THE HOW OF BLENDED INSTRUCTION:
CURRENT PRACTICES OF NORTH CAROLINA TEACHERS IN ONE-TO-ONE SCHOOLS

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DEDICATION

To my family, living and deceased, who always dreamed more for me. You have sacrificed and endured so much for me to attain this goal, and I could not have done it without you. I love you.

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ABSTRACT

THE HOW OF BLENDED INSTRUCTION: CURRENT PRACTICES OF NORTH CAROLINA TEACHERS IN ONE-TO-ONE SCHOOLS

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With an increasing number of students experiencing blended instruction, understanding how instructors blend their face-to-face and online teaching is important. This study explores current practice in blending instruction through a researcher-developed survey, which was administered to educators who work in North Carolina's public pre-kindergarten to grade 13 schools with a one-to-one student-to-instructional computer ratio. Descriptive statistics, such as frequency and proportion, and a category system of common responses for open-ended questions were used to analyze the data. Participants' ratings and comments are shared, providing a better picture of who in North Carolina's public pre-kindergarten to grade 13 schools is blending instruction, which hardware and online tools are being used, with what frequency, by whom (instructors and/or students), and what barriers are encountered when implementing this model. This study establishes a starting point for additional research on blended instruction. Recommendations for further study, including the investigation of how the hardware and online tools are being used in context to assess best practices, are presented. Administrators in schools and school systems, the Regional Education Service Alliances, the Department of Public Instruction, professional associations, and teacher education programs could benefit from the data collected.

Keywords: blended instruction, one-to-one computing, pre-kindergarten to grade 13, North Carolina

CHAPTER ONE

An increasing number of students are experiencing blended instruction (i.e., a combination of face-to-face (f2f) and online learning environments). In 2007-2008, the Sloan Consortium, an organization that supports quality, online education, conducted a study of K-12, school district administrators in the United States and found that 75 percent of the districts represented had one or more students enrolled in a fully online or blended course (Picciano & Seaman, 2009). Why? One reason may be that "instructors believe diverse delivery methods may significantly enhance learning outcomes as well as increase student satisfaction" (Lim & Morris, 2009). For example, the principal of a blended, public high school reported an 8.5 percent higher attendance rate and a 27 percent higher graduation rate than the district as a whole, and the principal attributes the students' successes to the school's blended structure (Blackboard K-12, 2009). (It is important to note that this school has a college preparatory, digital technology focus, and students from across the district are enrolled in it.)

Blended instruction is a present manifestation of distance learning, which began as correspondence courses at home by postal mail, then real-time, two-way video in the brick-and-mortar school, and now anywhere, anytime that there is an Internet-connected device. According to Watson (n.d.), "The advantage of online learning over these other channels is its combination of rich student-teacher-peer communication and interaction, either synchronous or asynchronous, and robust personalized teaching within instructor-led courses". This variety in delivery is where the potential exists for dynamic learning opportunities. Watson (n.d.) adds,

> Emerging models in other countries, such as Singapore and Australia, as well as in higher education, suggest that a large part of the future of education will involve providing content, resources, and instruction both digitally and face-to-face in the same classroom. This blended approach combines the best elements of online and face-to-face learning. It is likely to emerge as the predominant model of the future – and to become far more common than either one alone.

Purpose of the Study

The University of Central Florida's President Hitt is quoted in a North Carolina Virtual Public School (2009) publication saying that professors will teach either online or in a blended environment (i.e., not 100 percent face-to-face). If that is true, it will be necessary for secondary schools to prepare students for these environments, so exploratory studies are needed. Other researchers cite methodological shortcomings in addressing students' learning style, age, and gender differences (Fang, 2006; Rovai & Jordan, 2004). When process has been examined, it most often has been at the middle school and higher education levels. Garthwait and Weller (2005) identify a lack of knowledge about the impact of teacher's gender on one-to-one implementation. VanHook-Schrey (2008) identified a need for training in: 1) technology integration for current and future teachers and 2) collaborating with technology support staff. These groups could be an audience for the findings. The purpose of this study is to report how North Carolina pre-Kindergarten (pre-K) to grade 13 (Early College) teachers are combining their face-to-face and online environments to differentiate instruction and maximize the learning of the millennial generation and, in turn, facilitate other teachers' adoption of innovation.

