the two concepts. She shared that they seemed too related to her to try to determine with which of the elements the students were engaged.

- **Influences that affect student engagement**

Theme 6 was another broad theme supported by several codes. Student accessibility to technology, types of novelty, student feelings about Chromebooks, and technological
affordances were all codes suggested by the interviews to have a relationship with and even possibly an influence on student engagement. Student accessibility was defined as the students’ out of school access to the internet using a Chromebook or similar device. “Novelty” is a related code and has two sub-classifications: short-term novelty associated with something new or not regularly accessible and sustained whereas structural novelty is associated with the characteristics or structure of the activity. This latter type of novelty remains after the “newness” diminishes. The research literature suggests that novelty, as a general concept, is an influence on student engagement. Student feelings about technology are those that teachers expressed on behalf of the students. Technological affordances captured the characteristics of a technology that allow the user to achieve a goal.

The literature suggests that student accessibility to technology is an influence on student engagement. For this population, the thought is that limited access might mean that there is a novelty to the technology that engages students. Three teachers shared that they felt that students had limited access to the internet and associated technologies. Wendy explained that she did not give homework because so much of her work was done online and students did not have internet access at home. She noted that although they may have a device at home, they were not always allowed to use it or may not have the data plan in place to support extended academic use. She spoke to the idea of novelty related to access, saying, “Maybe the fact that they get their very own computer here is something special, and so they get excited about it.” In this case, the novelty would be short-term as it relates to having access to something out of the ordinary. Anne agreed that students had limited access to technology and the Internet. While she did not speak specifically to novelty, she observed, “I do have a few that do have Internet access at home, but not a lot. And so those that do have cell phones, I hear them using it more for social media, either
Kik or Snapchat.” Helen noted that most of her students did not have access to technology. She pointed out how she stressed to them that it was a privilege to be able to use the Chromebook at school, saying, “I try to get everybody to understand that this is a privilege that we have this Chromebook. Expensive machinery is a blessing and a privilege and an honor that we even have it. A lot of kids don't have it.” While she also did not speak specifically to novelty, she did describe earlier in her interview how her students experienced incarceration virtually and the high level of student engagement in the activity. The opportunity to do something otherwise inaccessible relates to novelty because the students have access to something out of the ordinary. Erin shared a different perspective and also did not speak specifically to novelty, either short-term or sustained. She explained that she felt students did have access to technology. She noted that she often heard discussions about how students played Minecraft or watched Netflix outside of school.

Teachers noted throughout the interviews how they perceived that students felt about the Chromebooks. Wendy talked about using Flipgrid and how students enjoyed voting on the best student video response. In discussing independent work, she shared that she thought students enjoyed being able to get started right away on a project and work on their own. She also spoke specifically about the different types of activities and how much students enjoyed them, especially games. Anne spoke in general terms about the students and their attitudes toward the Chromebook, saying, “So, I think they like that personal thing that even though they know it's not theirs, they can’t take home, but still it's theirs. And so, they can get something that they can really kind of call their own during that time [Chromebook activity].” Helen commented that her students really enjoyed their historical figure project including the presentations and the ability to watch those presentations on the Chromebook. She also talked about how much her students
enjoyed doing a Kahoot, a gameshow-style review quiz. Like Anne, Erin shared her students’ 
positive feelings about Nearpod when she described them asking to do the activities again. She 
also talked about how the students were disappointed if they found out the day’s lesson did not 
involve Chromebooks. She shared, “When they come in the classroom, they’re like, ‘So are we 
using the Chromebooks?’ and I’m, like, ‘No, not today.’ And they start moaning and groaning 
and complaining.”

Another possible influence on student engagement was identified as media or learning 
affordances. Originating with Gibson (1977) and later defined by Greeno, (1994) affordances are 
“conditions in which the constraints of successful performance hold.” In this study, affordances 
are those characteristics of the technology that enable a user to accomplish something he or she 
desires to do. Throughout the interviews, the teachers described the attributes of the Chromebook 
or particular applications on the Chromebook that allowed their students to perform a task or 
achieve a goal. These affordances relate to engagement in that they help to provide a desired 
outcome and that opportunity is motivating.

Wendy shared many affordances of the Chromebooks throughout her interview that she 
related to student engagement. She noted that the computers provide her students the opportunity 
to experience in simulation, labs and activities otherwise inaccessible to them. An example was 
the game that allowed students to create animals and test their survivability in different 
environments. Another affordance she related to engagement was gamified learning. The 
Chromebook applications like Kahoot and Quizziz allowed for content to be presented in a 
gaming context. Applications like Flipgrid, along with the capabilities of the Chromebook, 
provided allowed students to record themselves and share their learning with classmates.

Helen focused on the affordance of access to information the internet provided her
students. In her words, “It's sitting there, they know the whole world is just right here. Just blue blooming and glowing in front of you.” In addition, Helen also noted the affordance of personalized learning. She shared that she was able to differentiate learning for her students to provide them the opportunity to work at their own levels. The other teachers identified similar affordances. Anne and Erin both noted that the Chromebooks allowed their students to access educational experiences that were otherwise inaccessible. They provided examples in which the Chromebook and its applications were used to gamify instructional content for their students.

BrightBytes Findings

Introduction

The BrightBytes survey is a technology survey that is taken annually by students and teachers in the school district. Student and teacher responses are analyzed by the BrightBytes organization, and the district receives a group of reports that share the findings. The BrightBytes organization, as a paid service, provides customized surveys for each district that they serve. They do not provide reliability and validity information for their surveys. Because of this, I was unable to establish the reliability or validity for the survey that students and Curriculum Report teachers took. The data collected was used as a secondary source. I examined the reports to determine if the BrightBytes findings corroborated the interview findings. The findings are reported here to allow for comparison with the interview themes.

Curriculum Report

The curriculum report was designed to capture students’ feelings about their technology skills and their understanding of how to use technology to learn. Of the approximately 450
students in the school, 148 responded to the survey. The BrightBytes analysis found that 83% of the student respondents felt that technology enhanced both their learning and their personal lives. Only around 20% expressed confidence in being able to send an email or navigate the internet. However, 83% expressed confidence in being able to record and share a video. Overall, 31% felt capable of solving their own technology problems. Despite that, 98% responded that they found it easy to learn new technologies.

*Infrastructure at School Report*

This report recorded teacher responses about the hardware and internet capabilities available to them and to their students. Teacher responses for this report include administrative personnel with 102 participants responding to the survey. With regard to student access at the 1:1 or 2:1 level, 74% of teachers reported that their students had access at least 50% of the time. However, only 27% of teachers reported that they and their students had access to high-speed internet. This differs from the level of 43% reported district-wide.

*Infrastructure at Home Report*

Infrastructure at home, like infrastructure at school, refers to students’ and teachers’ access to hardware and internet access in their homes. In the report, 91% of teachers and 85% of students had access to the internet at home. Similarly, 84% of teachers and 83% of students reported having access to a device at home. In both cases, almost half of teachers and over half of students shared the device with others in the home. These responses do not differ significantly from the district report in which 95% of teachers and 88% of students have access to the internet at home.
Supervisory Report

The supervisory report provides an understanding of how leaders share best practices with teachers and students regarding technology use. In the report, 36% of teachers reported that they felt recognized for using technology in the classroom. Fifty-two percent of teachers reported that technology was a topic of discussion in their personal learning communities (PLCs) and faculty meetings. Speaking somewhat to infrastructure, 24% of teachers reported that internet filters interfered with learning more than half the time. The number of teachers reporting difficulty with internet filters was similar to the district level, where 21% of teachers reported that internet filters interfered with learning.

21st Century Learning Report

This report tracks the learning opportunities that include technology. It describes the type of technology-based activities in which students are involved. The report shared that 63% of students were asked to participate in collaborative activities at least monthly. Fifteen percent of students indicated that they write at least once a month using technology, while 35% of students are asked to solve problems using technology. A little over a third of teachers responding asked students to complete online assignments at least monthly, and 75% of teachers who use assistive technologies with students, use it at least monthly as well. Interestingly, 67% of teachers reported teaching digital citizenship less than three hours per school year.

Professional Development Report

Teachers in this report indicated the types of professional development in which they participated, their self-assessed skill or comfort levels, and their professional development
preferences. Within the school, 44% of teachers found basic computing skills easy. These skills were defined as sending an email or creating a spreadsheet. Eighteen percent of teachers expressed an interest in additional training in this area. Fifty-five percent of teachers felt comfortable with the level of online skills (e.g., using search engines to locate information and collaborating online) with 10% indicating a desire for additional training. Within the area of multimedia skills, defined as the ability to edit photos or record and edit video, 44% of teachers reported a high level of comfort. Thirty-nine percent of teachers desired additional training in this area. Addressing digital citizenship, only 24% of teachers identified themselves as highly knowledgeable about the subject. Finally, in contrast to the 98% of students who indicated that learning technology was easy for them, only 69% of teachers shared the same level of comfort.

*Technology Support Report*

The technology support report captures how teachers feel about the technology support that they are provided in the district and at their schools. Within this school, 29% of teachers rated the technical support as high or above average, and 27% of teachers reported that they believed the internet speed was high or above average. In reference to both teacher and student devices, 33% believed that the technology provided by the school was excellent or above average. Speaking about their self-efficacy, 57% of teachers believed they were capable of solving their own technology problems.

