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**Emotional Regulation and Technology in
Various Educational Environments**

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Abstract

The purpose of this study was to examine the use of technology in various educational environments. Specifically, it looked at the ways in which technology is integrated into special education classrooms, and how it impacts learning. Two self-contained special education high school classrooms were studied, using qualitative methods of data. These included field notes based on observations and a semi-structured interview. In addition, a review of the literature on this topic was conducted to better place the study within the context of wider work done in this area. The data from the two classrooms were analyzed using the constant comparative method. The results of the study were presented along with a discussion regarding the findings, including the two main themes which were teacher comfort with technology and the impact that the technology has on the students. Although both teachers were different, and had vastly different teaching styles and experiences in the classroom, both found these themes to be the most important. Finally, conclusions were drawn based on the findings of the study, which included the type of training that might be helpful for teachers and staff working with special needs students using educational technology. Implications regarding future research and ways to generate deeper awareness and more effective use of educational technology with special education students were explored.

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Chapter 1 – Introduction

Incorporating technology into our educational landscape is a challenging task. With the advent of the idea of ‘21st century education,’ there has been more of a push than ever before to get the right device into the hands of teachers and students alike. However, in our pursuit of modern, up-to-date educational practices, implementation often falls short of an ideal in which we would be taking into consideration not only what the technology can do, but what the student feels and how the student reacts as a result of using the technology.

Layered on top of the work of Dewey (1899), which promoted the ‘whole child’ approach to education at the start of the twentieth century, a multi-modal, emotionally inclusive approach has informed educators since Bloom (1956) recognized the affective domain in his groundbreaking taxonomy. He was able to successfully describe the ways in which people react emotionally and their ability to feel other living things' pain or joy. Affective objectives typically target the awareness and growth in attitudes, emotion, and feelings. To apply an affective domain to an educational model was a new and valuable undertaking, enriching our understanding of the learning process itself.

Even though this fundamental understanding of the importance of a student’s personal investment and emotional regulation during learning has been a bedrock of our educational system, more and more educators seem to find that testing and data collection have led to a sharp decline in educators’ abilities to take the whole child’s needs into consideration. In addition, the inclusion of technology into our daily teaching practices can sometimes feel disconnected from the emotional lives of students. The emphasis on test results have often steered us away from recognizing the importance of emotional connections to learning. The pendulum has swung from

the whole child progressive ideas of Dewey, to the industrialized, results driven, product-oriented educational environment of the past decades. More recently, educators have been questioning the need for such excessive testing, and are revisiting many of the more progressive approaches.

Statement of the Problem

As our world becomes more immersed in technology, and the call to educational leaders is more consistently the call for an increase in technology, it is crucial to better understand the impact of technology on learning. While technology can, and often does support deeper learning for all students (McLoughlin & Lee, 2007), this is not always the case. In fact, without appropriate, thoughtful and developmentally astute designing, educational programs that implement technology can have poor learning outcomes (Galusha, 1998). While many view technology, particularly for special education students, as a panacea, studies have shown that without a solid instructional foundation or definitive purpose, success may be elusive (Olson & Olson, 2000).

For students with social, emotional, behavioral, psychiatric and developmental challenges, learning to regulate their emotions so that they are able to participate is part of their educational process. Feeling emotionally safe, in a welcoming classroom environment, encourages continued participation (Sheffler, 2009). Many of these students lack social-emotional competencies (Becker & Luthar, 2002). If students are not engaged in their learning, the process is laborious and students learn less, tend to react negatively to their lessons, and in general retain less information (Malekzadeh, Mustafa, & Lahsasna, 2015). So too, must the use of technology incorporate these aims. Since positive emotions promote higher cognitive flexibility and allow the learner to discover new ideas and possibilities (Baker, D'Mello,

Rodrigo, & Graesser, 2010), positive emotional experiences such as feeling engaged or delighted, impact learning in a positive way. The use of technology for its own sake is not a justified rationale for its use. Technology must be incorporated thoughtfully, with care and planning, and with the idea that at the heart of the planning is the child.

Thesis Study

The purpose of this study is to examine how technology is used with special education high school students. This purpose generated the following research question:

1. How are teachers integrating educational technology in the special education classroom?

The study will utilize the case study methodology, to investigate how a small sample of teachers integrated technology in the special education classroom.

The reason I chose the case study methodology is because it was a preferred methodology for the purpose of my research study; namely, it answered ‘how’ and ‘why’ questions, it took place in a setting in which I had no control over behavioral events, and it was not an historical study, but a contemporary one (Yin, 2003). The case study method was chosen, too, because it provided, for a small number of cases, insight and depth of understanding within the actual context of its existence, in an up-close way (Bromley, 1986). Another purpose of using case studies is that they are valuable for conducting evaluations (Berg, Lune, & Lune, 2004; Mertens, 2014; Patton, 2005; Yin, 2013).

Summary

Chapter one gave an overview of the purpose behind conducting this study, as well as presented the case and the context in which the study was conducted. The reader gained insight into the special education environment in which the study was conducted, and expanded their

understanding of where students were functioning academically, what emotional and behavioral issues they struggled with, and how technology was used in their classrooms. The reason for obtaining information about the use of educational technology in the special education classroom was clarified.

Chapter two will provide an understanding of the issues associated with education and technology. The literature review in chapter two will provide an overview of research that has been done on the impact of technology on education, with a specific awareness of the area of how technology may impact emotional regulation. A foundational approach is used, giving the reader a solid place upon which to understand the literature, placing the review of literature written about technology and education into the broader context of the fundamental understandings and underpinnings of educational ideas in the United States.

Chapter three will describe and outline the methodology of the case study. The methodology will be presented and discussed in order to provide clarity of design. Additional information will be provided to place the case study into the appropriate context (i.e., setting, data collection and analysis methods). This will give the reader a rationale for the methods used, as well as the appropriateness of these methods given the nature of the study.

Chapter four will present the results of the study and discuss these, looking at the themes that were discovered and drawing upon the literature review in order to do so. Comparisons will be made between the two classrooms in order to synthesize the results of the findings, and to look closely at what consistencies and differences were found. Examining ways in which the themes presented themselves in both classrooms and how teachers' approaches impacted these themes will also be discussed.

Chapter five will draw conclusions from the study, as well the limitations of the study, the implications of these conclusions, and make suggestions for future research. It will attempt to place the study within the broader context of education and situate it as a jumping off point for continued, relevant inquiry into this area. Reflecting on the value of this study as well as what has been learned and what can still be learned in this area will provide groundwork for anticipated future research.

Definition of Terms

Alpha Smart: A brand of word-processing keyboard that has been discontinued the manufacturer, NEO Direct. It has no Internet access.

Planning and Placement Team (PPT): An annual meeting held to determine a student's eligibility for special education and to modify and adjust a student's special education program as necessary.

Smart Board: An interactive white board that uses touch detection for user input

Chapter 2 – Literature Review

The notion of incorporating emotional awareness into our educational approach is not a recently discovered idea. In fact, the 20th century began with John Dewey's radical notion that we must educate the 'whole child,' and that learning was not separate from other activities. His work, based on a post-Darwinian sensibility, was predicated upon the idea that change is the only constant, and that the purpose of education should not be one fixed result, but a fluid process in which children could discover, expand and refine their natural curiosities and interests. In *The School and Society*, Dewey (1899) eloquently expressed ideas about children coming into the school building already being in possession of interests, passions, and emotionally based pursuits.

In his book *The Child and the Curriculum*, Dewey (1956) wrote that children were already in possession of this potential entering into their school experience, "the interest in conversation, or communication; in inquiry, or finding out things; in making things, or construction; and in artistic expression" (p. 47). These, he maintained were "the natural resources, the uninvested capital, upon which depends the active growth of the child" (p. 48). How then can we incorporate these ideas into our modern approach to learning and our excitement about all the possibilities educational technology holds in store?

Reaching out to students requires a multi-modal, whole child, emotionally inclusive approach. Bloom (1956) recognized the affective domain in his groundbreaking taxonomy. He was able to successfully describe the ways in which people react emotionally and their ability to feel other living things' pain or joy. Affective objectives typically target the awareness and

growth in attitudes, emotion, and feelings. To apply an affective domain to an educational model was a new and valuable undertaking, enriching our understanding of the learning process itself.

While this fundamental understanding of the importance of a student's personal investment and emotional regulation during learning has been a bedrock of our educational system it seems more testing and data collection have led to a sharp decline in teachers' abilities to take the whole child's needs into consideration. In addition, the inclusion of technology into our daily teaching practices can sometimes feel disconnected from the emotional lives of students. Our product oriented push toward higher test results have often steered us away from recognizing the importance of emotional connections to learning. The pendulum has swung from the whole child progressive ideas of Dewey, to the industrialized, results driven, product-oriented educational environment of the past decades and back, in recent years, toward a revisiting of these more progressive approaches. This topic has been of great interest to educators as it relates to K-12 learning environments, but also as emotion relates to the experiences of adult learners, as the advent of online learning environments becomes more and more prevalent.

My quest to understand the impact of technology on the emotional component of learning led me on a journey of observation, review of literature, and eventually, the collection of data.

The questions I had were:

1. If emotional regulation impacts students' ability to learn, how does technology address this aspect of education?
2. How can technology become more sensitive to the emotional lives of students as they learn?
3. How can educators use pre-existing technology to enhance the emotional regulation and increase the learning potential of their students?

Answers to these questions will help shape the future of the use of educational technology in ways that support a holistic approach to gaining and retaining information.