Research Questions

Building upon the learning theories of differentiated instruction and the Revised Bloom's Taxonomy, the research questions address how practitioners integrate digital technology to provide additional opportunities for students to customize their learning and produce a greater range of objects that demonstrate their understanding. Of the teachers who blend face-to-face and online instruction in one-to-one computing schools

1) what are their current practices in integrating hardware and online tools to differentiate instruction and facilitate higher order thinking, and

2) what obstacles did they have to overcome related to integrating hardware and online tools, and how did they overcome them?

Definitions

As previously stated, blended instruction is a combination of face-to-face and online learning environments. The term *hybrid* is used interchangeably by some persons (*Blended*

learning in K-12, 2013). However, Osguthorpe and Graham (2003) make the argument that "the origin of the word 'hybrid' is the interbreeding of two different species of animals or plants to create a new species…the word 'blend', on the other hand, focuses on the mingling together in ways that lead to a well-balanced combination." That combination can vary greatly depending on what and how often digital technology is integrated on a continuum of almost fully face-to-face to almost fully online (Rovai & Jordan, 2004; Watson, n.d.).

In a blended courseload, "some students are taking one or more fully online courses (likely asynchronously, or not in real-time) and attending a traditional classroom for one or more fully face-to-face courses…Within a computer lab full of students working at their own pace, a teacher may have one question on AP Statistics, then cross the room to answer a basic math question." (Watson, n.d.). Another format accommodates students who, for whatever reason, cannot attend a synchronous class in person. They are able to participate in real-time via web conferencing software.

A third group of blended learners experience the same class in multiple environments. According to Watson (n.d.), the Educause Center for Applied Research conducted a study of post-secondary institutions and found that 83 percent used a course management system to integrate an online component into their face-to-face classes. In Singapore, a technologically-forward country in regard to education, 100 percent of secondary schools and 85 percent of primary schools have a learning management system. Kentucky's virtual schools provide an online course shell, as well as content, technical support, professional development, and a student help desk (Watson, n.d.). This design may or may not result in fewer face-to-face meetings. At the University of Central Florida, some courses are labeled as "M" which means media-enhanced and reduced seat-time. These courses may meet MW instead of MWF. The out-of-class work is facilitated by the Internet.

Brown (n.d.) claims that 90-10 is the "gold standard" for blended instruction with either ninety percent of interaction face-to-face and ten percent online or vice versa. The instructional framework of the Odyssey, a charter school in Nevada, operates on this ninety percent online and ten percent face-to-face model with a fully online curriculum but required on-site attendance.

Students attend classes on campus one day a week for four hours with mentors available to work individually with students as needed. Another example is the Commonwealth Connections Academy, a K-11 public school in Pennsylvania, that "created a drop-in center where online students work with highly-qualified teachers in person (usually the same teachers the students work with online) to address deficiencies" (Watson, n.d.).

Conversely, the proportion could be ninety percent face-to-face and ten percent online. Students may have to progress through self-paced instruction online for basic content, followed by live, teacher-led instruction for more in-depth understanding. This sequence is called "flipping" because a lesson is introduced online and viewed individually before the group comes together to process learning and collaborate (Lim & Morris, 2009). Swain (as cited in Osguthorpe & Graham, 2003) describes an example of flipping:

> An accounting professor pre-records audio-synched PowerPoint presentations that students view online, allowing him to use class time to discuss students' questions. In his words, 'This has completely changed what I do in class. I used to spend time dispensing information. Now they get that online, and we can go deeper in class than ever before.

Online discussions prepare students for face-to-face discussions, and learners, who do not ask questions in public, can send questions via text to the group or private message the instructor (Fang, 2006).

Researchers must be clear about what blended instruction means for their study. For the purpose of this research, the following two statements apply:

- "blended learning combines online delivery of educational content with the best features of classroom interaction and live instruction to personalize learning, allow thoughtful reflection, and differentiate instruction from student-to-student across a diverse group of learners" (Watson, n.d.); and
- "the presence of software that organizes the course [is] a distinguishing characteristic between a truly blended course and face-to-face course that simply incorporates a few digital elements" (Watson, n.d.).

The prevalence of mobile computers and wireless Internet connections have led some schools to pursue *one-to-one*, or ubiquitous, computing, so that every student has an Internet-ready device (e.g., a laptop, tablet computer, eReader, smartphone, mp3 player, etc.) for the purpose of immediate access to digital technology-based curricular and instructional resources at school. Students may or may not have the device at home. In some cases, this initiative has been pursued in low-income and/or rural areas to off set the gap in technological resources.