**Summary**

This chapter shares the findings from the data collection and coding of interviews with four teachers from an at-risk fifth-grade school. The BrightBytes report summaries are provided
at the end to give context to the teachers’ responses. In the interviews, the teachers shared their
definitions of student engagement and their perceptions of student engagement as it related to the
students’ use of Chromebooks. As the interviews were coded, the data generated seven themes.
The teachers’ own words and thick description from the interviews was presented as evidence of
the themes. Six of the themes related directly to the research questions; one emerging theme
provided an opportunity for future research and is shared in the next chapter.
CHAPTER 5
DISCUSSION AND CONCLUSIONS

Introduction

With the push to include 1:1 technology in instruction, it is important to both stakeholders and researchers to understand the effect of this technology on student engagement levels. The literature connects student engagement with achievement, and establishes the importance of understanding not only the construct of engagement, but also how student technology use may affect it. Established in the literature review is the gap in research that addresses at-risk elementary students and their engagement levels while using technology. The study adds to the understanding of that topic by capturing and sharing the teacher perceptions of their students’ engagement levels and the relationship with 1:1 technology.

The study took place in a small suburban Texas school district. The school under study, considered a Title 1 school, is a fifth-grade center with approximately 450 students. For the 2017-2018 school year, the majority of students were identified as at-risk of not completing high school. The fifth-grade elementary school had recently implemented 1:1 technology, with all students having daily access to Chromebooks. As a former teacher in the district, I wanted to understand the effects of this implementation on student engagement. Using an online survey, teacher interviews, a classroom observation, and the district’s technology survey data, the study examined teachers’ perceptions of their students’ engagement levels when using the Chromebooks.

The study sought to answer four research questions:

• What are the teachers’ understandings of student engagement and its relevance in the classroom?

• How do teachers define and describe student engagement in their classrooms?
• What are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom?

• Do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity)?

This chapter shares the summary of the study’s findings as well as discussion about the findings and suggests implications of the research and possible areas of future inquiry. Using coding and comparative analysis to analyze the data, I share the themes from the interviews and supporting data. This provides the district stakeholders and the reader the opportunity to see, through the experiences of the teachers, the relationship between 1:1 technology and student engagement, particularly for this younger population.

Summary of Findings

Wendy, Anne, Helen, and Erin were kind enough to allow me a glimpse into their fifth-grade classrooms through the interviews and surveys they completed. Each of their interviews, approximately 45 minutes in length, was coded through the lens of the literature review and conceptual framework, but also with an understanding that other themes may emerge. Through weekly meetings with secondary coders, I worked through each interview multiple times, line by line, to code the utterances and group them into categories and later into themes. From the teachers’ interviews, seven themes were identified. Six of the themes related to the research questions. They were (1) Teachers’ understanding of student engagement; (2) Teachers’ understanding of student engagement related to the Chromebooks; (3) Teachers’ use of Chromebooks in the classroom; (4) Students’ activities using the Chromebooks; (5) Engagement with content vs. engagement with technology; and (6) Influences that affect student Chromebook use and engagement. One theme, teachers’ decision-making about how to use educational
technology in the classroom, emerged and did not directly relate to the research questions. This theme is shared as an opportunity for future study. The themes and how they relate to the four research questions are shown in Table 2.

The theme titled “Teachers’ understanding of student engagement” helped provide insights into two different research questions: (1) What are the teachers’ understandings of student engagement and its relevance in the classroom and (2) How do teachers define and describe student engagement in their classrooms? The teachers did not distinguish between describing their understanding of student engagement and defining student engagement. As a result, much of what they shared supported both questions.

For the remaining questions, the themes associated with a particular question were specific to the research question and not shared between questions. The theme, teachers’ understanding of student engagement related to the Chromebooks, was associated with Research Question 3, what are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom. Research Question 4 asked do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity) and had four themes: teachers’ use of Chromebooks in the classroom, students’ activities using the Chromebooks, engagement with content vs. engagement with technology and influences that affect student engagement. The BrightBytes data generated by district-wide online surveys provided context for the study in the form of eight reports that covered topics from comfort with technology to technology infrastructure. The responses in these reports were shared in the findings and are compared with the teacher interviews in the Discussion section.
Discussion

In this discussion, the themes from the interviews are situated within the literature, and the context of the BrightBytes reports to address the four research questions guiding the study. The four questions provide the topics of discussion in this section.

Research Question 1: What are the teachers’ understandings of student engagement and its relevance in the classroom?

Student engagement is a construct that includes emotional, affective, behavioral, cognitive, and academic indicators (Reschly & Christenson, 2012; National Research Council, 2003; Furrer & Skinner, 2003). In asking teachers about their understanding of engagement and its relevance in the classroom, I sought to understand how teachers in this school viewed student engagement and what value they placed upon it in their classrooms. While the literature establishes a connection between engagement and achievement (Appleton et al., 2008; Furlong & Christenson, 2008; Fredricks et al., 2004; Jimerson et al., 2003; Marks, 2000; Finn, 1993; Newmann et al., 1992), I desired to know if the teachers acknowledged the same connection, and as a result, placed importance on student engagement.

Teachers characterized student engagement in largely behavioral terms. They listed being on task, being interested in answering questions, maintaining eye contact, and participating in group discussions among the student indicators of engagement. Some teachers described students as being excited or having fun. One teacher, Helen, spoke about persistence, sharing that students wanted to continue on the Chromebooks until their projects were finished, even after the class time ended. While descriptions like excitement or having fun may suggest emotional elements of student engagement, the indicators are still outward expressions of inward emotion and could be characterized as behavioral. This finding places the teachers’ ideas about student engagement
squarely within the literature, embracing Skinner & Pitzer’s (2012) definition of student
engagement as an external observable manifestation of internal motivation. Overall, teachers
understood student engagement to be behavioral in nature. They believed that it was evident to
the observer and suggested through their positive descriptions, that it was desirable and
important in their classrooms.

Research Question 2: How do teachers define and describe student engagement in their
classrooms?

This question is closely related to the first research question; however, it focuses more
specifically on how the teachers defined student engagement. The teachers defined student
engagement by describing the behaviors they associated with it. Wendy defined it both in terms
of her students’ behavior and her own, describing not having to correct the students or redirect
their behavior. The students were so involved with the Chromebook activities that her only role
was to monitor their progress. The teachers defined student engagement as students being on
task, attending to instruction, and actively participating. Anne described students as “chomping
at the bit” to get started on their work. The participants also contrasted indicators of
disengagement with positive indicators of engagement as a way of refining their definitions of
student engagement. Teachers characterized students who talked out, were distracted by other
students, and used the Chromebook to access non-instructional materials as disengaged.

Instructors’ definitions of student engagement echoed research literature definitions. For
the most part, the teachers describe behavior that indicates to them that students are paying
attention to the content or the instructor. They noted being on task and participating as important
identifiers of engagement and adduced behaviors such as being off task and not participating in
instructional activities as disengagement. The teachers’ perceptions of the lack of engagement
are equally as relevant, which Finn (1989) noted when finding that non-participation is an important at-risk indicator, recommending “institutional encouragement” as soon as the behavior is identified (p. 131). Noting three different components of student engagement, Appleton, Christenson, Kim, & Reschly (2006) identified much of what the teachers described noting positive conduct, investment in learning, and positive attitude about learning as examples within the components.

From their descriptions, the teachers established that they understood the concept of student engagement as a construct. They outlined behaviors established in the literature as indicating student engagement and used as non-examples, behaviors also known to indicate disengagement or lack of participation. Their knowledge and understanding of student engagement gives credence to Skinner and Pitzer’s (2012) findings that teacher perceptions of student engagement and student-reported levels of engagement are correlated and a credible way to ascertain the levels of engagement in the classroom.

Research Question 3: What are the teachers’ perceptions of the effect of 1:1 technology implementation on student engagement in the classroom?

Establishing that the teachers have a solid working knowledge of engagement, my next step was to understand the teachers’ perceptions of the effect of the Chromebooks on the students’ engagement levels. Theme 2, teachers’ understanding of student engagement related to the Chromebooks, supported this research question. While Research Question 4 explored factors that influenced Chromebook use, this question looked specifically at the teachers’ perceptions. Each of the teachers stated that they felt the Chromebooks positively affected their students’ engagement levels. They described how students looked forward to using the Chromebooks and complained when the Chromebooks were not part of the lessons. Acknowledging the positive
effect of the Chromebooks on the students’ engagement levels, the teachers included the Chromebooks in specific parts of their lessons that necessitated engagement. The teachers referenced the Five E model, an instructional framework adopted by the district to guide teachers in planning their lessons. Each “E” represents a different emphasis in the lesson. The first “E,” Engage, is that section of the lesson that captures the students’ attention. The teachers shared that they used the Chromebooks regularly in the “Engage” section of their lessons, leveraging the students’ interest in the Chromebooks to draw them into the lessons.

Teachers’ reasons for the students’ engagement connected with the ideas from the conceptual framework. The instructors identified the elements of novelty, autonomy, and relevance among the reasons students were engaged with the Chromebooks and with the content. These elements are closely related and act as contributors to internal motivation and ultimately learning. Crick (2012) writes, “Intrinsic motivation for learning is stimulated by tasks of optimal novelty and difficulty, relevant to personal interests and providing for personal choice and control” (p. 680). Speaking about the novelty the Chromebooks offered over regular pencil and paper activities, Wendy shared that she felt using a Chromebook was “always more fun.” Multiple times during the interview, Wendy described the enjoyment she felt students experienced as a result of using the Chromebooks. Echoing Mouza’s (2008) finding that students’ limited access to computers contributed to the novelty effect, Wendy noted that students might be excited about the Chromebooks because the technology was something they did not always have or use away from the classroom. Anne also suggested that the novelty stimulus from limited access might affect engagement when she talked about how excited the students were because they had something to use that was their very own, something that was out of the ordinary for them. For Erin, what engaged students was the novelty provided by the
variety of activities that the Chromebook offered. In particular, Nearpod allowed students to interact with content, watch a video, and take an assessment all within one lesson. While it is possible for the “newness” to dissipate, the teachers suggested that the engagement was with the content and not just the technology, a concept explored more extensively in Research Question 4.