This literature review examines studies done with students of a variety of ages and abilities. First, the impact of technology on emotional regulation and higher learning online is explored. The manifestation of social cues, including body language and its impact on group work, as well as the importance of “teaching presence” and the ability to incorporate these elements into an online learning environment is examined. Second, responsive technology and tutoring is looked at, including the uses of emotion sensitive technology, its responsiveness to the changes in the emotions of learners, and how it may provide necessary support to improve student engagement. Third, the ways in which technology can help provide emotional support for students in special education is examined, including the use of role play and computerized mediated communication. Fourth, a review of the literature pertaining to online learning is shared, examining emotions and socialization, which includes group work and collaboration in virtual environments. Fifth, technology and emotional regulation in younger children is looked at, with emphasis on socialization and the development of social skills in young children. Finally, literature about social media, emotions and education is reviewed. A closer look at the educational uses of social media, such as *Twitter* and blogging provides insight into educational possibilities and opportunities for growth and learning.

Methodology

Multiple database searches were conducted to identify recent publications. Search terms were limited to publication dates ranging from 1995-2015. These limitations provided a relevant overview of trends, many of which impact our future progress in this area. All identified documents were examined and those that were relevant were retrieved for inclusion in the

review. Reference lists of retrieved documents were hand searched to identify additional publications. A summary of the database searches that were performed during the process of conducting the review is set out below.

Table 1.

Summary of Search Results

Databases Searched	Search Terms Used	Results
<i>Educational Resources</i>	Social Emotional Learning	18
<i>Information Center</i>	AND Technology	
<i>Education and Information</i>	Social Emotional Learning	262
<i>Technology Library</i>	AND Technology	
<i>(EDITLib)</i>		
<i>Education Research</i>	Social Emotional Learning	19
<i>Complete</i>	AND Technology	

Narrowing the search to the 20 years was helpful in targeting recent and relevant research on this topic. *EDITLib* proved to have the most articles and pieces of literature related to technology's relationship to learning and emotional regulation.

Impact of Technology upon Emotional Regulation and Learning Higher Learning Online

Since the early 1990s when the Internet became public, ideas about how to use it to enhance educational goals have proliferated (Kaplan, 2014). Even though there is evidence that technology supports the making of new connections and, therefore, learning (McLoughlin & Lee, 2007). There is complementary evidence that in cases where programs are poorly designed, a lack of learning can also be an outcome (Galusha, 1998). In particular, lack of an instructional

foundation and the use of technology without a definitive purpose can threaten the success of any attempt to learn through the use of technology (Olson & Olson, 2000). Successful outcomes in the classroom are determined by alignment with measurable learning goals. In light of this, it's clear that teachers play a significant role in facilitating student learning and aligning educational technology with content (Marshall, 2002).

In addition to aligning technology-learning with content and goals, alignment with emotional regulation is also a prerequisite for successful learning outcomes. If students are not engaged in their learning, the process is laborious and students learn less, tend to react negatively to their lessons, and in general retain less information (Malekzadeh, Mustafa, & Lahsasna, 2015). Positive emotions promote higher cognitive flexibility and allow the learner to discover new ideas and possibilities. Baker, D'Mello, Rodrigo, and Graesser, (2010) found that positive emotional experiences such as feeling engaged or delighted, impacted learning in a positive way. The authors also found that "engaged concentration is a state of engagement with a task such that concentration is intense, attention is focused, and involvement is complete" (p. 6). Students' cognitive-affective states determined not only the impact of various emotions on learning in different learning environments, but also the incidence and persistence of these emotions. The more negative emotions they felt, the more the cycle of negativity continued. In addition, sensitivity on the part of teachers is imperative to successful outcomes and consistent modification of strategies and lesson approach. Often, teachers are so focused on ensuring that students pass achievement tests that they have little or no time to address students' social and emotional needs (Allred, 2008).

By interrupting the cycle of negativity through the use of effective teaching strategies and appropriate interventions, more positive emotions may be able to build on themselves, thus

increasing the capacity for greater learning outcomes. Positive affect facilitates approach behavior (Cacioppo, Gardner, & Berntson, 1999; Davidson, 1993; Watson, Wiese, Vaidya, & Teilegen, 1999), or continued action (Carver & Scheier, 1990; Clore, 1994). Experiences of positive affect prompt individuals to engage with their environments and partake in activities, expanding their participation. In addition, an appropriate technology based learning environment contains within it the potential to generate its own unique emotional reaction and environment. The creative innovation that follows the development of online learning provides a unique place for the study of emotional presence and learning (Cleveland-Innes, 2002). As social beings, developing a social and emotional environment in which to learn is a natural phenomenon. Human beings crave social groupings and can generate the sense of creative development while working in groups (Ryan & Deci, 2000).

Collaboration prepares students for work as employees (Christen, 2009). Workers are successful if they are able to incorporate their skills into an ability to communicate online, share ideas, and work as part of a team (Casner-Lotto, & Barrington, 2006). Leadership skills are also valued employee contributions, including the ability to manage projects. Students with these skills will have an advantage outside of the classroom (Haythornthwaite, 2006). Since so many educational experiences rely on group work and collaboration, this idea is crucial for effective translation into the online environment (Stacey, 2007). One way in which online learning is different from face to face learning is the design and implementation of enriching and educationally meaningful collaborative group work (Rovai, 2002). Collaborative learning requires working together toward a common goal, and encompasses the whole process of learning (Dooley, 2008). This includes students teaching one another, students teaching the teacher, and of course the teacher teaching the students. In addition, it means that students are

responsible for one another's learning as well as their own, and that reaching the goal implies that students have helped each other to understand and learn. Not only is collaboration beneficial to learning in so many different ways, but actually being able to read body language and facial cues facilitates this type of collaboration. To that end, allowing the human, social, facial cue and body language nature of learning to seep into our online environments as well as our tutoring technology would enhance learning for students, increasing their level of comfort and engagement (Giesbers, Rienties, Gijsselaers, Segers, & Tempelaar, 2009).

Responsive Technology/Tutoring

The interest in intelligent tutoring systems (ITS) began in the late 1970s, where the systems employ effective intelligent algorithms that would optimally conform to the learner and formulate strategies that optimize the learning (Malekzadeh, Mustafa, & Lahsasna, 2015). ITS are computer-based educational systems that provide individualized instruction similar to a human tutor. Typical ITS determine how and what to teach a student based on the learner's pedagogical state to enhance learning. Just as an experienced human tutor works to manage the emotional states of a learner to motivate him or her and to improve the learning process, researchers have designed the learner model structure in ITSs to determine the emotional state of learners (Neji, Ben Ammar, Alimi, & Gouardères, 2010).

Pour, Hussain, AlZoubi, D'Mello, and Calvo (2010) endowed ITS with the ability to detect learners' unpleasant emotional states (e.g., confusion, frustration, etc.), respond to these states, and generate appropriate tutoring strategies as well as emotional expressions by embodied pedagogical agents. These emotion-sensitive ITS aspire to narrow the interaction bandwidth between computer tutors and human tutors with the hope that this will lead to an improved user experience and enhanced learning gains (Pour et al., 2010; Klein, Moon, & Picard, 2002). In

embedding emotional state reasoning into ITS and intelligent learning environments, there are two main issues that are faced by the developers. The first issue is determining the emotional states of the target learners. The second issue is determining factors that cause those states as well as how to respond and regulate negative emotional states (Avramides & Du Boulay, 2009; Du Boulay, Rebolledo Méndez, Luckin, & Martínez-Mirón, 2007).

In order to deal with the first issue, researchers paid attention to the determination of students' emotions (Pour et al., 2010). Despite the complexity associated with real-time emotion detection, several researches have embarked on learner's emotion detection. However, not many researches that focused on the causes of favorable or adverse emotional state of learners and strategies for regulating them. If the ITS design or the feedback offered were not suited to individual user needs and character, the learner can be frustrated or bored. The challenge is therefore to help learners to regulate their emotional states so that positive states such as flow/engagement persevere, while negative states such as frustration and boredom are prevented or regulated (Zakharov, Mitrovic, & Johnston, 2008). The innovation and design of affective-sensitive technology that can be incorporated into real-world environments and learning would have an impact on our educational landscape (Kort & Reilly, 2002). If we could understand the impact of emotions on learning thoroughly enough to design such technology to be sensitive to these changes, we would probably expand our reach to be able to differentiate for all levels of learners in all situations.

The innovative models and theories that have been proposed to facilitate advancement in the field of human-computer interaction tend to focus exclusively on cognitive factors. As a result, systems are often unable to adapt to real-world situations in which affective factors play a significant role. Connecting real-world learning and technology is going to allow students to

bring their learning into applicable situations beyond the classroom (Adams & Burns, 1999). In addition, theories of affect greatly impact learners with special needs due to their unique learning challenges and emotional sensitivities. Emotional support and regulation of emotion is crucial in the education of students with special needs. If students' emotional needs are not being met, those with low frustration tolerance, short attention spans, learning disabilities and a myriad of other challenges will begin to demonstrate behaviors that will negatively impact learning. These include shutting down, acting out, disrupting the class, aggression, and interfering with the learning of others (Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003).