Significance of the Study

Blended instruction is a timely topic because it is an educational response to growing cultural and economic reliance on digital technology. With its pedagogical potential for differentiation and socialization, audience appropriateness for the millennial generation and developing 21st century skills, and fiscal feasibility with current accessibility and projected sustainability, it stands the chance of being an innovation that teachers will adopt over time for its promise of learning gains through professional intentionality and economic necessity. Incentives, such as the Pew Grant Program in Course Redesign, exist to encourage blended instruction in schools (i.e., universities in the case of the Pew Grant Program) (Oh, 2006).

Pedagogy

Students' needs for differentiation and socialization are two considerations for blended instruction. A blended environment adds another dimension for content internalization and demonstration of learning.

Differentiation. Title I of the No Child Left Behind Act of 2001 (NCLB, 2002) mandates the following:

> all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging State academic achievement standards and state academic assessments. This purpose can be accomplished by…(2) meeting the educational needs of low-achieving children in our Nation's highest-poverty schools, limited English proficient children, migratory children, children with disabilities, Indian children, neglected or delinquent children, and young children in need of reading assistance;…[and] (8) providing children an enriched and

> accelerated educational program, including the use of schoolwide programs or additional services that increase the amount and quality of instructional time.

Although NCLB was not entirely well received in the education community for its federally-issued, unfunded mandates, the policy-makers acknowledged that different learners require different solutions. Our country's current president Barack Obama reiterated this emphasis on diverse learners in his reauthorization of the Elementary and Secondary Education Act (ESEA) and added that high school graduates should be "well prepared for college and a career" (U.S. Department of Education, 2010).

Differentiation is the buzzword for the instructional variation needed by individual learners. McQuarrie, McRae, and Stack-Cutler (2008) found that "Compared with the general student population, students with mild or severe learning disabilities received more benefits from differentiated and intensive support, especially when the differentiation was delivered in small groups or with targeted instruction." On the other end of the ability spectrum, Tiesco (as cited in Huebner, 2010) studied 31 math teachers and 645 students and concluded that differentiated instruction was also effective for keeping high-ability students challenged in heterogeneous classrooms. Although differentiation is typically associated with low- and high-ability learners, every student learns differently. Variety is key. Title I of NCLB (2002) requires programs or services that increase the amount and quality of instructional time, and a blended model is a conduit for additional content exposure.

North Carolina General Statute 115C 102.6B and 102.6C require state and school system technology plans to be updated every two years. According to the authors of North Carolina's 2004 Educational Technology Plan,

> Three main focus areas for positively affecting student achievement are (1) collaborative instruction, (2) differentiated instruction, and (3) project-based learning…The Technology Plan calls for school districts to move beyond integrating competencies into the curriculum and employ technology to enhance and facilitate higher order thinking skills. (North Carolina Division of Instructional Technology, 2004)

Digital technology can be a transformative instructional tool when educators use it for more than technology-sake. According to VanHook-Schrey (2008), researchers "refer to technology as a possible panacea offering teachers the opportunity to individualize instruction, create open-ended student centered investigations, and shift from the role of traditional instructor to mentor and co-learner."

Blended instruction is what educator and professional learning community expert Rick Dufour calls the "genius of and" as it combines the strengths of two learning models (i.e., predominately face-to-face socialization and online instructional differentiation). Although teachers certainly can differentiate face-to-face, and digital technology does not provide automatic differentiation, the online option adds tools to the teacher's instructional skill set. Although there are proponents of fully face-to-face and fully online courses, instructional delivery does not have to be an either/or decision. A blended framework increases the likelihood that one or more strategies will meet students' varying learning needs. Rovai and Jordan (2004) noted,

> A combination of f2f and online learning environments provides a greater range of opportunities for students to interact with each other and with their professor. These interactions should result in increased socialization, a stronger sense of being connected to each other, and increased construction of knowledge through discourse, thus providing stronger feelings that educational goals were being satisfied by community membership.

As with most instructional changes, it is reasonable to expect that the teacher's investment of time would be front-loaded with physically creating the environment, establishing group norms, etc. However, "The blended course possessed a significantly higher adjusted mean learning score than the online course, but with a medium effect size," meaning that the course environment is moderately associated with the higher score (Rovai & Jordan, 2004).