Wendy also noted the autonomy the Chromebooks gave students. This element of self-determination theory (Ryan & Deci, 2000) included in the framework, suggests that students work because of their own internal motivation, a willingness to complete a task because of its perceived value to them. Wendy talked about how students were excited to add their creativity to projects and to work ahead at their own pace. Anne described it as ownership of their learning. Helen expressed that as students saw the technology as a tool, they were motivated to use it by the affordances that would allow them to solve their problems. It became about their goals and abilities, not necessarily the compelling influence of the teacher.

Anne also discussed the relevance that the Chromebooks brought to the students’ experience. Relevance relates closely to autonomy, providing students with their own reasons for participating by connecting their activities on the Chromebooks with the real world. Anne noted that being able to associate elements of the instruction to the students’ experiences was motivating for them, creating, as she noted, “a real-life connection.” Nearpod and other software applications allowed her to help make those connections. Helen saw the Chromebooks as full of possibilities for the students. She described the Chromebooks as “the whole world sitting right there,” and noted that it was difficult for students to resist. Wendy also cited the opportunity for students to access experiences otherwise inaccessible. She listed subject-specific activities and experiences that students would not be able to participate in without the Chromebooks. Not only is the importance of relevance prominent in studies of technology use (Dahlstrom & Bichsell,
2014), but also in student engagement because, as Pianta, Hamre, and Allen (2012) note, “Consciously addressing the relevance of what occurs within the classroom to the larger world is critical to engaging otherwise restless young minds” (p. 371).

It is important to share that as positively as teachers viewed the Chromebooks and their relationship with engagement; teachers were also candid about the potential distraction that the Chromebooks represented. Helen spoke positively about the possibility that the internet and the technology provided for students. However, she then immediately described how she needed to have students place the Chromebooks in their desks until it was time to use them to prevent off-task behavior. Erin frequently spoke about the challenge of making sure students were on the correct website. Each of the teachers noted the challenge of keeping students within the appropriate software or on academic websites. When asked about any changes they would make, all of the teachers hoped for software that would allow them to easily see all of the students’ screens at once to facilitate student monitoring and management of off-task behavior. The teachers did not consider the challenge a reason to avoid the technology; however, they did express frustration with the difficulty of managing all the students without being able to see their screens.

Teachers expressed that their students’ engagement levels increased with Chromebook use. They identified relevance, autonomy, and novelty as reasons for students’ engagement with the technology. Not unlike the student responses in the ECAR survey (Dahlstrom & Bichsell, 2014), the students were motivated by how the Chromebooks allowed them to connect to real-world experiences. The ways in which the Chromebooks allowed students to personalize their learning also drew the students into the lessons. Students’ limited accessibility to technology at
home made using the Chromebooks in the classroom a novel experience. Even with the potential for distraction, teachers related Chromebook use to positive student engagement levels.

Research Question 4: Do teacher-perceived student engagement levels vary with the type of activity or content presented on the 1:1 technology (e.g., games, collaborative project, or research activity)?

This question explored the impact of different Chromebook activities on student engagement. As a broad topic, it included multiple themes: teachers’ use of Chromebooks in the classroom, students’ activities using the Chromebooks; engagement with content vs. engagement with technology; and influences that affect student engagement. Organized by theme, this section of the discussion shares how the types of Chromebook use by teachers and students may influence student engagement.

Teachers’ Use of Chromebooks in the Classroom

Teachers’ use of Chromebooks in the classroom encompassed activities in which teachers managed routines, behavior, and communication. It also included teacher-led instructional activities. In this theme, the question became which of these activities, if any, influenced students’ engagement levels? As teachers managed routines and behaviors, they described activities in which they used the Chromebooks as an incentive for staying on task. Helen described using a game on the Chromebook at the end of the instructional time to reinforce the lesson, but also to incentivize good note-taking as students who took notes were allowed to use them in the game. Anne and Erin also spoke of using the Chromebooks as an incentive for good behavior. In these situations, students were engaged throughout the lesson because of their desire to use the Chromebooks or to play the game at the end of the lesson. Teachers also described
using the Chromebooks to allow students in the off-site Disciplinary Alternative Education Program (DAEP) to stay involved with class activities and keep up to date on assignments. Using the Chromebooks in this situation allowed teachers to continue to communicate their expectations and students to stay engaged with content, even while away from the classroom. In a situation where technology is not available, many students are normally left to complete packets of classwork, removed from the engaging elements of instruction. However, by including the Chromebooks, students had access to the same engaging elements as their classmates. The differentiation teachers provided with the Chromebooks also helped the learners engage with content. Helen specifically discussed that the Chromebooks let everyone participate in class projects and have similar learning experiences. Teachers’ strategic use of the Chromebooks to support learners and incentivize participation and on-task behavior proved effective in increasing student engagement.

Students’ Activities Using the Chromebooks

Similar to the earlier theme, this theme focused on the students’ activities using the Chromebooks. Teachers shared the types of activities and the specific software that the students used. Teachers identified gamified learning activities as a strong positive influence on students’ engagement, consistent with the literature on gamification that states that gamification increases engagement (da Rocha Seixas et al., 2016; Richeter et al., 2014; Barto et al., 2013; Otmakhova et al., 2013). Websites like Kahoot, Quizziz, and Quizlet Live allowed teachers to quickly and easily gamify content and include it in the instruction. Game-show style games were most commonly used, introducing an element of competition between students. While this was an effective way to engage students, teachers did not know that the students became more involved
with the games than with the content. This idea is furthered developed in the discussion of engaging with content versus engaging with technology.

Autonomy again appeared in this theme as teachers shared how the Chromebooks allowed students to do creative work, to take the initiative on their own projects, and to contribute to their learning by sharing Chromebook extensions. Flipgrid, a platform that allows students to video their responses to a question provided by the teacher, gave students the ability to share their opinions and contribute to learning for the class. Another platform, Nearpod, was used to allow students to work through content at their own pace. It also gave students the ability to share their knowledge with the class through online questions that were shared with the class. These platforms and activities were viewed by teachers as supportive of increased student engagement, connecting with the concept that engagement improves when teachers provide activities that give students some choice in the direction of their learning (Skinner & Pitzer, 2012).

Relevance, as it relates to student learning, also appeared in this theme. Students’ Chromebook activities included experiences that the students may not have had access to without the technology. Used by Helen, virtual experiences like the Nearpod module on incarceration and Wendy’s use of science simulations provided the students the opportunity to see the concepts and ideas within their real-world context, helping students to understand the value of the learning. Making these connections for students and providing real-world context should help students engage in the instruction and with the content (Piatta et al., 2012). Crick (2012) explained, “For children and youth, the connection of academic skills and knowledge to their real-life experience is a near-universal property of classrooms that foster engagement” (p. 371).
The activities that students participated in on their Chromebooks appeared to promote increased student engagement based on teacher perception. Consistent with the literature, gamification, autonomy, and relevance influenced the level with which students engaged in learning activities. The Chromebooks facilitated these experiences by providing access to platforms that gamify learning, giving the students choice and ways to contribute to their own learning, and by connecting students to real-world experiences.

**Engagement with Content vs. Engagement with Technology**

Skinner and Pitzer (2012) described engagement as the “active verb between curriculum and actual learning” (p.23), suggesting that students must interact with the content to improve learning outcomes. While Chromebooks can assist in this interaction, they can also serve as a distraction. The teacher interviews provided evidence of both these potential outcomes. Anne noted that her students were highly motivated by the competition-style game. However, when she asked the students to share what they had learned, they could not demonstrate learning, indicating a lack of transfer. Erin described a similar situation where the students’ competition with each other became the focus for the students. She described the students as participating in the game, but bored with the content. This issue with learning transfer has been noted in the literature, specifically with gamification and simulations. In gaming contexts, participants who were motivated by rewards associated with the games demonstrated little or no learning transfer (Domínguez, Saenz-de-Navarrete, de-Marcos, Fernández-Sanz, Pages, Martínez-Herraiz, 2013). In simulations like the science teachers described, researchers described a need for the simulation tasks to closely resemble real-world tasks in order to facilitate learning transfer (Kozleski, 2004; Warren & Jones, 2017).
By contrast, Wendy provided examples of how the different types of content motivated the students. She noted that the students indicated preferences in the games and she attributed that to the students’ interest in one content area over another. These cases illustrate the challenge in not only determining if students are engaging with the content, but also how to encourage engagement with content over engagement solely with the technology. There is some literature to suggest that it is the structure of the game or technologically-based activity that makes a difference (Dicheva, Dichev, Agre, & Angelova, 2015). However, this field of study is still developing as researchers try to capture the effect of specific gaming elements on transfer of learning and academic success. Another perspective is the idea of supplemental use versus essential use. How the teachers choose to use the technology, that is to say, the level and type of integration, affects whether or not the students engage with the content and ultimately improve achievement (Norris, Hossain & Soloway, 2012). Further research is warranted to provide understanding of the types of activities that encourage engagement with content and, particularly in gamification, how to ensure that learning transfer occurs.

Influences that Affect Student Engagement

A number of themes provided evidence of some of the influences on student engagement when the Chromebooks are used. The type of software program or activity, the relevance of the learning, the students’ autonomy in their learning, and gamification all influence student engagement. Teachers also noted how students felt about the technology. Throughout the interviews, teachers described the students as excited or looking forward to using the Chromebooks and disappointed when they were not included. Particularly when games were included, students were motivated to participate. This interview data was supported by the
BrightBytes survey results. In the survey, the students indicated they felt that technology enhanced both their learning and their personal lives. They also expressed confidence in being able to learn new technologies. Positive associations with academic activities and confidence in one’s own skill level may contribute to increased student engagement (Schunk & Mullen, 2012).