Technology Can Help Provide Emotional Support For Students In Special Education

Many students lack social-emotional competencies (Becker & Luthar, 2002). These students can become less connected to school as they progress through school, to high school (Archambault, Janosz, Fallu, & Pagani, 2009). This lack of connection negatively affects their academic performance (Márquez, Martín, & Brackett, 2006). It can also negatively impact their behavior. In fact, it can ultimately have a negative impact on their physical health (Blum & Libbey, 2004). Technology can be a great equalizer for individuals with disabilities that might prevent full participation in school, work, and the community. This is most evident in the case of individuals with mobility, hearing, or vision impairments, but is also true for individuals with limitations in cognition and perception (Behrmann, 1998). Students with disabilities need additional support; not only academically, but emotionally as well. Feeling safe, supported, heard, helped and guided can go a very long way toward independent learning for students with special needs. Eden and Heiman (2011) examined the relationships between the usage mode of four kinds of computerized mediated communication (CMC) by students with and without learning disabilities as well as perceived social and emotional support. The use of CMC by

students to facilitate their learning by providing social support was found to occur more with undergraduate students with learning disabilities.

The contribution these communications had on social and emotional relationships, especially for the students with learning disabilities, was significant. Graesser, McDaniel, Chipman, Witherspoon, D’Mello, and Gholson (2006) looked at the relationship between emotions and learning by tracking the affective states that college students experienced while interacting with *AutoTutor*, an intelligent tutoring system with conversational dialogue. The way the system worked was that the emotionally sensitive tutor would facilitate learning, but this would occur only if learner emotions were accurately identified. It is an excellent method for enhancing skills critical to learning and developing social skills, and it can be readily individualized (Walker, Shea, & Bauer, 2010). By incorporating role play and the arts into education, human expression is developed. The honing of social skills and interactions, emotional regulation and exploration are all part of this experience. We learn through play, (Whitebread, Coltman, Jameson, & Lander, 2009), including our artistic play, and actual plays. By role playing, acting out emotional scenarios, and interacting through drama, much emotional territory can be covered.

As a sort of ‘rehearsal,’ many social and situational skills can be practiced and honed. (Tse, Strulovitch, Tagalakis, Meng, & Fombonne, 2007). Just as astronauts simulate missions into space, so too can we assist students with real-life situations and learning in a technologically supported role-playing environment (Blatner, 2009). Tools have been developed to enable integration of an existing edrama application with several new components to support avatars with emotionally expressive behaviors, rendered in a three dimensional environment (Zhang, Gillies, Dhaliwal, Gower, Robertson, & Crabtree, 2009). The functionality includes the

extraction of affect from open-ended improvisational text. The authors proposed that their system had the potential to develop normal classroom education for young people with or without learning disabilities by providing around the clock efficient personalized social skills, language and career training via role-play and offering automatic monitoring. Increasing evidence suggests that aspects of children's learning-related social skills (including interpersonal skills and work-related skills) contribute to early school performance (McLelland, Morrison, & Holmes, 2000). The system described seems to have applications for inclusion and self-contained special education environments as well as mainstream educational settings (Zhang, Barnden, Hendley, & Wallington, 2006).

D'mello and Graesser (2012) designed and evaluated two systems: *AutoTutor* and *Affective AutoTutor*. *AutoTutor* is an ITS that helps students to learn complex technical content in Newtonian physics, computer literacy, and critical thinking. *AutoTutor* is quite effective in helping students learn by holding a conversation in natural language, simulating the pedagogical and motivational strategies of human tutors and modeling and responding to their cognitive states. The affect-sensitive versions of *AutoTutor*, called the supportive and shakeup tutors, are collectively referred to as *Affective AutoTutor* were also developed. The emotionally sensitive version of *AutoTutor* is capable of detecting learners' emotional states, regulating negative emotional states, and synthesizing the emotions of the animated pedagogical agent. The agent's feedback has been designed based on reactions to the emotional states of boredom, frustration, and confusion. The agent's action to students' negative emotions were derived from two sources, which are theoretical foundation (i.e., attribution theory and cognitive disequilibrium during learning and recommendation by pedagogical experts (Craig, Graesser, Sullins, & Gholson, 2004). The attribution theory addressed boredom and frustration using empathetic responses

from the tutor. The cognitive disequilibrium theory was also applied to address confusion, when a learner entered a state of confusion. Staying in a state of cognitive disequilibrium for too long was not recommended. The tutor should display empathy to acknowledge the learner's attempts, and lead the learner out of the state of confusion (Graesser, Lu, Olde, Cooper-Pye, & Whitten, 2005).

Online Learning, Emotions and Socialization

Just as many individuals use online learning and meet up in group sessions, many educators promote group work as a way of collaborating, sharing ideas, and expanding their awareness of the topic. Findings from a study by Kim, Ji-Seong, Bonk, and Lim (2009) suggested that promoting and supporting 'deep learning' through group reflection is essential for team project learning in a Web-based community. In addition, Taverna, Paulo Kushnir, Berry, and Harrison (2015) outlined the importance of social interaction and social involvement in online learning situations. Since it was known to reduce negative emotions such as isolation, student engagement in socially oriented activities while learning online was cited by students as having been very important to their learning process. These activities included being initiated into the culture of the class, resolving social conflict and negotiating negativity in the form of negative tone and harsh critique. Traditionally, classroom 'group work' had involved live students in real time processing information with each other in person. The benefits of this type of peer interaction are many. In addition, effective instructor intervention is a crucial component leading to better group performance. In traditional learning environment, a teacher maintains a sympathetic relationship with learners to facilitate the development of positive emotions (Connor & Davidson, 2003). In terms of group learning evaluation rubrics, structural equation modeling revealed that the level of activeness in online contributions may not be as important as the

evidence of collective reflection and critical thinking in team learning scenarios. Overall, online collaboration and group reflection seem to require more thoroughly designed group tasks and learning environments to induce positive outcomes.

Research has shown that an important component in students “performance in and satisfaction with their online course is the active participation of the instructor within their course” (Picciano, 2002; Rovai, 2002; Swan & Shih, 2005). Students want to interact with their professors throughout their online experience. A criticism that shows up repeatedly in the literature involves online instructors who do not respond to students in a timely manner or provide little or no feedback (Song, Singleton, Hill, & Koh, 2004). This speaks to the importance of the phenomenon of ‘teaching presence.’ Teaching presence is a complex concept. It includes the planning, scaffolding, differentiating and modifying of lessons, which teachers are trained to do. It also incorporates less tangible, more nuanced interactive skills that teachers develop instinctively and naturally in the course of interacting with their students (Garrison, 2007). Teaching presence is also a promising mechanism for developing learning communities in online environments (Shea, Li, & Pickett, 2006), both with older, adult students as well as with younger students, who rely so completely upon adult feedback and interaction for social and emotional cues.

Technology and Emotional Regulation in Younger Children

Since online learning has mostly been the domain of adult learners; particularly university students, we know very little about the impact, especially the emotional impact of technology on learning with younger students. In addition, rather than tease apart the social/affective and cognitive domains, studies generally focus on how to help younger students with social skills. A lot of work has been done with younger students around pro-social behavior,

empathy, morality, and social skills (Eisenberg, 2000). Hamre and Pianta (2012) looked at teachers' exposure to the preschool promoting alternative thinking strategies and two levels of support through *MyTeachingPartner*, a web-based approach to professional development. The results showed that it is possible to train teachers to use specific strategies to promote pro-social behaviors and social competence in preschool aged children.

Another advantage of using technology to foster emotional regulation and pro-social behavior with young children is to simulate real life events and happenings using visual input. Simulation technology is form of learning with computers in which the user may experiment in a simulated situation (Kamalevini, 2015). This simulation technology strongly resembles reality or in a deliberate simplification. Simulation technology enables students to make decisions without great risks. Feeling emotionally safe, in a welcoming classroom environment, encourages continued participation (Sheffler, 2009). As a result of the decisions made the computer reacts with informative feedback. The feedback is almost always of a visual nature, and, appealingly to younger students, often has the characteristics of animation program. Simulation technology programs are multimedia programs, which can offer teachers the possibility of providing experimentation with social skills, higher ordered thinking, and many other educational and social goals.

Social Media, Emotions, and Education

Questions around our everyday use of technology, such as tweeting, social media in general, and their relationship to learning and our emotions have been on the minds of everyone from advertisers to educators and social scientists. According to philosopher of technology Andrew Feenberg (2010), "where... society is organized around technology, technological power is the principal form of power in the society" (p. 82). In fact, the use of social media as a

personal learning environment is generating a potentially promising pedagogical approach for both integrating formal and informal learning using social media and supporting student self-regulated learning in higher education contexts (Dabbagh & Kinstantas, 2012). A study conducted by the Institute for Prospective Technological Studies suggested that the high take up of social media applications outside of formal educational settings provides new opportunities for innovating and modernizing education and training institutions and for preparing learners for the 21st century (Redecker, Ala-Mutka, & Punie, 2010). People use *Twitter* to communicate, to ask questions, to ask for directions, support, advice, and to validate open-ended interpretations or ideas by discussing with the others (Grosbeck & Holotescu, 2008). These forms of technology have proven themselves invaluable in assisting with a “whole person” approach to seeking support, validation, socialization as well as knowledge and information (Gruzd, Wellman, & Takhteyev, 2011).

Luo and Franklin (2015) looked at tweeting and blogging from the perspective of instruction, as well as from social and emotional standpoints. They employed *Twitter* and blogs as instructional Web 2.0 tools to support student learning in an undergraduate-level class. Students embraced the incorporation of *Twitter* and blogs in the class. In many ways, simply being in this space with others and being able to see their classmates’ accounts brought a sense of connection to those less experienced with virtual communication (Java, Song, Finin, & Tseng, 2007). Creating a community of learners is one strategy that has been recommended for increasing satisfaction (Hill, 2002).