North Carolina State Superintendent June Atkinson (2009), at the Summer Leadership Virtual Conference, related the direction of public education to a global positioning system (GPS) (i.e., "a personalized education for each student") through digital technology. The purpose of a GPS is "to get you where you need to go," which, in educational terms, is college and career ready (Atkinson, 2009). A GPS analyzes different routes (e.g., shortest or fastest) based on the

needs of the user and recalculates when the course changes, reiterating the need for more formative assessments. Atkinson (2009) proposes the following changes to North Carolina public school culture: school as a gathering place; instructor as a learning coach; desk as anywhere, anytime; 180 days and 1000 hours to a flexible calendar and schedule; individualized; and face-to-face to virtual. The North Carolina Virtual Public School is assisting with this charge through their modular program, a form of blended instruction for regular education (credit recovery) and Occupational Course of Study (original credit). Additionally, the Race to the Top federal grant, authorized under the American Recovery and Reinvestment Act of 2009 and intended for education reform, funded North Carolina Governor Bev Purdue's Career and College: Ready, Set, Go! program, which included increasing the number of students that perform at or above grade level by "[putting] more technology into the hands of students and teachers to increase individualized learning options" (Purdue, 2009). With support from state leaders, it is likely that blended instruction has staying power.

Socialization. Some students need to feel connected to others or have interpersonal interaction in order to learn. Socialization is associated most often with face-to-face instruction because it is a real-time, shared experience. A lack of socialization has been used as an argument against distance learning because historically it was asynchronous and independent (Osguthorpe & Graham, 2003). Much of the literature related to online and blended instruction comes from higher education, which has application to K-12 schools. Still, one must be cautious when reading the literature on distance education and using it to support or oppose blended instruction because of how rapidly changing digital technology is.

Researchers have conducted studies to compare and contrast the outcomes of face-to-face, online, and now blended instruction: "Previous research has indicated learning quantity and quality suffers when learners are solely and completely immersed in technology-based instructional delivery methods. Reasons that help explain this learning decline include a lack of human interaction" (Lim & Morris, 2009). Carr (2000) writes about the attrition rate in online versus face-to-face courses and purports that, based on anecdotal evidence by individual institutions, course completion and program retention is lower in distance education. A lack of

instructor presence and unclear expectations were one person's reasons for withdrawing from an online class, and, from an instructor's perspective, "sometimes students just get lost out there in cyberspace" (Carr, 2000). However, other adult learners whom Carr (2000) interviewed had similar reasons as those in face-to-face courses who do not persist (e.g., family obligations).

Through an ethnographic case study of a graduate-level, online course, Hara and Kling (2001) used observations, interviews, and document review to conclude, like Carr (2000), that student distress over technical issues and ambiguous expectations were of greater concern than isolation. Technical issues become fewer as technology changes and improves. It was unclear if asynchronous communication caused the greatest discontent. Although there are remedies in the online environment, in a blended setting, students would have the opportunity to ask questions when face-to-face. Training in online and/or blended instruction to improve effectiveness and the students' experience will be mentioned again in Chapter 2.

Data exists to support the positive learning outcomes related to blended instruction. According to Strickland and Ellis (2010), "Data taken from research with older learners found that students who took all or part of their class online performed better, on average, than those taking the same course through traditional face to face instruction. As well, instruction combining online and face to face elements had a larger advantage relative to purely face to face instruction than did purely online instruction." In addition, blended learning yields higher completion rates than e-learning alone (*Blended learning in K-12*, 2013). Rovai and Jordan (2004) shared a benefit and caution of digital text conversation:

> The text-based computer-mediated communication (CMC) that is used by Internet-based e-learning systems for discussion board and email discourse is a powerful tool for group communication and cooperative learning that promotes a level of reflective interaction that is often lacking in a face-to-face, teacher-centered classroom. However, the reduced non-verbal social cues in CMC, such as the absence of facial expressions and voice inflections, can generate misunderstandings that adversely affect learning.

Clear and respectful writing notes that indicate intent and emoticons can help to prevent text miscues. Audio and video further ameliorate such concerns and facilitate engagement.

Instructional Audience: Millennials and 21st Century Skills

Knowing and relating to one's instructional audience may be as important as the content itself. Therefore, also relevant to the significance of this study is the research on millennials, who are transitioning into adulthood at the start of the new millennium. According to the Pew Research Center (2010), they "are on course to become the most educated generation in American history…accelerated in recent years by the millions of 20-somethings enrolling in graduate schools". Still, where and what they are learning (i.e., social media) is largely misunderstood, unmonitored, and undeveloped as an instructional tool. Pew (2010) reports that 75 percent of millennials have created a profile on social networking sites. What is more, they spend nine hours each week on them (National School Boards Association, 2007). With such pervasiveness, it is necessary for the adults in their lives to be there, too. Nielsen (2010) advised, "Caregivers must be taught how to engage in the online learning environments in which their children participate."