Related to how students felt about the Chromebooks is the idea of media learning or technological affordances. Affordances are characteristics of a particular technology that, when the individual interacts with them, allow for a particular action to occur and act as “preconditions for activity” (Greeno, 1994). Identifying affordances helps the observer to understand what it is about a particular piece of software, a platform, or hardware that makes it possible for the user to accomplish the given task. In a science classroom, Webb (2005) noted media-enabled learning affordances like testing a hypothesis in a virtual environment or building a virtual model. Teachers in the study described affordances like speech to text and virtual experiences as additional examples. As preconditions, affordances influence engagement in allowing students to complete the desired activity. Without their presence, the enticement may not be there for the student to participate in an activity.

In the interviews, teachers identified some affordances that influenced students’ engagement levels. The ability to experience activities otherwise inaccessible was noted as both an affordance and an influence on engagement. Students were drawn in by the opportunity to experience something outside of their normal reality. For teachers, the affordances of customizable games to include teachers’ content and the easy-to-learn game platforms allowed teachers to quickly convert content into gamified learning experiences. Diagnostic and self-adjusting software on the Chromebooks provided a way for teachers to differentiate instruction so that students received the support for their learning at the level appropriate for them.
Affordances like speech to text made writing differentiation possible.

Accessibility, as it related to novelty, was also identified as an influence on student engagement. I hypothesized that because of students’ limited access to technology and the internet, the students might respond to the Chromebooks as a novel experience. This out-of-the-ordinary experience might motivate students to engage with the content on the Chromebooks by providing the content in a way that was different than students normally experienced. The teachers did note that student access to the internet and personal technologies was limited, although Erin felt that they had some access because of student conversations about using the technology at home. Wendy felt that her students were more engaged because they did not have the same opportunities and access to technology at home. Surprisingly, the BrightBytes survey data suggested that the majority of students had access to both technology and the internet at home. These results differed from the teachers’ perceptions. What is difficult to know is how the survey and the students defined access. While many students used Wi-Fi available at public locations, this was different from the teachers’ understanding of students having access at home.

Understanding what types of activities influenced student engagement was a broad topic that included how teachers and students used the Chromebooks, whether engagement was with the technology or the content, and what other influences beyond student and teacher use impacted students’ levels of engagement. The recurring motifs of relevance and accessibility shed light on what it is about Chromebooks that encourages engagement. Additionally, the idea of affordances and the attitudes of the students toward technology also emerged as influences.

Implications for Practice

Early intervention for at-risk students is important to help students achieve academic
success (Finn, 1989). For the school under study, with a majority of students considered at-risk, the task is formidable. While there is extensive literature suggesting at-risk students benefit from engaging with the environment and instructional content, how to facilitate the different types of engagement remains a challenge. However, the recent Chromebook implementation at the school offers a valuable tool. Teacher perceptions of student engagement during Chromebook use indicate that Chromebook use can facilitate increased engagement for the students. Chromebooks have the ability to provide students with a sense of autonomy in their work. The technology can offer choice, control, and a creative outlet that helps students take ownership of their learning. The BrightBytes survey data also highlights students’ confidence in using technology, supporting Bandura’s (1986) concept of self-efficacy and its role in learning success. The Chromebooks provide students, who may have limited access to experiences and information, the opportunity to see the relevance of the learning in a real-world context. Gamified instructional content, accessible on the Chromebooks, captures student attention adding elements of fun, challenge, and competition. When used strategically within the lessons, the games can incentivize more positive behaviors and, again, connect students with instructional content. However, there are a number of considerations for use that have emerged from the study:

1. Teachers’ beliefs about technology impact student use. The teachers’ views about technology impacted how they used technology in the classroom. Their comfort level, their feelings about the content and the technology, and their perceptions about how useful the technology was to their work and their students’ learning influenced what they chose to do with the Chromebooks. Those decisions, in turn, affected student use.

2. The activities that students participate in using Chromebooks or other 1:1 technologies are important to the success of an implementation. Chromebooks or other 1:1
technologies have the potential to encourage student engagement by giving autonomy to the
learners and connecting them with relevant, real-world experiences. Teachers explained that
Chromebook-based activities allowed students to share their knowledge, experience something
out of the ordinary, and learn at their own level and speed, were well received, and increased
student engagement.

3. It is preferable for students to engage with content over technology. Teachers
reported that learning transfer did not occur when students interacted primarily with technology.
While videos, games, and text can be engaging when presented on a Chromebook or 1:1
technology, software, games, and platforms that push students to actively explore the content,
synthesize what they have learned, and connect to real-world experiences can help provide
learning transfer.

4. One-to-one technology becomes a more effective tool for instruction when it is
integrated into instruction. Teachers shared their frustrations about how 1:1 technology can serve
as a distraction. Instructors that integrated the Chromebooks had success in helping students see
technology as a tool. In these cases, the desired learning outcomes drove the practice. The
technology use was almost organic in that it flowed naturally from the needs of the learners and
the requirements of the lesson.

5. At-risk students may benefit from 1:1 technology use. Teachers noted that their
students were motivated by technology use within the lessons, potentially facilitating increased
interaction with academic content. This interaction supports the literature that suggested that, in
early grades, student interaction with content can improve achievement (Finn & Zimmer, 2012).
The teachers also noted that with this student group’s limited access to 1:1 technology and the
internet, the Chromebooks provided exposure to experiences otherwise inaccessible and also to
the technologies as they were used for academic purposes. Increased engagement for at-risk students at the elementary level may improve achievement and improve retention in later grades (Finn & Zimmer, 2012; Severson, Walker, Hope-Doolittle, Kratochwill, & Gresham, 2007).

Limitations of the Findings

There are some limitation associated with this study’s findings. This study used a single case approach. While a case study approach does provide the opportunity to share experiences from a particular situation in order to illuminate a phenomenon or to generalize to a theory by providing support or non-examples (Ravitch & Mittenfelner Carl, 2016), a single case study is still limited in transferability. The participants were limited to a single grade level, and the majority of students were identified as at-risk, creating a narrow focus which limits the transferability of the findings. The primary data came from the perceptions of only four of the 22 teachers in the school, making it difficult to know if the findings are representative of the other classes. Three of the four teachers were science teachers. Again, these limitations are related to the narrow focus of the study and are important to consider as district stakeholders and others review the findings. This study took place during the second year of a 1:1 technology integration. The technology was still fairly new to both students and teachers. It is unknown if the early stage of integration had an effect on the engagement levels of the students, the perceptions of the teachers, and ultimately on the findings.

Future Research

An emerging theme in the study was teachers’ decision-making processes about how to use educational technology in the classroom. Teachers gave a number of reasons for choosing
technology. The infrastructure, particularly internet connection and speed, came up in multiple interviews as an influence on the ways teachers used the Chromebooks. Depending on the available internet speed, the Chromebooks were more or less effective as a part of the instruction. One teacher shared that she sometimes used her own phone as a hotspot when the internet lagged, in order to maintain students’ attention. Time constraints, teachers’ instructional goals, teachers’ comfort level with the particular software or platform, the affordances available in the Chromebooks and associated software, and their own ideas about technology also influenced how the teachers used the Chromebooks. Significant literature exists advocating for classroom technology use and describing frameworks to understand the cross-section of knowledge that might be required to use technology in the classroom. However, there is less literature that seeks to capture the full measure of influences on teachers’ decision-making with regard to when and how to use technology.

An additional area of future inquiry came from the theme of gamification in the study. Teachers noted that in some types of games, learning transfer did not occur. While students seemed to interact with the instructional content, their emphasis was really on the technology use. The result was that students did not retain the information they were to learn from the gamified lesson. Other activities that teachers shared did provide for learning transfer. Additional research is recommended to examine online game structure and affordances within the games that facilitate knowledge retention for students.

Finally, while there is research that identifies types of affordances desirable in high school and college classrooms, there are few studies that view the concept of affordances and which affordances are more desirable from the elementary grade-level perspective. Examining technological affordances from an elementary grade-level perspective may provide useful
information about which types of technologies may be effective for students in lower grades.

**Conclusion**

In her Nobel Peace Prize speech, Emily Green Balch (1948) said, “Technology gives us the facilities that lessen barriers of time and distance.” For at-risk students, the barriers go beyond time and distance. The challenge for educators in the last century has remained how to remove barriers to success for those student groups most challenged by economic and societal hardships. Technology holds the promise of assisting in that task, but the impetus is on the academic community to provide an understanding of how to best leverage technology’s strengths for students.

To contribute to this understanding, this study set out to determine the effects of 1:1 technology implementation on student engagement in an at-risk elementary classroom. While earlier research on student engagement focused on student retention through high school, this study sought to understand how Chromebooks might help engage students with instructional content early enough in their academic careers to increase their chances of academic success. In the study, teachers shared their perceptions of student engagement in largely positive terms. They described students as excited and interested when Chromebooks were part of instruction. They suggested that when the students knew that Chromebooks were part of the lesson, the engagement in the lesson increased.

Overall, I hypothesized that for this particular student group, relevance, novelty, and gamification would play a role in how significantly the students engaged with the content on their Chromebooks. For a student population without regular internet access, using Chromebooks in the classroom was a novel experience. Simulations and virtual experiences, normally
inaccessible to the students but available on the Chromebooks, connected classroom learning with real-world experiences, providing a sense of relevance in the students’ lessons. Chromebooks also provided teachers with a means to quickly and easily gamify content used as instruction, assessment, and reinforcement. Teachers reported that these affordances increased student engagement and in turn supported the students in their learning goals.

It is the hoped that the results of this study can inform other school administrators and decision makers facing similar challenges. 1:1 technology implementations are costly and time-consuming. Having a sense of what benefits might be gained and what challenges are present allows administrators and teachers to make informed decisions about how to implement and use Chromebooks in the classrooms. For the reader, the additional themes and emerging questions like affordances in gamification to promote learning transfer may provide opportunities for future study.
APPENDIX A

TEACHER SURVEY QUESTIONS FOR ONLINE SURVEY

Based on 2004 SETDA Teacher Survey, developed in partnership with Metiri Group; reproduced with permission.
Demographic Questions (Short Answer):
A. What is your age?
B. Including the current year, how many years have you been a teacher?
C. Including the current year, how many years have you been teaching at Dan Powell?
D. Were you a teacher at Dan Powell last year? If not, where did you teach?
E. What subject do you teach?
F. Generally speaking, what is your class size?