Summary

Having reviewed all of this rich, profound and very exciting literature about the interplay between technology, emotions and learning, I am excited by the possibilities that are still to

come, particularly with regard to the empowerment of all students. Research-based learning activities, computer networking, and assistive technologies will become more a part of daily educational experiences for all learners. Inclusion will mean more than just a typical group of students working with special education students. With the advent of technology in the classroom, inclusion for the future will mean learning can take place in almost any place, at almost any time. The ability to access, adapt, and create knowledge using information and communication technologies is critical to social inclusion. Social development challenges may be addressed through the effective integration of technology into communities, institutions, and societies. What is most important is not so much the physical availability of computers and the Internet but rather people's ability to make use of those technologies to engage in meaningful social practices (Warschauer, 2003). With regard to emotional regulation and learning as they relate to technology, the use of affect-sensitive technologies and the designing of well thought out curriculum and online teaching and learning models will go a long way toward ensuring learning for all.

There is a lack of literature about technology and its relationship to the emotional regulation of students with special needs and students from impoverished backgrounds in the classroom. Since behavior management is such a crucial piece of teaching students with these diverse learning needs, the introduction and use of technology must incorporate some emotional component allowing for teachers to modulate and tailor learning to the affective and emotional needs of their students. I realize that the majority of literature has focused on distance learning, since that has been the most widely studied. Special education and impoverished students have been looked at but not as closely. This appears to be a necessary addition to the body of literature in the field.

Chapter Three – Methodology

The purpose of this study was to examine how technology is used with special education high school students. This purpose generated the following research question:

1. How are teachers integrating educational technology in the special education classroom?

The study utilized the case study methodology, to investigate how a small sample of teachers integrated technology in the special education classroom.

Design of the Study

The case study methodology was a preferred method in situations when “(1) the main research questions are ‘how’ and ‘why’ questions; (2) a researcher has little or no control over behavioral events and (3) the focus of study is contemporary (as opposed to entirely historical) phenomenon” (Yin, 2003, p. 4). All case study research starts from the same feature, which is fundamentally the desire to derive an up-close or otherwise in-depth understanding of a single or small number of ‘cases,’ set in their real-world contexts (Bromley, 1986). This closeness aims to produce deeper understanding as well as insightful appreciation of the cases, ultimately resulting in new learning about real-world behavior and its meaning. In addition, the case study method is commonly used for the purpose of conducting evaluations (Berg, Lune, & Lune, 2004; Mertens, 2014; Patton, 2005).

A multiple case study enables the researcher to explore differences within and between cases (Sovacool, 2014). The goal is to replicate findings across cases. As comparisons were drawn, it was very important that the cases were carefully chosen so that the researcher could either predict similar results across cases, or predict contrasting results based on a theory (Yin,

2003). My interest was in exploring two individual teacher perceptions in the special education classroom within a high school setting. Therefore, I used a case study design with embedded units of analysis where the school constitutes the case, while the classrooms of two individual teachers are the units of analysis.

The Case

The research took place at a private, grade one through twelve, special education school located in the urban area of New Britain, Connecticut. The private school was considered a ‘department’ of the Connecticut Children’s Medical Center, a hospital in Hartford, Connecticut. The school served approximately 130 students in grades first through twelfth grade, although many students remained in the program through age 21, and were part of a more transitional and vocational type of programming. The majority of the students came from the urban areas of New Britain and Hartford. Students were referred to our school by public school districts, or local education agencies for reasons of behavior. Once a local education agency felt they had exhausted all possible resources within their public school setting to offer the student a free and appropriate public education, and the student was still not showing improvement, they made a referral to our program.

The classrooms in this study contained a *Smart Board* and three student computers. Students also had access to the use of iPads. There was wifi throughout our building, with a *NetNanny* monitoring system to help ensure appropriate content for students. All students were monitored by staff during instructional time, as well as at any point during which they may have been using technology for the purpose of an incentive. We also had a computer lab, which was used by all classrooms, including the vocational education department. Students worked on resume writing, finding recipes, keyboarding and research skills.

The participants in the research study came from two high school classes, each with similar functioning levels. These are mostly students who will achieve a ‘certificate of completion’ upon leaving our school, and, while they learned content, they also learned a lot of vocational skills and applied academics. They received credits, but were not expected to meet the demand of their local education agency for credit completion. That being said, there were a few that received high school diplomas, including full credits required by their local high school. The ages of the students in these classes ranged between 14 and 21. The average class size was eight, which is a typical size within our building. The classes were made up of predominantly male students.

Data Collection Methods

The table below outlines the questions and methods of this study (see Table 2). Each method of data collection will be described in the following section.

Table 2.

Research Question and Methods Used to Collect Data

Research Question	Data Collection Methods
1. How are teachers integrating educational technology in the special education classroom?	Interviews Observation

The research question described in the chart above was answered through the use of qualitative methods. In the next section, each of the methods is described in detail.

Interviews

Creswell (2007) asserted that while there are several kinds of data, all data falls into four basic categories, “observations, interviews, documents, and audiovisual materials” (p. 129).

Researchers may use many different techniques, but at the heart of qualitative research is the desire to expose the human part of a story. In her book, *The Art of Storytelling*, Nancy Mellon (1998) stated, “because there is a natural storytelling urge and ability in all human beings, even just a little nurturing of this impulse can bring about astonishing and delightful results” (p. 174). The natural storytelling aspect of interviews is appropriate to the setting in which these interviews will occur, as the experience of the teachers will be authentically shared by learning of their experiences in the classroom.

For the exploration of the central phenomenon of this research, a semi-structured interview design with open-ended questions was deemed most appropriate. This choice was based on the following considerations:

- the semi-structured design gives the participants ample time and scope to express their diverse views and allows the researcher to react to and follow up on emerging ideas and unfolding events,
 - results obtained through semi-structured interviews can be compared among each other since all participants are required to express their views about the same general themes,
 - semi-structured interviews allow not only for assessing the participants' opinions, statements and convictions, they also allow to elicit narratives about their personal experiences (Nohl 2009), and
 - open-ended questions allow the participants to freely voice their experiences and minimize the influence of the researcher's attitudes and previous findings.
- (Creswell 2005)

I used interviews to collect information from two teachers. The questions helped guide their responses. The focus was on their experiences and rationale for using educational technology in their classrooms. I used a Smartphone to record the interviews, which allowed me to be able to listen repeatedly, taking notes. Focus was on the experiences of the teachers as they integrate educational technology into their classrooms. A comparison of the two classrooms was made.

Observation

Marshall and Rossman (1989) defined observation as “the systematic description of events, behaviors, and artifacts in the social setting chosen for study” (p. 79). Observations enable the researcher to describe existing situations using the five senses, providing a ‘written photograph’ of the situation under study (Erlandson, Harris, Skipper, & Allen, 1993). DeMunch and Sobo (1998) described participant observation as the primary method used by anthropologists doing fieldwork. Fieldwork involves “active looking, improving memory, informal interviewing, writing detailed field notes, and perhaps most importantly, patience” (DeWalt & DeWalt, 2002, p. vii). Further, participant observation “combines participation in the lives of the people being studied with maintenance of a professional distance that allows adequate observation and recording of data” (Fetterman, 1998, pp. 34-35).

Researchers have used video (and before that film) for many years particularly in workplace studies (see Heath, Luff, & Hindmarsh, 2010), the learning sciences (see Goldman et al., 2009), and the home (see Goodwin, 2000; Norris, 2004). Studies have used video to ask questions in a variety of sites including how social class and race are articulated in the school classroom (e.g., Mehan, 1979). The use of video with a Smartphone to capture observations was an effective means of recording multiple interactions simultaneously, while allowing me to have the ability to review and analyze the data with accuracy. I took videos of two classrooms

utilizing educational technology during two lessons (i.e., four lessons total), and recorded from the beginning of the lesson to the end. I then reviewed each lesson and took notes on key areas of interest, specifically times when the use of educational technology was present, events occurring before and after the use of the technology.

I used observation as a data collection tool in my thesis study to try to understand, monitor and watch the classrooms in process. Through observation, I was able to monitor and watch the classrooms that I studied as the lessons unfolded. I used observations to gather data on individual behaviors and interactions between individuals.

Data Analysis Methods

I used the constant comparison method. According to Patton (1990), “the first decision to be made in analyzing interviews is whether to begin with case analysis or cross-case analysis” (p. 376). I used cross-case analysis of two interviews, using the constant comparison method “to group answers... to common questions [and] analyze different perspectives on central issues” (p. 376). As Glaser and Strauss (1967) described, the constant comparison method as following four distinct stages: “1. comparing incidents applicable to each category, 2. integrating categories and their properties, 3. delimiting the theory, and 4. writing the theory” (as cited in Lincoln & Guba, 1985, p. 339). Further Goetz and LeCompte (1981) explained that this method “combines inductive category coding with a simultaneous comparison of all social incidents observed” (p. 58). As social phenomena were recorded and classified, they were also compared across categories. Thus, hypothesis generation (i.e., relationship discovery) began with the analysis of initial observations. This process underwent continuous refinement throughout the data collection and analysis process, continuously feeding back into the process of category coding. “As events are constantly compared with

previous events, new topological dimension, as well as new relationships, may be discovered” (Goetz & LeCompte, 1981, p. 58). As Bruner, Goodnow, and Austin (1972), explained, “to categorize is to render discriminably different things equivalent, to group the objects and events and people around us into classes, and to respond to them in terms of their class membership rather than their uniqueness” (p. 16). Some of the reasons that categorizing contributes to the process of analyzing data are that allows the researcher to simplify the environment, it gives the activities we observe direction, it gives us the ability to both make sense of and relate events to one another. It also lessens the need for constant new learning as we are putting new information into these categories.