The evolution of distance learning was mentioned briefly earlier. It is necessary to remember that the needs and expectations of society have changed dramatically, too. Based on the term Web 1.0, 2.0, and 3.0, which describe the development of the Internet and its use, Moravec (2009a) relates the purposes of society and education:

> Society 1.0 refers to pre-industrial, industrial, and information age society that was based on linear, task-oriented relationships…Society 2.0 refers to the knowledge-based society that is driven by globalization and the growth of networking technologies. In this paradigm, information is no longer as important as the knowledge that's created as we interpret information and create meaning… Society 3.0 refers to an emerging innovation-based society that is not quite here yet…In an era of accelerating change, the amount of information available doubles at an increasing rate.

The description for Society 2.0 is apt for today's preoccupation with social media for both personal and business connection and the mainstream technologies that allow individuals to create and share information instantly. Education is slowly incorporating these same elements:

> The role of the corresponding Education 1.0 regime was to create graduates that would perform well in jobs with easily defined parameters and relationships...The role of

> Education 2.0 is to develop our talents to compete in a global market with new social relationships, and where we are able to leverage our knowledge...Education 3.0 schools produce knowledge-producing students, not automatons. (Moravec, 2009b).

According to Moravec (2008), the goal of current educators should be that every student be a knowmad (i.e., "nomadic knowledge-worker, that is a creative, imaginative, and innovative person who can work with almost anybody, anytime, and anywhere") – mobile millennials.

Outside of school, millennials are immersed in digital technology. Inside of school, these devices often are banned, but the students could benefit from seeing them used educationally. Blackboard K-12 (2009) recognized this disconnect by acknowledging, "Today's digital native students expect their learning environment to include technology because it is an intrinsic part of their lives." Part of the big picture of education is literacy, and "being literate in a real-world sense means being able to read and write using the media forms of the day, whatever they may be" (Ohler, 2009). However, "because writing is a deep habit, when students sit down and compose on a keyboard, they slide into the mode of writing they do most of the time on a keyboard" (Bauerlein, 2010). The Nielsen Company (2013) found that 3,339 text messages are sent each month by the average teen. Thus, the need for an intervention involving the devices exists not only to maintain a distinction between formal and vernacular writing but also to teach etiquette and refine skills for adult life, a curriculum in its own right.

The need for digital technology skill development extends beyond high school. Watson (n.d.) questions why "Too many schools are still attempting to prepare students for this world without teaching within the [communication] mode that students will find when they move on to post-secondary education or the workforce". According to the American Society for Training & Development's 2008 State of the Industry report, one-third of training content is delivered and frequently tested online (as cited in Rossett & Marshall, 2010). Further, in one study, once the trainees became familiar with the digital technology, they were comfortable using it afterward for internal communication (Fang, 2006). There is a belief that allowing digital technology would lead to off-task behavior, but Li and Pow (2011) found that it became the students' "cognitive companion."

Unfortunately, VanHook-Schrey (2008) references “findings [that] indicate a decrease in computer use in the classroom as students reach the secondary level, where higher order thinking skills are most prevalent, and show that secondary ELA [English Language Arts] teachers are more likely than other academic teachers to implement frequent computer use in the classroom. The International Association for the Evaluation of Educational Achievement (IEA) studied teachers’ technology use related to instructional delivery and found that 75% of American educators were ‘computer-using teachers’, although Becker reported that only 25% could be identified as ‘computer-using’,” reflecting a discrepancy in educators’ perception and action. This discrepancy was echoed in a 2009-2010 report of North Carolina principals, who estimated that 90-plus percent of their teachers were technologically proficient; however, students in those schools said that only half were (Trantham, 2010). According to the authors of the National Education Technology Plan, “[Educators] must leverage technology to provide engaging and powerful experiences, content, and resources and assessments that measure student achievement in more complete, authentic, and meaningful ways” (U.S. Department of Education, 2010).