Teacher Technology Usage Questions:
1. Which best describes your skill level with word processing/document processing?
   • No Skill
   • Novice
   • Intermediate
   • Highly Skilled

2. Which best describes your skill level with spreadsheets (for data analysis and management)?
   • No Skill
   • Novice
   • Intermediate
   • Highly Skilled

3. Which best describes your skill level with email (including attachment and address book features)?
   • No Skill
   • Novice
   • Intermediate
   • Highly Skilled

4. Which best describes your skill level with presentation software?
   • No Skill
   • Novice
   • Intermediate
   • Highly Skilled

5. Which best describes your skill level with Chromebooks prior to this year?
   • No Skill
   • Novice
   • Intermediate
   • Highly Skilled

6. Which best describes your current skill level with Chromebooks?
   • No Skill
   • Novice
   • Intermediate
   • Highly Skilled
7. What best describes your comfort level with using Chromebooks as a part of instruction?
   • Extremely comfortable
   • Moderately comfortable
   • Somewhat comfortable
   • Not comfortable

**Student Technology Usage Questions:**

8. How much time per week does a typical student in your class(es) use Chromebooks while at school? (Select one)
   • Not at all
   • Less than 30 minutes per week
   • 30 to 60 minutes per week
   • 1 to 2 hours per week
   • More than 2 hours per week

9. How often do students in your class(es) use Chromebooks to communicate with experts, peers, and others (e.g., over email or through discussion boards)?
   • Daily
   • Weekly
   • Monthly
   • Rarely
   • Never
   • Not applicable

10. How often do students in your class(es) use Chromebooks to solve real-world problems (i.e., involving situations, issues, and tasks that people actually tackle in the outside world)?
    • Daily
    • Weekly
    • Monthly
    • Rarely
    • Never
    • Not applicable

11. How often do students in your class(es) use Chromebooks to produce print products?
    • Daily
    • Weekly
    • Monthly
    • Rarely
    • Never
    • Not applicable

12. How often do students in your class(es) use Chromebooks to produce multi-media, Web, or presentation products?
    • Daily
    • Weekly
    • Monthly
13. How often do students in your class(es) use Chromebooks to conduct online research?
   • Daily
   • Weekly
   • Monthly
   • Rarely
   • Never
   • Not applicable

14. How often do students in your class(es) use drill and practice or tutorial software?
   • Daily
   • Weekly
   • Monthly
   • Rarely
   • Never
   • Not applicable

15. How often do students in your class(es) use the Internet to collaborate with students in or beyond your school?
   • Daily
   • Weekly
   • Monthly
   • Rarely
   • Never
   • Not applicable

16. How often do students in your class(es) use Chromebooks to visually represent or investigate concepts (e.g., through concept mapping, graphing, reading charts)?
   • Daily
   • Weekly
   • Monthly
   • Rarely
   • Never
   • Not applicable
Student Engagement Questions
17. How important is the role of student engagement in learning? (Short answer)

18. What behaviors suggest student engagement? (Short answer)

19. What practices in your classroom most affect student engagement? (Short answer)

20. What is the relationship, if any, between technology and student engagement? (Short answer)

21. What effect, if any, have the Chromebooks had on student engagement? (Short answer)
APPENDIX B

SETDA TEACHER SURVEY

Based on 2004 SETDA Teacher Survey, developed in partnership with Metiri Group; reproduced with permission.
**Directions:** This survey is about technology use at your school. You will be asked about your own technology use, the availability of technology at your school, and school/district policies or resources related to technology.

In all questions that follow, “technology” refers to computers (including PDA’s or “Palm Pilots”) or equipment that is used with computers (e.g. scanners, printers, digital video recorders, etc.). Do not consider overhead projects, traditional (i.e. analog) VCRs, or tape recorders when answering these questions.

Most schools across the nation are not yet at the point where budgets, funding requirements, technology resources, etc. allow teachers, students, and administrators to use technology to its full potential. This survey will help identify specific areas of need and will help track changes in these issues over time. For the survey to be most useful, it is important that you respond as honestly as you can. Please be assured that individual responses will never be used for reporting.

*Thank you for your help!!*

**Background Information**

School Name: __________________________
State: ________________________________
NCES School ID: □□□□□□□□□□□□□□□□

<table>
<thead>
<tr>
<th>T1</th>
<th>School level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
<td>a. Elementary</td>
</tr>
<tr>
<td>□</td>
<td>b. Middle</td>
</tr>
<tr>
<td>□</td>
<td>c. High</td>
</tr>
<tr>
<td>□</td>
<td>d. Mixed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T2</th>
<th>What grade levels do you currently teach? (Check all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
<td>a. Pre-K</td>
</tr>
<tr>
<td>□</td>
<td>b. Kindergarten</td>
</tr>
<tr>
<td>□</td>
<td>c. 1st grade</td>
</tr>
<tr>
<td>□</td>
<td>d. 2nd grade</td>
</tr>
<tr>
<td>□</td>
<td>e. 3rd grade</td>
</tr>
<tr>
<td>□</td>
<td>f. 4th grade</td>
</tr>
<tr>
<td>□</td>
<td>g. 5th grade</td>
</tr>
<tr>
<td>□</td>
<td>h. 6th grade</td>
</tr>
<tr>
<td>□</td>
<td>i. 7th grade</td>
</tr>
<tr>
<td>□</td>
<td>j. 8th grade</td>
</tr>
<tr>
<td>□</td>
<td>k. 9th grade</td>
</tr>
<tr>
<td>□</td>
<td>l. 10th grade</td>
</tr>
<tr>
<td>□</td>
<td>m. 11th grade</td>
</tr>
<tr>
<td>□</td>
<td>n. 12th grade</td>
</tr>
<tr>
<td>□</td>
<td>o. Ungraded</td>
</tr>
</tbody>
</table>

| T3 | Which subject(s) do you teach? |
(Check all that apply)

- □ a. General Elementary (all subjects)
- □ b. Mathematics
- □ c. Science
- □ d. English
- □ e. History/Social Sciences
- □ f. The Arts
- □ g. Foreign Languages
- □ h. PE/Health
- □ i. Special Ed.

**T4**
Including this school year, how many years have you taught?

- □

**T5**
Including this school year, how many years have you taught at your current school?

- □

**T6**
Taking into account professional and personal use, how often do you typically use the Internet from home? (Select one)

- O Daily or almost daily
- O One or more times per week
- O One or more times per month
- O Less than monthly
- O Never

**S1-1**

**T7**
Are data being collected to determine if technology is impacting student achievement in your content area(s)?

- O No
- O Yes, to some extent
- O Yes, definitely

**T8**
Do those data clearly indicate that technology is positively affecting student achievement?

- O No
- O Yes, to some extent
- O Yes, definitely

**S1-2**
<table>
<thead>
<tr>
<th>T9</th>
<th>Are data being collected to determine if technology is impacting students’ 21st Century Skills (like information literacy, visual literacy, self-direction, or global awareness)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>O No</td>
<td></td>
</tr>
<tr>
<td>O Yes, to some extent</td>
<td></td>
</tr>
<tr>
<td>O Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T10</th>
<th>Do those data clearly indicate that technology is positively affecting students’ 21st Century Skills (like information literacy, visual literacy, self-direction, or global awareness)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>O No</td>
<td></td>
</tr>
<tr>
<td>O Yes, to some extent</td>
<td></td>
</tr>
<tr>
<td>O Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T11</th>
<th>Are data being collected to determine if technology is impacting students’ technology literacy?</th>
</tr>
</thead>
<tbody>
<tr>
<td>O No</td>
<td></td>
</tr>
<tr>
<td>O Yes, to some extent</td>
<td></td>
</tr>
<tr>
<td>O Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T12</th>
<th>Do those data clearly indicate that technology is positively affecting students’ technology literacy?</th>
</tr>
</thead>
<tbody>
<tr>
<td>O No</td>
<td></td>
</tr>
<tr>
<td>O Yes, to some extent</td>
<td></td>
</tr>
<tr>
<td>O Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T13</th>
<th>Are data being collected to determine if technology is impacting student engagement?</th>
</tr>
</thead>
<tbody>
<tr>
<td>O No</td>
<td></td>
</tr>
<tr>
<td>O Yes, to some extent</td>
<td></td>
</tr>
<tr>
<td>O Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T14</th>
<th>Do those data clearly indicate that technology is positively affecting student engagement?</th>
</tr>
</thead>
<tbody>
<tr>
<td>O No</td>
<td></td>
</tr>
<tr>
<td>O Yes, to some extent</td>
<td></td>
</tr>
<tr>
<td>O Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T15</th>
<th>How much time per week does a typical student in your class(es) use technology while at school?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(Select one)

- O Not at all
- O Less than 30 minutes per week
- O 30 to 60 minutes per week
- O 1 to 2 hours per week
- O More than 2 hours per week

<table>
<thead>
<tr>
<th>T16</th>
<th>In your classes, what role does technology play in building the following skills or proficiencies in your students? <strong>Mark “NA” only if you are not working on this skill or proficiency with your class.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Select one)</td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
</tr>
<tr>
<td>a. Writing</td>
<td>O</td>
</tr>
<tr>
<td>b. Mathematics</td>
<td>O</td>
</tr>
<tr>
<td>c. Science</td>
<td>O</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T17</th>
<th>When designing technology-supported learning experiences, how frequently do you use research to guide your decision-making? (Select one)</th>
</tr>
</thead>
</table>
|     | O Always or almost always
|     | O Sometimes
|     | O Never or almost never
|     | O I don’t know
|     | O Not applicable; I don’t use technology to support student learning