At the perceptual level, categorizing consists of the process of identification, “a 'fit' between the properties of a stimulus input and the specifications of a category.... An object of a certain color, size, shape, and texture is seen as an apple” (Bruner, Goodnow, & Austin, 1972, p. 176). Categories, created when a researcher groups or clusters the data, become the basis for the organization and conceptualization of that data (Dey, 1993). “Categorizing is therefore a crucial element in the process of analysis” (p. 112). The process of identifying, coding, and categorizing main patterns that exist within the data is known as content analysis, or analyzing the content of interviews and observations (Patton, 1990). “The qualitative analyst's effort at uncovering patterns, themes, and categories is a creative process that requires making carefully considered judgments about what is really significant and meaningful in the data (p. 406). As Boyatzis (1998) wrote in *Transforming Qualitative Information*, thematic analysis was a process of “encoding qualitative information” (p. vii). Thus, the researcher developed codes, words or phrases that served as labels for sections of data. Depending on the methodology and research question, codes could come in many shapes and sizes. Referring to a set of codes,

Boyatzis explained, “this may be a list of themes, a complex model with themes, indicators, and qualifications that are causally related; or something in between these two forms” (p. vii).

Further, Boyatzis showed how one could take a variety of approaches to using thematic analysis and essentially get the same rigor. He contrasted theory-driven codes, derived from the researcher's or other existing theories; inductive codes, derived bottom-up from the researcher's reading of the data; and prior-research driven codes. He argued that all approaches had something to offer qualitative data analysis.

The work of Kvale and Brinkmann (2009) outlined the seven stages of an interview investigation as follows:

1. *Thematizing*: this first stage is one in which a researcher develops their purpose. In addition, researchers add details, which describe the essence, or concept of the topic.
2. *Designing*: all seven stages of the process, moral implications, and the intention behind the study are all incorporated into this stage.
3. *Interviewing*: next, the researcher will make use of an interview guide to walk the researcher through the process, and ongoing awareness of the dynamic between the researcher and the interviewees.
4. *Transcribing*: capturing the data is of utmost importance here. During this stage, the researcher must develop a way of transforming interviews in order to analyze them as data. Often, taped or recorded oral speech will become written text for this purpose.

5. *Analyzing*: methods of analysis will vary. Researchers will choose the most appropriate method based on all of the factors involved in both the purpose of the study and the results of the interviews.
6. *Verifying*: in this stage, researchers need to check their results for consistency and adherence to the intended topic. These are called reliability and validity.
7. *Reporting*: finally, the results of what was discovered must be somehow written to represent the study in a way that makes sense to the reader. In addition, it must conform to all standards of ethics and scientific criteria.

By using constant comparison method of data analysis to gain understanding and insight into the experiences of special education teachers and their daily use of educational technology, I was able to find themes and organize these themes according to the information provided. Constant comparative analysis is appropriate for this study because it provides a means of extracting categories and themes that emerge in examining the process of using educational technology daily with students in the special education classroom.

Reliability and Validity

For purposes of reliability and validity, I used three methods. The first method was triangulation. The second method was pilot testing. The third method was member checking.

Triangulation

Triangulation is defined to be “a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study” (Creswell & Miller, 2000, p. 126). Triangulation facilitates validation of data through cross verification from more than two sources. It tests the consistency of findings obtained through different instruments and increases the chance to control, or at least assess, some of the

threats or multiple causes influencing our results. Triangulation is not just about validation but about deepening and widening one's understanding. It can be used to produce innovation in conceptual framing. It can lead to multi-perspective meta-interpretations. By looking at behaviors from different perspectives, triangulation makes an effort to tease out the rich and layered complexities therein.

Four types of triangulation were identified by two researchers: Denzin (1978) and Patton (1999). They were as follows:

1. Methods triangulation: in this type of triangulation, various methods of data collection are utilized in order to determine whether or not the findings are consistent with one another.
2. Triangulation of sources: this type of triangulations does not use different methods of data collection, but rather, the same type of data collection, in order to understand similarities and differences within the findings. An example of this type would be using the same method to collect data within two different settings or at different times of day, or at different times during the year.
3. Analyst triangulation: this third method uses separate analysts' findings to serve as sources of comparison. Each analyst shares their perspective and findings, and details are looked at for patterns, similarities and differences.
4. Theory/perspective triangulation: finally, there is the type of triangulation which sorts through data from various lenses and perspectives. The impact of the theoretical perspective is examined to develop greater understanding of how this may or may not impact findings. (Cohen & Crabtree, 2006)

For the purposes of this study the most relevant form of triangulation will be triangulation of sources and theory/perspective triangulation.

Pilot Testing

Pilot testing is crucial to researchers. Prior to the interview process, researchers will ‘try out’ the interview instrument within a practice context. This pilot testing allows for a greater awareness and understanding on the part of the researcher about their interview instrument. It gives the researcher insight into any misunderstandings, lack of clarity, or extraneous questions that could be edited or eliminated (Kvale, 2007). Pilot testing is way of checking your interview to see that the language is understandable to participants and that the questions make sense. It is a way to examine the order of the questions, the wording of the questions, and whether or not the questions will actually provide the necessary information. In addition, pilot testing helps the researcher gain much-needed practice in the art of interviewing. The participants in a pilot test will be those who share interests with those who will ultimately be included in the actual study. This process of pilot testing allows researchers to gain insight into areas that need additional improvements or editing to their interview instrument (Turner, 2010).

The Pew Research Center for U.S. Politics and Policy (2016) discussed pilot testing and its use in finding out responses to a questionnaire by a sampling of individuals. In many cases, the pilot test will be conducted ahead of time, allowing for a period of analysis and revision prior to the actual implementation of the study. In cases where new information is being explored, new procedures are being implemented, or large scales are involved, this can be particularly helpful.

Member Checking

Member checking is a technique in which data, analytic categories, interpretations and conclusions are tested with members of those groups from whom the data were originally

obtained. This can be done both formally and informally as opportunities for member checks may arise during the normal course of observation and conversation. Typically, member checking is viewed as a technique for establishing to the validity of an account. Member checking is primarily used in qualitative inquiry methodology and is defined as a quality control process by which a researcher seeks to improve the accuracy, credibility and validity of what has been recorded during a research interview (Barbour, 2001; Byrne, 2001; Coffey & Atkinson, 1996; Doyle, 2007; Lincoln & Guba, 1985). Member checking is also known as participant verification (Rager, 2005), informant feedback, respondent validation, applicability, external validity, and fittingness (Morse, Barrett, Mayan, Olson, & Spiers, 2002).

In general during an interview, the researcher will restate or summarize information and then question the participant to determine accuracy. The participants either agree or disagree that the summaries reflect their views, feelings, and experiences, and if accuracy and completeness are affirmed, then the study is said to have credibility (Creswell 2007; Lincoln & Guba, 1985). Lincoln and Guba (1985) believed another kind of member checking occurs near the end of the research project when the analyzed data and report are given to the participants to review for authenticity of the work. The participants check to see whether a 'true' or authentic representation was made of what he or she conveyed during the interview. Member checks may involve sharing all of the findings with the participants, and allowing them to critically analyze the findings and comment on them (Creswell, 2007).

Subjectivity Statement

As an educator with a variety of experiences in many different contexts, I have always questioned the value of using technology just for the sake of using it. Recent trends in education promote the use of technology, causing teacher education programs, administrator educator

programs and parent education programs to steer toward what is being called ‘21st century learning.’ Best practices in education now incorporate the incessant citing of the necessity and importance of access to the Internet, of allowing all students in all classrooms access to iPads and laptops, and pushing fiercely toward a ubiquitous use of technology in education. In addition, the push toward inclusion of special education students has increased this comprehensive thrust toward technology as a way to level out the playing field and allow all students to have equal access to content, creating an appropriate educational environment for general education and special education students alike.

My experiences in this field have shaped my understanding of students and their learning process. I firmly believe that student engagement and emotional regulation are the cornerstone of active participation and the ability to learn, for general education as well as special education student. As a former music therapist, I watched as the power of music helped to create calming, soothing spaces in which students could regulate their emotions and begin to access their own intellectual skills. As a special education teacher, I sought to create new avenues of learning for my students by using both ‘low tech’ and ‘high tech’ educational and assistive technology. Now, as an administrator in a private special education school, I want to provide opportunities for professional growth and development for all of the teachers I supervise. These opportunities must include educational technology, not for its own sake, but as a means to an end. Knowing that all students learn and access content differently, we must continually strive to put into place the most effective, accessible, appropriate and challenging strategies possible. Continuing to access usable technology in the special education classroom will allow teachers more ways in which to reach and teach their students, no matter what their behavioral, cognitive or physical limitations may be. However, it is crucial that we are not also bogging teachers down with empty

expectations for the use of technology with no real purpose behind it (i.e., “I am going to come into your room for an observation and I need to see your use of technology”). If that technology use is connected to an authentic purpose for learning, then the technology is a means to an end. Otherwise, it can become another cumbersome expectation, devoid of meaning for teachers and students alike.

My intention is to utilize this study to determine whether the experiences of special education teachers using educational technology in their classrooms is proving to be an authentic learning experience for them and for their students. The outcome of this study will help shape the way in which I approach professional development activities and strive to deepen and strengthen the approach used within our educational environment.

Summary

The purpose of this study was to examine the use of educational technology in special education classrooms. Specifically, this study looked at how educational technology was used by special education teachers within their own classrooms, and what this experience was like for them. I used case study methodology to obtain ample amounts of data to support the best possible understanding of the use of educational technology in the special education classroom. I looked specifically at ways in which special education teachers used educational technology to promote learning, help students access content and promote emotional regulation. I also looked at the ease and comfort with which the teachers utilized the technology, and ways in which they felt supported within their school to pursue answers to technology questions as well as to implement ideas.

For the purpose of this case study, I collected multiple measures of qualitative data, including interviews and observations. I used constant comparative analysis as the primary form

of data analysis. I ensured the reliability and validity of the data collection methods through the use of triangulation, using semi-structured interviews as well as observations. I also implemented pilot testing, walking through the semi-structured interview questions with teachers prior to the start of the actual study. Finally, I used member checking to ensure my results were a true reflection of the teachers' perspectives. In addition, I attempted to place the experiences of special education teachers' experiences of using educational technology within their classrooms within the broader context of educational technology trends.

Chapter 4 – Results and Discussion

My case study, which examined the use of educational technology in special education classrooms, used multiple methods of data collection to provide insight into the following research question:

1. How are teachers integrating educational technology in the special education classroom?

Two special education teachers, Naomi and Melissa, completed semi-structured interviews. The interviews explored teachers' attitudes and opinions about their experiences utilizing educational technology in their classrooms. I also spent time in each of the classrooms to observe and collect data using field notes. A review of the completed semi-structured interviews, artifacts and documents revealed two themes to answer the research question.

Teacher Comfort Level and Familiarity with the Technology

I found that in my observations of the two classrooms, technology was being used in very different ways, despite the two teachers both having access to the same technology. Naomi had great interest in the use of iPad applications, connectivity between the iPad and the Smart Board in her classroom, and exploring the Quick Response code reader. She was creative and ambitious in her approach, talking at length to administrators and other educators within the school building about the use of technology. She felt strongly that teachers and therapists in our school building needed to commit to the use of iPads, applications, connecting between the iPads and the Smart board, and using apps for literacy as well as for math. She researched extensively on her own time regarding these types of technologies, and shared that information with others, as well as sharing information from the New England Assistive Technology (NEAT) workshops

she'd attended with the school's Technology Curriculum Committee, which she chaired. While not always comfortable and familiar with the technology, she was making bold attempts at becoming more so.

As Naomi stated:

the challenge is with teachers; they just don't find the time to use the apps, find the ways into the iPads and the technology so that they can get comfortable with it. Getting the technology into the classrooms and into the teachers' hands is crucial. Because if we're fumbling with it and not comfortable with it and we're up there in front of the students – you know, lead by example.

Naomi's words were linked to a strong feeling she had about the level of expertise and comfort she not only strived for herself, but also envisioned for all the teachers in our building.

During my observation of her lessons, her use of apps was enthusiastic, exciting, engaging for students, and somewhat exploratory. Of the seven times I observed her teaching, I noted one particular literacy lesson, in which she introduced the *Post-It* app. Students were asked to write down main idea, main character and sequencing of events from a book they'd been reading, onto *Post-It* notes. They then stuck these onto the wall. Naomi took a picture of them, pulled up the app on an iPad connected to the Smart board. Instantly, each student, who also had an iPad opened to the *Post-It* app, could see the picture of the 'Post-Its.' Naomi ran through the process of how to arrange and rearrange the 'Post-Its,' how to edit them, and how to sequence events in the correct order. She brought a high level of enthusiasm and excitement to this lesson. However, at certain points she struggled to understand how to use it. Mid-way through the *Post-It* app lesson, she began to become clearly flustered with the settings on the iPad she was using. The students were engaged and were patient while she figured out the problem.

Upon reflecting on the particular lesson, she explained that she wishes she had spent more time with the app prior to using it during her lesson. She also felt that staff who were working with students in the room were learning at the same pace as the students, and that she needed to do a better job pre-teaching the functions of the app to staff prior to bringing it in to use with the students. There were moments when, even though each student had an iPad, and the technology was visible to all in the front of the room on the Smart board, the staff who were there to support student learning were asking more questions than the students. In a couple of instances, staff questions threw the group off track. Naomi had to do a lot of negotiating to get things back in focus, and realized that this was a layer of frustration that could have been avoided with more comprehensive planning.

She has felt that there has been a struggle among teachers to get access to the technology and to find the time to become familiar and comfortable with it. Interestingly, when asked about how technology is used school-wide, Naomi expressed frustration about the differences between teachers in the school. She didn't want to speak poorly of others, but expressed that many teachers, including Melissa, the other teacher I studied for this case study, do not invest as much of their time or energy into using or learning about technology. She herself has gone to a number of NEAT technology workshops and presentations, has become the chairperson of the Technology Curriculum Committee at our school, collaborating with peers to implement new ideas and share what she's learned at the workshops. In speaking about this, she said:

It's split. There are individuals within our school who make the effort to keep up with knowledge. Where it lacks is once we have it, really disseminating it through the school, and making it a school wide thing instead of just a class-by-class thing.

It was clear that Naomi had some built-up frustrations regarding the use of technology within the school. Her ability to make attempts to change the awareness in the school, by attending workshops, sharing the information, and by taking on a leadership role in the Technology Curriculum Committee all spoke to her deeper commitment to fostering real change and growth in this area, not only for herself, but for the school as a whole.

The second teacher I interviewed and observed for this case study, Melissa, had conflicted feelings about the use of technology both within her classroom and within the school as a whole. She was less familiar with the use of the iPads, and only used them in limited ways; even then not always to her satisfaction. During the course of my daily observations of her classroom over a five-week period (i.e., some observations were 30 minutes in length, some 45 minutes, and some only 15 minutes), I got the sense that she didn't really see the point to making use of some of the higher tech educational tools at her disposal. She used her Smart Board every morning for the purpose of showing the news, using a website called 'CNN Student News.' More often than not, these news videos were a springboard for class discussions and, sometimes, planned written assignments. Melissa tended to use the iPads in ways that may make reading more accessible to students, but didn't venture far beyond her comfort zone. In my observations, she used technology in limited ways. iPad use was limited to dissemination of books which had been loaded onto them, so that each student had the book in front of them to read.

While she relied heavily on the Smart Board for use as a projector, showing the news daily and often pulling up educational videos, Melissa had trouble with the interactive components of the Smart Board, both because she wasn't certain how to use them all, and because she felt that when she tried, they weren't working the way they were supposed to. She had an air of resignation about the whole thing, as if it were simply too much to be bothered

with, given the amount of behavioral challenges she had to deal with and the pressures of complying with all of the paperwork demands of the classroom.

She spoke about the higher tech tools with ambivalence. She was also less comfortable, familiar, and excited about technology.

Being able to easily use the technology and make it streamlined and natural is so important. Accessibility. I am doing books on the iPad right now – I thought the kindle could read to you, but it can't. Having it feel more natural and not frustrating, or causing more frustration. If I'm getting frustrated, I can only imagine how students feel. It's helpful to be able to access information all together. Using technology is helpful, you know, like to better their learning experience, making things more modified or adapted for a better playing field. I can be researching and demonstrating finding information and they can be helping and doing it along with me on the Smart board. Sometimes students like to use the iPad and this can be more engaging and fun for them, but at times it can also be frustrating, because the technology won't do what you'd like it to do.

Melissa's demeanor while discussing this topic was one of resignation. She seemed to feel that a lot of the higher-tech equipment was practically without value, given the number of constraints she associated with it.

In working with the Technology Curriculum Committee, as well as observing and interacting with Naomi, I realized that Melissa had the wrong information about the iPads. There was certainly a way to have the *Kindle* app read aloud to students, but Melissa had sort of given up on this. When I asked her whether she had spoken with our Information Technology coordinator as well as with other teachers in the building, including Naomi, to learn how to access this, she shrugged her shoulders, and said, "yea, I guess. I mean, I think if I can't figure it

out, I'm not sure what time I'm going to be able to find to be able to work on it with someone.”

This tone of resignation created a little bit of a vicious cycle for her; the less she felt there could be a solution to her problem in this area, the less she attempted to pursue the solution. Melissa expressed similar frustration with regard to the consistent use of technology within the school.

She said:

I think the biggest challenge is consistency. I think if I had iPads in my room all the time, it would make a huge difference. So frustrating when there's something out there that could really help, but we can't access it – or because of money.

When asked about the use of technology, and access to technology as supported by the school, Melissa responded:

it's mixed. We definitely have certain things. But there's a lot of red tape around using things, so that can be really restrictive. For as long as I've been here, we've always had a computer, but we used to only have one. We now have iPads, but we can't always gain access to the document camera. That can be hard. So when you look at technology, there's low tech, medium tech, and high tech. We use a lot of low tech stuff, like [Picture Exchange Communication System] PECS and pictures, and we have the high tech stuff like the iPads and Smart boards, but we don't do as well with the medium tech stuff.

There's more middle-of-the-road stuff. I like Alpha Smarts and I still use them. I don't think that kids always need access to a full computer.

Once again, Melissa had inaccurate information about technology. There had been a recent shift in our school's policy on the use of the document cameras within certain guidelines and boundaries, as part of the movement toward getting our school “up to speed” with regard to incorporating technology into the classrooms. I informed her of this, and she stuck with her

position that it wasn't always possible to find time to utilize or explore these aspects of the technology. She seemed overwhelmed at the possibility of having one more thing on her list of things to be responsible for in her classroom, as the interactions and responsibility for goals and objectives were already more than she could take on.