<table>
<thead>
<tr>
<th>T18</th>
<th>How often do students in your class(es) use technology to do the following? Mark “Not Applicable” only if this use does not apply to your subject area:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Select one)</td>
</tr>
<tr>
<td></td>
<td>Daily</td>
</tr>
<tr>
<td>a. Communicate with experts, peers, and others (e.g., over email or through discussion boards)</td>
<td>O</td>
</tr>
<tr>
<td>b. Solve real-world problems (i.e., involving situations, issues, and tasks that people actually tackle in the outside world)</td>
<td>O</td>
</tr>
<tr>
<td>c. Produce print products</td>
<td>O</td>
</tr>
<tr>
<td>d. Produce multi-media, Web, or presentation products</td>
<td>O</td>
</tr>
<tr>
<td>e. Conduct online research</td>
<td>O</td>
</tr>
<tr>
<td>f. Use drill and practice or tutorial software</td>
<td>O</td>
</tr>
</tbody>
</table>
g. Use the Internet to collaborate with students in or beyond your school  

h. Visually represent or investigate concepts (e.g., through concept mapping, graphing, reading charts)  
i. Use digital tools and peripheral devices (e.g., digital cameras, probes, scanners) to enhance their learning or their school work  

| C1-2 | T19 | In my school, teachers:  
(Select one)  

- O Are expected to use technology regularly, as appropriate to their teaching assignment (e.g., once a week)  
- O Are expected to use technology a few times each year  
- O Decide individually whether and how often they will use technology. There are no expectations for technology use, or expectations exist, but teachers don’t implement them.  

| C1-2 | T20 | In my school, teachers in the same grade or subject-area:  
(Select one)  

- O Share little or no common understanding about how technology will be used. Teachers decide individually whether and how they will use technology.  
- O Share some common understanding about how technology should be used; however, some teachers implement these uses and others do not. (For example, your earth science curriculum guide identifies spreadsheets as the adopted way of teaching graphing and data analysis; however, some teachers do not use technology for this purpose.)  
- O Share a common understanding about how technology will be used to enhance learning, and there are clear expectations that technology will be used in these ways. (For example, your earth science curriculum guide identifies spreadsheets as the adopted way of teaching graphing and data analysis, and every earth science teacher uses technology for this purpose.)  

| C1-3 | T21 | Which of the following strategies has your school employed for addressing students’ technology literacy:  
(Check all that apply)  

- a. My school has identified specific skills (e.g., using technology to collaborate effectively with peers) that students must have in order to be technologically literate.  
- b. My school has a specific program or plan for helping students become technologically literate (e.g., responsibilities are officially assigned to subject areas for covering different technology skills, or students take stand-alone courses to build technology literacy).  
- c. Technology literacy is assessed formally at some point during a student's tenure in my school.  

Columns 2 & 3: S1-4; Column 4: C1-3
<table>
<thead>
<tr>
<th>Technology</th>
<th>T22 Which technologies do you require students to use for your classes?</th>
<th>T23 Which technologies do you explicitly teach students to use?</th>
<th>T24 For which technologies do you explicitly assess student proficiency?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Word processing/document processing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Spreadsheets (for data analysis and management)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Other data analysis (SPSS, Fathom, Mathematica) or database software (e.g., Microsoft Access, Filemaker Pro)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Email (including attachment and address book features) and Web browsers (including book-marking, “back” or “home” features)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Presentation software (e.g., PowerPoint, Astound)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. Multimedia editing or authoring tools (e.g., Authorware, Hyperstudio Photoshop, Illustrator) or video editing technology</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. Graphic peripherals (e.g., scanners, digital cameras)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>h. Electronic information sources like the WEB, ERIC, EBSCO (searching for these efficiently, for example, by using “and” / “or” to narrow/expand a search, identifying synonyms or keywords)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>i. Technologies specific to your field (e.g., probeware in the sciences, geographic information systems in the social sciences)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skill</th>
<th>T25 I explicitly design class content or assignments to build this skill in students (Check all that apply)</th>
<th>T26 I explicitly assess whether students are proficient in this skill (Check all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Understanding ethical, legal and societal issues related to technology use, and using technology in ethical ways (e.g., the Internet and individual right to privacy)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Understanding the fundamentals of technology systems (e.g., understanding distinctions between hardware and software, familiarity with basic computer functions)</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

C1-4

T27 How prepared do you feel to manage technology-supported learning with your class(es)? (Select one)
O I have a variety of classroom management and organizational strategies for using technology. I know I can smoothly orchestrate technology-supported learning activities in a variety of settings and ways (whole class, small group, centers in labs or the classroom).

O I have some classroom management and organizational strategies, but think I need more.

O I have very few classroom management and organizational strategies for using technology

---

**T28**

“**Best practices with technology**” are technology-supported teaching practices that either have a basis in educational theory or are supported by research.

How are **best practices with technology** identified and shared at your school?

(Select one)

- O Our school has a formal process for identifying best practices and then ensuring that every classroom teacher learns of those practices (as appropriate to their teaching assignment).
- O Best practices are identified and shared informally. For example, an enthusiastic teacher finds an innovative practice, and sharing happens either informally or at staff meetings. A number of teachers eventually learn about these practices.
- O Best practices are not typically identified or shared at my school.

---

**T29**

At your school, how frequently are teachers exposed to innovations and best practice in teaching with technology?

(Select one)

- O On an ongoing basis
- O Occasionally
- O Almost never

---

**T30**

Which best describes your skill level with each of the following technologies:

<table>
<thead>
<tr>
<th>Technology</th>
<th>No Skill</th>
<th>Novice</th>
<th>Intermediate</th>
<th>Highly Skilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Word processing/document processing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Spreadsheets (for data analysis and management)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Other data analysis (e.g., SPSS, Fathom, Mathematica) or database software (e.g., Microsoft Access, Filemaker Pro)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Email (including attachment and address book features) and Web browsers (including book-marking, “back” or “home” features)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Presentation software (e.g. PowerPoint, Astound)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. Multimedia editing or authoring tools (e.g., Authorware, Hyperstudio Photoshop, Illustrator) or video editing technology</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. Graphic peripherals (e.g., scanners, digital cameras, etc.)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
h. Electronic information sources like the WEB, ERIC, EBSCO (searching for these efficiently, for example, by using “and” / “or” to narrow/expand your search, identifying synonyms or keywords)  

i. Technologies specific to your field (e.g., probeware in the sciences, geographic information systems in the social sciences)

C2-2

IMPORTANT: Questions T31 through T34 describe various aspects of using technology for teaching, assessment, or professional development. Many of the approaches or strategies described are high-level, and in some cases, teachers simply do not have the resources or training to implement them. The questions are intended to track progress as technology access and professional development change over the next few years. Please indicate your level of agreement with the following statements.

<table>
<thead>
<tr>
<th>T31</th>
<th>Planning Technology-Supported Instruction:</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>When designing my lessons, I <strong>regularly</strong> think about whether technology could enhance my teaching or student learning.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b.</td>
<td>When selecting education technologies, I refer to and base my selections on current research on their effectiveness.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c.</td>
<td>I am comfortable planning for class sessions that involve students using technology during instruction.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

C2-2

<table>
<thead>
<tr>
<th>T32</th>
<th>Executing Technology-Supported Instruction</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>I <strong>regularly</strong> use technology to enhance learning in my classroom.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b.</td>
<td>I have classroom management and organizational strategies for using technology; I can smoothly orchestrate learning activities when my students use technology.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

Rows A & C: C2-3;  Row B: C2-4

<table>
<thead>
<tr>
<th>T33</th>
<th>Technology and Assessment:</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>I use technology to help me manage student assessment data (e.g., using electronic gradebooks)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b.</td>
<td>I have effective strategies for assessing the content of students’ technology-supported work (e.g., assessing student work when the product includes research from several online sources, or when the product is a Web page or digital video rather than the traditional essay)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c.</td>
<td>I am comfortable using technology to help me gather, analyze, and interpret data on student progress (e.g., by graphing trends in achievement, using hand-held computers to collect data on students as they are learning).</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
### T34
**Technology For My Professional Use:**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I use technology to support my own professional growth through activities such as online learning, research, and collaborative projects.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. I regularly use technology to communicate and collaborate with peers (e.g., email, threaded discussion boards, listserv, chat)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. I regularly use technology to increase my own productivity as a professional (e.g., word processing, email, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

### T35
**During this school year, which of the following products do (or will) students in your classes use to demonstrate their learning?** (Check all that apply)

- [ ] a. Word-processed documents
- [ ] b. Presentations (e.g., PowerPoint)
- [ ] c. Electronic portfolios
- [ ] d. Video or audio products
- [ ] e. Electronic art (e.g., digital photography, Kidpix for illustrations, Draw software for graphics)
- [ ] f. Websites
- [ ] g. Models (e.g., modeling population trends in animal life based on different environmental legislation)
- [ ] h. Submissions to journals, newspapers, or magazines (electronic or in-print)

### T36
**Which of the following are you currently doing (or have you done) during this school year?** (Check all that apply)

- [ ] a. Formally or informally collaborating with other educators using email
- [ ] b. Formally or informally collaborating with other educators using the Internet (other than email)
- [ ] c. Taking an online course
- [ ] d. Participating in technology-related professional development (workshops, training sessions)
- [ ] e. Taking a technology-related course at a university