While there was evidence that technology supported the making of new connections and, therefore, learning (McLoughlin & Lee, 2007); there was also evidence that in cases where programs were poorly designed, a lack of learning could also be an outcome (Galusha, 1998). Kaplan (2014) wrote that ideas about how to use the Internet to enhance educational goals had proliferated since the early 1990s. Technology, though, was not the answer or a panacea to solve all of the challenges we face as educators. In fact, Olson and Olson (2000) cited main reasons for negative outcome as a lack of an instructional foundation, as well as the use of technology without a definitive purpose. In Naomi's situation, there was a definitive purpose, however, it was evident that she was aware to a great degree that without a definitive purpose and a strong instructional foundation, her students could easily have a negative outcome. Her cognizance of this reality drove her to be deeply self-reflective on this topic and to work hard to make adjustments for future planning. In my observations of her lessons, including the literacy lesson with the *Post-It* app in which she struggled somewhat, as well as in my interactions with her and from her interview responses I did note a degree of enthusiasm on her part that made a difference to her students. Unquestionably, she experienced frustrating challenges in terms of the full implementation of her vision of how the technology would seamlessly be incorporated into her teaching, how it would impact her students, and how all would be able to avail themselves of the full potential of each technological device and application. However, her enthusiasm and commitment to the process carried over into her communication within her classroom setting,

and this paved a way for students to increase their engagement regardless of technical difficulties. If students were not engaged in their learning, the process is laborious and students learned less, tended to react negatively to their lessons, and in general retained less information (Malekzadeh, Mustafa, & Lahsasna, 2015).

Therefore, it's clear that the technology itself was not creating success for students, but that teachers' implementation of technology with purpose and fidelity was behind this success. The idea that teacher-driven use of technology created the positive learning environment spoke to theme one as both teachers expressed the dire need for teacher comfort, familiarity and expert planning and facility with technology as a cornerstone to the successful use of it within their classroom.

Impact the Technology Had on the Students

While the interview questions centered around the impact that educational technology has on special needs students in the areas of communication and emotional regulation, the responses of the teachers tended to be more in depth with regard to emotional regulation. In describing her students, Naomi stated that their ability to regulate their emotions was poor. She put it this way:

they typically need an outside person or system to keep them calm or remind them of what they could do. 'Zones of Regulation' is a system we use. This gives them visuals to help identify what zone they're in. It cues them to think about what they could do.

Technology in the classroom is helpful in that students are more motivated and able to be more engaged. It acts as an incentive. It can be almost like a coping skill, especially to help keep them in the green, or 'ready to work' zone. I think sometimes they don't realize they are learning, but they are. They are having more fun.

In the case of the use of the *Post-It* app, students were clearly engaged in the activity. There were audible sounds of delight as students saw what the *Post-It* app could do. Having observed this class many times in the past, I could tell that the introduction of this app was unusually engaging for them, and that they were genuinely excited to learn more about its use.

In accordance with this theme of the impact technology had on students in her classroom, Melissa frequently made use of moving picture experts group layer 3-audio (MP3) players, which she used for the purpose of helping students with emotional regulation, calming down, and getting into a more peaceful and positive frame of mind so that they could continue the learning process. For purposes of emotional regulation, and not academic engagement, Melissa seemed far more comfortable and positive about technology, especially the use of music. When asked about the purpose of technology and its impact on students, Melissa said, “we use technology for some de-escalation things. We can pull up a funny video, or some music. That’s really helpful.” She made the suggestion for students to bring in their own music and then she would try to find a way to transfer it onto a school MP3 player during an internal team meetings regarding three different students’ behavior, and then again at three Planning and Placement Team meetings I attended. Her investment in this aspect of programming for her students was evident and obviously meaningful to her personally, as she spoke about it passionately within the meetings and spent a lot of time engaged in this process. In one instance, she sat for extended periods of time (i.e., over an hour at a time), with a very distraught student, pulling up show tunes on her iPhone in order to build a relationship with him and help him to relax. The technique worked well and had the desired results, but it was notable that in this area Melissa was very confident, while her confidence and enthusiasm waned when implementing technology for academic purposes.

To discuss the second theme, regarding the impact of the technology on students, both teachers were aware and engaged in the process of promoting positive emotions in their students, particularly given the aggression and time out of the classroom that could result from negative emotions with this particular population. Both Naomi and Melissa demonstrated awareness that positive emotions promote higher cognitive flexibility and allow the learner to discover new ideas and possibilities. Baker, D'Mello, Rodrigo, and Graesser, (2010) found that positive emotional experiences such as feeling engaged or delighted, impacted learning in a positive way, and this thread was an underpinning of the classroom tone and environment, as well as the use of technology, in both classrooms. Both teachers also seemed to grasp and promote the understanding about student engagement that “engaged concentration is a state of engagement with a task such that concentration is intense, attention is focused, and involvement is complete” (p. 6). The underlying commitment and caring that both teachers consistently demonstrated toward their students was evident, although their implementation of strategies varied so much. Approaching students from a holistic perspective, whether in general or special education, does make a difference. When teachers were aware of the emotional regulation and engagement of students, negative reactions and behavioral issues tended to decrease, and retention of information tended to increase (Malekzadeh, Mustafa, & Lahsasna, 2015). By interrupting the cycle of negativity through the use of effective teaching strategies and appropriate interventions, more positive emotions were able to build on themselves, thus increasing the capacity for greater learning outcomes. In fact, positivity can build upon itself. Positive affect facilitates approach behavior (Cacioppo, Gardner, & Berntson, 1999; Davidson, 1993; Watson, Wiese, Vaidya, & Teilegen, 1999), or continued action (Carver & Scheier, 1990; Clore, 1994).

Melissa had a clear grasp on this cycle, and was quite comfortable and familiar with the use of technology for purposes of encouraging positivity and de-escalation; the proactive use of technology for educational and academic purposes was less a part of her daily repertoire.

Marshall (2002) has found that measurable learning goals aligned with teaching and use of technology can lead to successful outcomes in the classroom. As both teachers demonstrated in their desire to create a positive learning environment for their students, experiences of positive affect prompt individuals to engage with their environments and partake in activities, expanding their participation. They both knew that without the 'buy in' of their students, very little, if any, learning would take place. In addition, an appropriate technology based learning environment contains within it the potential to generate its own unique emotional reaction and environment. The excitement that students showed during the *Post-It* app lesson in Naomi's class clearly showed this. Human beings crave social groupings and can generate the sense of creative development while working in groups (Ryan & Deci, 2000).

Regarding theme two, many students lack social-emotional competencies (Becker & Luthar, 2002). These students can become less connected to school as they progress through school into high school (Archambault, Janosz, Fallu, & Pagani, 2009). This lack of connection negatively affected their academic performance (Márquez, Martín, & Brackett, 2006). It also negatively impacted their behavior. In fact, it ultimately has a negative impact on the students' physical health (Blum & Libbey, 2004). When Naomi and Melissa planned their lessons, they planned with these ideas in mind. The differences between the two teachers were levels of confidence and willingness to try new technologies to level the playing field. Technology can be a great equalizer for individuals with disabilities that might prevent full participation in school, work, and the community. This was most evident in the case of individuals with mobility,

hearing, or vision impairments, but was also true for individuals with limitations in cognition and perception (Behrman, 1998). The use of the Smart Board in Melissa's classroom, the limited use of the iPads, and the use of MP3 players all spoke to this type of participatory push; that she wanted them to be able to participate fully, to access content, and to engage academically.

Naomi demonstrated this understanding as well, but went much further in her use of the apps and her personal research and commitment to broadening both her personal understanding of how to level the playing field for her students and the students across the building, in every classroom. Students with disabilities need additional support; not only academically, but emotionally as well. Feeling safe, supported, heard, helped and guided can go a very long way toward independent learning for students with special needs. Often, teachers are so focused on ensuring that students pass achievement tests that they have little or no time to address students' social and emotional needs (Allred, 2008).

Naomi was extremely sensitive to this reality, having worked with this population for fifteen years. Melissa, too, was clued into the immediate need for breaking a negative cycle with her students, although she tended to be more reactive and less proactive, as well as using technology much more for emotional regulation exclusively rather than proactive academic planning to encompass both academic goals as well as emotional regulation at the same time. The more negative emotions they felt, the more the cycle of negativity continued. In addition, sensitivity on the part of teachers is imperative to successful outcomes and consistent modification of strategies and lesson approach.

During the course of our semi-structured interview, Melissa touched upon a point she's thought about a great deal, which relates to the economic disparity between the students' daily lives and the cost of technology. She put it this way:

I think it can be confusing for the students to have stuff that's so expensive. I understand that there are students who don't have dinner, or are wearing the same clothes multiple days in a row, but then we have this box of electronics – they're not getting their basic needs met. Just think about the hierarchy of need. Like a student hasn't had a meal in a day and then they're getting handed an iPad. I just feel like we're not doing enough of the middle tech level here. Especially if we're not using the iPads the way we could or should be using them.

Once again, Melissa's frustration with the higher-tech equipment was evident. It seemed that the frustration had put up a barricade between her and the technology, as if there were no longer a relationship there to pursue.

Just as emotional support and regulation of emotion is crucial in the education of students with special needs (Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003), so too is the regulation and support of physical and basic needs (e.g., shelter, food, clothing, love, safety) (Maslow, 1943). Melissa's insight into the disparity between the daily living situation of many of her students and the expensive equipment found in the school building raised an interesting point that would warrant further study.