### T37
**Rate your access to the following items while at school:**

<table>
<thead>
<tr>
<th></th>
<th>Non-Existent</th>
<th>Very Poor/Barely Adequate</th>
<th>Adequate or Pretty Good</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>O</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>a. The type of equipment I want to use with my students for planning lessons or for professional development (e.g., cameras, scanners)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Sufficient numbers of computers and other equipment (e.g., cameras, printers) so I can implement technology-supported learning opportunities as I want to</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Computers and other equipment where I need them (e.g., in my classroom; in a science lab)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Reliability of computers, printers, projectors, and other equipment (i.e., it works when I need it)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Reliable, high-speed access to the Internet in classrooms, labs, and media centers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Software, appropriate for my content area and the age of my students, that I want to use with class(es)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Technology tools for my own productivity (e.g., electronic gradebooks, word processing, presentation software)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Distance Learning Opportunities (e.g., online courses or professional development offered through video-conferencing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Technical support with little or no wait-time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Instructional support that helps me to integrate technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**T38**

Rate **your** access to the following items while **outside of school**:

By relatively new computer, we mean computers that are:

- Less than 4 years old
- Run MAC OS 9 or above, or Win 98/Windows
- 2000/Windows XP or above
- Have 128 MN RAM or above

<table>
<thead>
<tr>
<th>Item</th>
<th>Non-Existent</th>
<th>Very Poor/Barely Adequate</th>
<th>Adequate or Pretty Good</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. A relatively new computer</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Internet access</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. High-speed Internet access (DSL or cable)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. Access to school servers</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>e. Software, appropriate to my content area and the age of my students, that I want to use with my class(es)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>f. Technology tools for my own productivity (e.g., electronic gradebooks, word processing, presentation software)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>g. Distance Learning Opportunities (e.g., online courses)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
**T39**
Rate your students’ access to the items below while **outside of school**:
(Take your best guess at students’ access outside of school and mark “Don’t Know” only if you have absolutely no idea)

<table>
<thead>
<tr>
<th></th>
<th>Don’t Know</th>
<th>Non-Existent</th>
<th>Very Poor/Barely Adequate</th>
<th>Adequate or Pretty Good</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. A relatively new computer</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Internet access</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. High-speed Internet access (DSL or cable)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. Access to school servers</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>e. Access to software I use for my classes</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>f. Distance Learning Opportunities (e.g., online courses)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**IMPORTANT**: Questions **T40** - **T43** ask about different groups of students’ access to:
**Equipment and software**: Examples include access to up-to-date computers in the classroom, scheduled time in computer labs, etc.
**A wide variety of technology uses**: Examples include using technology for creating presentations, doing research, publishing online, and other purposes versus using technology only for drill and practice or word-processing.

**T40**
In your school, have you gathered any data regarding possible variations in access to technology for the following groups of students?

<table>
<thead>
<tr>
<th></th>
<th>Don’t know</th>
<th>Have not gathered data</th>
<th>A little data gathered informally</th>
<th>A lot of informal data collected</th>
<th>Some formal data gathered</th>
<th>A great deal of formal data collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Students from low socio-economic backgrounds</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Girls</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. Students from historically disadvantaged racial or ethnic backgrounds</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. Students with special learning needs</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

Row A: C4 - 1;   Row B: C4 - 2;   Row C: C4 - 3;   Row D: C4 - 4

**T41**
In your school, how much access do the following groups of students have to **a wide variety of technology uses** compared to their peers?

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Students from low socio-economic backgrounds</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Girls</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. Students from historically disadvantaged racial or ethnic backgrounds</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. Students with special learning needs</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
T42
Do all schools in your district that are the same grade level (e.g., all elementary schools) have approximately the same level of access to **equipment and software**?

- O Don’t know
- O Some schools have far less access and others have far more
- O Some schools have somewhat less access and others have somewhat more
- O There is no real difference between schools

---

C4-5

T43
Do all schools in your district that are the same grade level (e.g., all elementary schools) have approximately the same level of access to a **wide variety of technology uses**?

- O Don’t know
- O Some schools have far less access and others have far more
- O Some schools have somewhat less access and others have somewhat more
- O There is no real difference between schools

---

C5-1

T44
Does your school or district have a vision for how technology should be used by students and by teachers to improve teaching and learning? (Select one)

- O I don’t know
- O Yes, a formal, written vision that has been shared with myself and other teachers
- O Yes, a formal, written vision, but many teachers have not actually seen it
- O Yes. It isn’t written down, but it has been clearly shared with me and other teachers
- O Yes. But it isn’t written down, and I and many other teachers aren’t really aware of what the vision is
- O No. I am not aware of a vision for technology use, written or un-written

---

C5-2

How true is each of the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very</th>
<th>Some</th>
<th>Not at all</th>
<th>I don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>T45 Our academic learning standards or content standards:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Specifically incorporate technology literacy</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Specifically incorporate 21st Century skills (like information literacy, visual literacy, self-direction, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>T46 When teachers design curriculum and plan instruction, this district requires that they consider:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21st Century Skills like information literacy, visual literacy, global awareness, and self-direction</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>T47 In this district, we have assessments that:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Measure 21st Century Skills like information literacy, visual literacy, global awareness, and self-direction**

O O O O

---

**C5-4**

**IMPORTANT: Questions T48 - T50** ask about technology-related policies, training, and incentives in your school or district. Teachers sometimes have difficulty responding candidly if they feel that they are being “disloyal” to their school. However, it is understood that some of the issues addressed in the questions are limited by budgets, funding requirements, or state/federal policies, and may not be in control of school leadership. Please respond to each item as honestly as you can.

<table>
<thead>
<tr>
<th>T48</th>
<th>Rate your agreement with the following statements. In my school:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>a.</td>
<td>Innovative, technology-supported teaching practices are rewarded (e.g., through public recognition, software or equipment for professional use, stipends for professional development)</td>
</tr>
<tr>
<td>b.</td>
<td>Risk-taking in exploring innovative practices with learning technology is encouraged and accepted.</td>
</tr>
<tr>
<td>c.</td>
<td>Research and best-practice are viewed by teachers and administrators as valuable and necessary for making decisions about technology use.</td>
</tr>
<tr>
<td>d.</td>
<td>Teachers are excited about learning new ways of using learning technology to improve student learning in their content areas or grade levels.</td>
</tr>
<tr>
<td>e.</td>
<td>Teachers are not afraid to learn about new technologies and use them with their class(es).</td>
</tr>
<tr>
<td>f.</td>
<td>School leadership is willing to support – through funding or manpower – teachers’ efforts at innovation and technology integration.</td>
</tr>
</tbody>
</table>

**T49**

| Rate your agreement with the following statements. In my school: |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| a.  | Practices identified as research-based or “proven”— including lesson plans and curricula — are posted online so that they are accessible by all teachers. | O | O | O | O |
| b.  | Incentives are provided to teachers who adopt proven best practices related to technology (e.g., laptops, conferences attendance, stipends for professional development). | O | O | O | O |

**T50**

<table>
<thead>
<tr>
<th>To what extent does your school encourage innovative teaching practices? Innovation is generally:</th>
</tr>
</thead>
<tbody>
<tr>
<td>O Rewarded (e.g., through public recognition, equipment, professional development)</td>
</tr>
<tr>
<td>O Supported, but not rewarded</td>
</tr>
</tbody>
</table>
Which of the following incentives are provided by your school/district to encourage teachers to use learning technology? (Check all that apply)

- a. Release time for planning the use of technology
- b. Schedule changes so teachers have time to learn and plan collaboratively
- c. Classes or workshops related to technology integration
- d. Expectations/requirement that professional staff use technology for teaching and learning
- e. Ability to check out school technology for use over the summer months
- f. Special purchasing plans for technology (e.g., discounts, paybacks through professional development, or interest-free loans)
- g. Funding or grants for classroom-based and media center technology resources
- h. Access to a technology-based administrative/student information system
- i. Technology certification for teachers
- j. Salary incentives for teachers participating in technology related professional development
- k. Public acknowledgement or recognition (e.g., in newsletters or during school board meetings) when teachers use technology effectively

During this school year:

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. My students have had the opportunity to work on projects or assignments that involve collaborating with organizations (environmental groups, businesses) or individuals in their community.</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Students in <strong>other</strong> classes in this school have had the opportunity to work on projects or assignments that involve collaborating with organizations (environmental groups, businesses) or individuals in their community.</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

As a result of technology:

<table>
<thead>
<tr>
<th></th>
<th>Decreased</th>
<th>Remained the same</th>
<th>Increased a little</th>
<th>Increased moderately</th>
<th>Increased substantially</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. My interactions with my students’ parents has:</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Parents’ involvement in my students’ schoolwork has:</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>T54</td>
<td>In the last two school years, have you participated in school or district-offered professional development that was in any way related to technology use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>O  Yes</td>
<td>O  No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Answer Question T55 ONLY if you marked Yes on Question T54.

**T55**

How true is each statement below about the professional development experiences offered by your district or school? Base your responses on your experiences over the last two school years.

<table>
<thead>
<tr>
<th>Professional development offered by my school or district:</th>
<th>Very True</th>
<th>Somewhat true</th>
<th>Not at all true</th>
<th>I don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Prepares teachers to discuss specific research or theory upon which the professional development is based.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Prepares teachers to assess student work produced with technology (e.g., when students produce a research report using a variety of online resources).</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. Includes opportunities for teachers to see actual examples of technology applied to learning in classrooms similar to their own.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. Allows teachers to practice skills acquired during professional development in real or simulated classroom settings.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>e. Includes time for teachers to work together, and to discuss and plan for using technology in the classroom.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>f. Is flexible enough to change direction or focus, depending on teachers’ needs and interests.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>g. Explicitly shows participants how specific technology uses are related to standards and school improvement goals.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>h. Takes into account the resources, equipment, and support available to teachers, and makes certain in advance that the uses of technology covered during training can be implemented in the classroom.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>i. Includes strategies for getting &quot;behind the classroom door&quot; that require teachers to observe and be observed by other teachers.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>j. Tracks teachers as they gain skills, and provides opportunities for even the most advanced integrators of technology to enhance their skills.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**THANK YOU!**

You have successfully completed the survey.
APPENDIX C

SEMI-STRUCTURED TEACHER INTERVIEW QUESTIONS
Technology Questions

1. What are your experiences with technology?
2. What is your view of personal technologies (i.e., smartphones, tablets, laptops, notebook computers)?
3. What is your view of educational technologies (those technologies mentioned above used in an education setting)?
4. What was your experience or familiarity with the Chromebook prior to this year?
5. What was your comfort level with the Chromebook prior to this year?
6. What type of training did you receive? Did it affect your comfort level? If so, how?
7. Do you use the Chromebooks as a part of your instruction?
8. How do you use the Chromebook? What types of activities?