Summary

Although very different in their usage of educational technology, both teachers expressed concerns and demonstrated frustrations that led to my understanding of two central themes, present in the classrooms of both teachers. These themes spoke volumes about their experiences in implementing and utilizing educational technology with consistency and personal investment. Depending on the teachers' personal experiences with technology, the drive toward greater expansion of knowledge, experimentation and pursuing more information to share with students

was either enhanced or limited. While neither teacher had a complete grasp on what the solution would be to address the challenges she faced, both teachers were committed to creating positive learning environments for their students and did so in varied ways.

Chapter Five – Conclusions and Implications

This case study was generated by my own interest in the use of technology, particularly in special education classrooms. Since there was a national push toward increased use of technology, I wanted to look more closely at the ways in which this is being implemented and the impact it has on students. Chapter One broke down the statement of the problem, provided a brief explanation of the thesis, and contained a definition of terms. Chapter Two reviewed literature I found related to the use of educational technology and its relationship to social emotional learning and emotional regulation. Chapter Three laid out the design of the study, including data collection and analysis methods, as well as tools to ensure the reliability and validity.

The actual thesis study provided a window into how educational technology was being used in two special education classrooms. Two themes were uncovered. The first theme was teacher comfort level and familiarity with the technology. The second theme was the impact the technology has on the students. Each classroom was set up very differently, and each teacher utilized technology in very different ways. One teacher was excited, enthusiastic and proactive in her approach to technology use in her classroom.

Teacher one, Naomi, engaged students in the exploratory journey of finding new ways to use apps and iPads. She became chair of the technology curriculum committee, working with others within the building to disseminate information about technology in the school, attended New England Assistive Technology workshops, and did research during her personal time. She reflected on how she was using technology in her classroom, what impact it had on her students, and how she could improve her own familiarity with it. Her enthusiasm was evident in her

teaching as well as in the response of her students. She was self-reflective and realized she needed to do more in order to continue to learn and grow as a technologically savvy educator. Naomi valued the use of technology. She felt it was a pathway for students to access content and broaden their skills as they entered the wider world. She was passionate about providing opportunities for students to have experiences with technology. She spoke about the fact that in her teaching career, she had known parents of her students and teachers who had taught her students in years past who felt that students were not capable of using technology, and thus she would have a classroom full of 17-21 year olds who didn't know how to get online, use a mouse, or even use a simple app. Naomi was committed to changing this for her students. She incorporated her commitment into her professional learning activities, the research she did on her own time, and her school-wide participation in the dissemination of knowledge and greater usage of educational technology within the school. She believed it was part of her role responsibilities to help students become more comfortable and familiar with technology so that they could use it with some confidence after leaving our school.

The other teacher, Melissa, was tentative about the use of technology within her classroom, and spoke about feeling ambivalent about the use of technology on a number of different levels. Building-wide, she felt there were some hampering limitations in the ease of use of equipment. Some of her beliefs about these limitations were accurate and true, while some were not. She also felt that she had more than enough on her plate as a teacher, and that the amount of time, effort and energy it would take to learn what she needed to learn about the technology was more than she could spare working with such behaviorally challenged students.

She questioned the value of all of the higher tech equipment, didn't feel particularly comfortable using it, and didn't feel it made a big impact on her students academically. Where

she did find enthusiasm and where her comfort level soared was in the use of technology for the purpose of deescalating students during behavioral episodes, reengaging students who were beginning to show signs of a negative emotional cycle, and using iPads and the Smart board in relevant, if limited ways to level the playing field so that all of her learners could have access to content.

She also spoke about her interest in mid-level rather than high-level technology. She used *Alpha Smarts* with her students on occasion and moving picture experts group layer 3-audio (MP3) players more often than apps on the iPad. She seemed frustrated about both the technology and her struggle to use it in meaningful ways. She also reflected that many students didn't have their basic emotional and physical needs met outside of school, so that handing an iPad to a student who hasn't had enough to eat at home seemed to be an irreconcilable conflict. The two themes that emerged from this research study were relevant to implementation of sound technological strategies within the special education classroom. Both the enthusiasm and the reluctance on the part of teachers informed my deeper understanding of how crucial teacher familiarity and comfort level with technology are to the actual impact that this technology will have on students. The themes are innately connected and fundamental to understanding how and why certain technologies are being used.

Limitations of the Study

The three limitations for this study were sample size, time to complete the study, and lack of prior research on the topic. The first two limitations were connected to one another, as I would have pursued the study of additional teachers had I the time in which to do so. In some ways, both the sample size and the time limitations were helpful, in that I was able to really drill down my observations and distill information from the interviews that directly answered my research

question. It was helpful that the two teachers were so different in their approach to and use of technology in their classrooms. This difference gave me a rich understanding of the underlying themes, and allowed me to capture the essence of the main issues.

On the other hand, having had a wider sample and more time allotted would have allowed me to look for trends in approach and use of technology. It also would have allowed me to sort through more subtle aspects of the incorporation of technology. Having had more time, even with two teachers, would have helped me to see not just a smattering of lessons, but a more authentic and longer lasting look at their practice. If I had been able to implement this study over the course of an entire school year, I feel I also would have been able to track teachers' shifting attitudes and behaviors related to their use of technology in the classroom. In this way I would have gotten significantly more information about their true feelings regarding technology, and would have most likely uncovered more than the two themes I was able to.

The lack of prior research that I was able to identify in the area of the use of technology in special education classrooms from my own literature review limited my ability to compare my study to those that had gone before. I wasn't able to find studies that spoke to my particular population (i.e., high school students with severe emotional dysregulation, as well as intellectual disabilities) or my particular teacher profile (i.e., special education teachers in a private, special education school with very little experience in other teaching environments). This left me delving into my own perceptions about my school with no direct path to follow. Despite this limitation, I was able to freely think about the situation within my school, and was able to draw upon basic themes, conclusions and relevant findings from other studies, which still had much to offer.

Implications for Practice

The implications for practice that this study uncovered were that teachers need step-by-step guidance, support, training, and check-ins in order to be able to learn to engage with the technology themselves. Only with this type of comprehensive approach to teacher use of technology will teachers really be able to take risks in their use of such things. As both the research and this study show, technology alone will not provide the necessary environment for learning that impacts students in meaningful ways. It is the human piece, the teacher piece, which completes the puzzle. Teacher confidence drives the learning momentum forward, leading to students with special needs experiencing an increase in their access to content, emotional regulation, positive engagement within the classroom, and a more level playing field.

Private and public schools alike would be wise to think through purchases of iPads, Smart Boards, MP3 players, applications, computers, tablets, and software of all kinds with those who will be modeling their use in mind, and that is primarily the teachers. If schools and school districts can't proactively build in ongoing training, support and check-ins for teachers, the technology will languish on the desk, underused and lacking impact on student learning. With some foresight, real enthusiasm, excitement and engagement can be generated. Mentoring teachers through the process of discovering new ways to use technology, building time into their schedules to do so, and creating a school environment in which new ideas related to technology are encouraged and supported is the only way that the technology will have any meaning at all.

Suggestions for Future Research

Based on my findings in the literature review, as well as the information I gathered during this study, I would suggest future research explore two ideas. The first is this idea of school support of teacher implementation of technology. How do individual schools and school

districts view teachers when they plan for increases in the budget for the purpose of purchasing supplies and technology to enhance ‘21st century learning?’ Studying the technology plans and teacher training plans rolled out by individual schools and districts would give us more information regarding the effectiveness of these trainings and how they may be improved.

Second, I suggest looking at the ways in which technology impacts students who are both in special education classrooms and who also come from impoverished backgrounds. These are students who have multiple challenges in their lives, not the least of which is underexposure to technology from a young age. If technology is part of the world in which we now live, and if being ‘literate’ in technology is now something akin to being literate in reading and writing, then students living in poverty, will surely suffer the effects of not having been taught to use a keyboard, mouse, search engine, tablet or other device from an early age as students from wealthier backgrounds certainly have. Looking at the impact that this background can have on special education students in particular, may allow us to plan more carefully for our academic interventions and support, particularly around introduction of technology and maintaining cultural, socioeconomic and intellectual sensitivity in our work.

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Appendices

Appendix A

Semi-Structured Interview

1. How long have you been teaching students with a wide range of disabilities in the special education classroom?
2. What (if anything) drew you to teach in a specialized setting such as CCMC School?
3. How would you describe the communicative abilities of students with a wide range of disabilities in your classroom?
4. How would you describe the emotional regulation abilities of students with a wide range of disabilities in your classroom?
5. What are your views on the use of technology in the special education classroom?
6. Does your school make a definitive effort to stay current with available technology? If so, how? If not, what do you perceive as the reasons?
7. Which types of technology do you use in your classroom?
8. Are there any specific technologies that are predominately used? What characteristics of the technology render them more effective?
9. For what purpose do you incorporate these technologies to support students with a wide range of disabilities in your classroom?
10. Please provide one or more example(s) of what you consider effective use of technology at your school.
11. What impact do you perceive this technology has on the communication of students with special needs?

12. What impact do you perceive this technology has on the emotional regulation of students with a wide range of disabilities in your classroom?

13. What impact do you perceive educational technology has on the access of content for the students in your special education classroom?

14. What are the indicators of communication that you observe technology has on these students?

15. In what other ways has technology impacted your students with special needs?

16. What issues or challenges have you encountered in your practice of implementing technology for students with disabilities?

17. Is there anything else you would like to add with respect to the use of technology for students with a wide range of disabilities?