Student Engagement Questions

1. Are you familiar with the term, “student engagement”? How would you define student engagement?
2. Overall how do you view the level of student engagement in your classroom?
3. How does your students’ engagement level compare to last year?
4. What factors do you feel affect student engagement?
5. How do you perceive the relationship between student engagement and technology—specifically using Chromebooks?
6. Do you see any change in engagement during Chromebook usage? If so, explain.
APPENDIX D

INSTITUTIONAL REVIEW BOARD DOCUMENTS
May 7, 2018

Student Investigator: [Redacted]
Department of Learning Technologies
University of North Texas

Re: Human Subjects Application No. 17-262

Dear [Redacted]

As permitted by federal law and regulations governing the use of human subjects in research projects (45 CFR 46), the UNT Institutional Review Board has reviewed your proposed project titled “Teacher Perceptions of Student Engagement as Related to Technology Use in the Classroom.” The risks inherent in this research are minimal, and the potential benefits to the subject outweigh those risks. The submitted protocol is hereby approved for the use of human subjects in this study. Federal Policy 45 CFR 46.109(c) stipulates that IRB approval is for one year only, July 7, 2017 to July 6, 2018.

Enclosed are the consent documents with stamped IRB approval. Please copy and use this form only for your study subjects.

It is your responsibility according to U.S. Department of Health and Human Services regulations to submit annual and terminal progress reports to the IRB for this project. The IRB must also review this project prior to any modifications. If continuing review is not granted before July 6, 2018, IRB approval of this research expires on that date.

Please contact The Office of Research Integrity and Compliance at 940-565-4643, if you wish to make changes or need additional information.

Sincerely,

[Redacted]
Professor
Chair, Institutional Review Board

CT jm
Informed Consent Form

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

**Title of Study:** Teacher Perceptions of Student Engagement as Related to Technology Use in the Classroom

**Student Investigator:** University of North Texas (UNT) Department of Learning Technologies.

**Supervising Investigators:**

**Purpose of the Study:** You are being asked to participate in a research study which involves using teacher observations of student engagement to understand how student engagement may be affected by the use of Chromebooks.

**Study Procedures:** You have been invited to participate in a study about student engagement as it relates to technology. This study includes three phases. The first phase is an online survey that asks you about your views regarding technology and student engagement.

Based on the information you provided, you have been selected by the researcher to participate in the second phase. The second phase consists of an interview which allows you to share more about your views. The researchers will seek respondents that provide a continuum of positive to negative experiences to provide a depth of knowledge about why and how participants responded as they did. This will allow for a typification of participant experiences. The semi-structured interview will take approximately 1 hour of your time. The audio of the interview will be recorded so that it can be transcribed. The interviews will be transcribed by the Student Investigator. During the transcription, personal identifiers will be removed and your personal information will be replaced with a letter identifier. Once the audio data is transcribed, it will be coded to look for patterns in responses. These patterns may help the researchers understand the relationship, if any, between Chromebook use and student engagement. The original recordings and transcriptions will be kept on the UNT campus with the supervising investigator for a period of three years following the end of the study. After that time, the paper copies will be shredded, and digital files will be erased using commercial software applications designed to remove all data from the storage device.

You are also invited to participate in the third phase. The third phase involves a brief observation of your classroom while technology is in use. This observation will last 30 to 45 minutes and will be conducted by the **Student Investigator**. The observation is to better understand how you use technology and how students respond to the Chromebooks.
The observation will NOT be recorded and any notes taken will not include names of students. Your observation will be connected to your interview by assigning the same letter identifier. Once the observation is associated with your interview, your name and any other personal identifiers will be deleted. Observation notes will be coded and analyzed for patterns. The notes and analysis will be kept on the UNT campus with the supervising investigator for a period of three years following the end of the study. After that time, paper copies will be shredded, and digital files will be erased using commercial software applications designed to remove all data from the storage device.

Your participation in each of the phases is completely voluntary. You may withdraw your participation at any time.

**Foreseeable Risks:** No foreseeable risks are involved in this study.

**Benefits to the Subjects or Others:** We expect the project to benefit you by providing insight into how student engagement can be affected by the introduction of technology. This knowledge may help you as you use technology in your own classroom.

**Compensation for Participants:** For completing the interview and possible subsequent observation, you will be given a $10 Starbucks card as a thank you for your time.

**Procedures for Maintaining Confidentiality of Research Records:** Investigators will protect your personal information closely so no one will be able to connect your responses and any other information that identifies you. Federal or state laws may require us to show information to university or government officials who are responsible for monitoring the safety of this study. You will not be identified in any publication or presentation from this study. All data associated collected for this study will be stored on the UNT campus with the supervising investigator for a period of three years following the end of the study.

The security and confidentiality of information collected from your email survey cannot be guaranteed. Confidentiality will be kept to the extent permitted by the technology being used. Information collected via email can be interrupted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses. Your email address will be discarded once you have received compensation, or participation is discontinued.

Confidentiality will be maintained to the degree possible given the technology and practices used by the online survey company. Your participation in this online survey involves risks to confidentiality similar to a person’s everyday use of the internet.

**Questions about the Study:** If you have any questions about the study, you may contact [Redacted].

**Review for the Protection of Participants:** This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-4643 with any questions regarding the rights of research subjects.

Office of Research Integrity & Compliance
University of North Texas
Last Updated: July 11, 2011

APPROVED BY THE UNT IRB
7/7/17 - 7/6/18

Page 2 of 3
Research Participants’ Rights:

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- [Signature] has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

Printed Name of Participant

Signature of Participant __________________________ Date __________

For the Student Investigator or Designee:

I certify that I have reviewed the contents of this form with the subject signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

Signature of Student Investigator __________________________ Date __________
July 5, 2018

[Redacted]
Department of Learning Technologies
University of North Texas

RE: Human Subjects Application No. 17-262

Dear [Redacted]:

The UNT Institutional Review Board has reviewed and approved the extension you requested to your project titled “Teacher Perceptions of Student Engagement as Related to Technology Use in the Classroom.” Your extension period is for one year, July 5, 2018 through July 4, 2019. Federal policy 45 CFR 46.109(c) stipulates that IRB approval is for one year only.

Enclosed is your consent document with stamped IRB approval. Please copy and use this form only for your study subjects.

The UNT IRB must re-review this project prior to any modifications you make in the approved project. It is your responsibility according to U.S. Department of Health and Human Services regulations to submit annual and terminal progress reports to the IRB for this project. Please mark your calendar accordingly.

Please contact The Office of Research Integrity and Compliance, 940-565-4643, if you need additional information.

Sincerely,

[Redacted]
Professor
Chair, Institutional Review Board

SRjm
The observation will NOT be recorded and any notes taken will not include names of students. Your observation will be connected to your interview by assigning the same letter identifier. Once the observation is associated with your interview, your name and any other personal identifiers will be deleted. Observation notes will be coded and analyzed for patterns. The notes and analysis will be kept on the UNT campus with the supervising investigator for a period of three years following the end of the study. After that time, paper copies will be shredded, and digital files will be erased using commercial software applications designed to remove all data from the storage device.

Your participation in each of the phases is completely voluntary. You may withdraw your participation at any time.

**Foreseeable Risks:** No foreseeable risks are involved in this study.

**Benefits to the Subjects or Others:** We expect the project to benefit you by providing insight into how student engagement can be affected by the introduction of technology. This knowledge may help you as you use technology in your own classroom.

**Compensation for Participants:** For completing the interview and possible subsequent observation, you will be given a $10 Starbucks card as a thank you for your time.

**Procedures for Maintaining Confidentiality of Research Records:** Investigators will protect your personal information closely so no one will be able to connect your responses and any other information that identifies you. Federal or state laws may require us to show information to university or government officials who are responsible for monitoring the safety of this study. You will not be identified in any publication or presentation from this study. All data associated collected for this study will be stored on the UNT campus with the supervising investigator for a period of three years following the end of the study.

The security and confidentiality of information collected from your email survey cannot be guaranteed. Confidentiality will be kept to the extent permitted by the technology being used. Information collected via email can be interrupted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses. Your email address will be discarded once you have received compensation, or participation is discontinued. Confidentiality will be maintained to the degree possible given the technology and practices used by the online survey company. Your participation in this online survey involves risks to confidentiality similar to a person’s everyday use of the internet.

**Questions about the Study:** If you have any questions about the study, you may contact [Person’s Name] at [Phone Number or Email].

**Review for the Protection of Participants:** This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-4643 with any questions regarding the rights of research subjects.

Office of Research Integrity & Compliance  
University of North Texas  
Last Updated: July 11, 2011

Page 2 of 3
Research Participants' Rights:

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

Printed Name of Participant

Signature of Participant  Date

For the Student Investigator or Designee:

I certify that I have reviewed the contents of this form with the subject signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

Signature of Student Investigator  Date
REFERENCES


Jones, V., Jo, J., & Martin, P. (2007, February). Future schools and how technology can be used to support millennial and generation-z students. In ICUT 2007 (Proc. B), 1st Int. Conference on Ubiquitous Information Technology (pp. 12-14).


143