Much emphasis is being placed on students’ development of 21st century skills: (a) learning and innovation (i.e., creativity and innovation, critical thinking and problem solving, and communication and collaboration); (b) information, media, and technology [i.e., information literacy, media literacy, and ICT (information, communications, and technology) literacy]; and (c) life and career (i.e., flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility) (Partnership for 21st Century Skills, 2004). It is believed that competence in these areas is required to live successfully in the 21st century. Access to and the use of digital technology is a given. Napier, Dekhane, and Smith’s (2011) work focuses on independence, time management, and comfort with digital technology.

Digital technology provides a flexibility unlike any other innovation in education. Watson (n.d.) hypothesized that “In an age when information and communications technology skills are so critical, and so much collaboration, resource sharing, content development and learning are done

digitally, asynchronously, and at a distance, it is unlikely that student learning will continue to be based solely on print textbooks and face-to-face classes conducted in 50-minute increments". From school to work to simply living, the role of digital technology is transitioning (e.g., print to digital books) and expanding, and, in the best interest of students, educators must seek exposure for all students to have knowledge and skill with the potential tools of the future and provide instruction in (in)appropriate use. The U.S. Department of Education (n.d.) promotes "Successful online/blended project-based learning [as] an effective and interesting way to extend problem solving and logic skills by applying the strategies and processes of social, political and economic modeling to real environmental."

Resources

Blended instruction allows for differentiation and socialization and has technological relevance for current young adults, but can public schools realistically provide and sustain the physical resources when budgets are being cut? The answer is yes.

Current accessibility to digital technology. North Carolina General Statutes 115C 102.6B and 102.6C require state and school system technology plans to be updated every two years:

> To assure such a rigorous and relevant core curriculum the Department of Public Instruction promises to assist in the development of instructional strategies for technology integration, implementation, and infusion into the [North Carolina Standard Course of Study] in support of 21st Century Skills, to provide assistance for teachers, administrators, and support personnel to integrate technology into assessment and individualization of student instruction, and to provide guidance to [Local Education Agencies] to ensure equity in the distribution of and access to media and technology resources for all students. (North Carolina Division of Instructional Technology, 2004)

Public education is a responsibility of the individual states, and North Carolina's elected officials and educational leaders support technology integration in instruction. However, the front-line, that is the instructors, determine how effective the strategy is. VanHook-Schrey (2008) referenced the work of a group of researchers:

> Harper et al. advise that such reform, 'like past revolutions in education, will go the way of previous technologies unless changes to our schools and the tools provided with computers occur'", and "there has been little research on the actual implementation of such changes in North Carolina classrooms following the initiation of the Educational Technology Plan, and the reality of widespread computer technology integration is uncertain.

Also, every public school system in North Carolina submits to the Department of Public Instruction an Annual Media and Technology Report, which includes each school's enrollment or [Average Daily Membership (ADM)] and the number of students per instructional computer. The number of students per instructional computer has decreased over time as demonstrated in Table 1 below.

Table 1

North Carolina's Statewide Ratio of Students per Instructional Computer

	2005	2006	2007	2008	2009	2010	2011	2012
Students per Instructional Computer	3.53	3.43	3.31	3.22	2.72	2.37	2.14	1.81

Note: Data based on the Annual Media and Technology Report and provided by Regional Digital Teaching and Learning Consultant M. Honeycutt (personal communication, March 24, 2013)

At home, 72.2 percent of persons, ages 15 to 19, use a computer, and 86.6 percent of those connect to the Internet (National Center for Education Statistics, 2005). These numbers vary slightly by gender but dramatically by race.

Fiscal sustainability. Cost is the number one factor in innovation diffusion. According to the U.S. Department of Education (2010), "we need cost-effective and cost-saving strategies that improve learning outcomes and graduation rates for millions of Americans." Blended instruction could be one such strategy. The costs associated with a blended instructional infrastructure occur primarily on the front-end of implementation (although maintenance is necessary), but, with a vision for how the digital technology will be used, it could be possible to divert money from other

investments if changes in policy and procedure are made [e.g., textbooks (if available digitally), supplies (such as paper and lab expenses), and some professional development, substitute teacher, mileage, meal, and lodging expenses (if offered online)] (Murray & Olcese, 2011; Niemiec & Otte, 2009). Acquisition costs are decreasing (Murray & Olcese, 2011). Maine, Michigan, and New Mexico have established statewide, one-to-one computing initiatives in their middle schools, providing a digital technology equalizer for low-income students (North Carolina State University, n.d.*a*). North Carolina is pursing a cloud (online) server to support K-12 education statewide (North Carolina State University, n.d.*b*). Blackboard K-12 (2009), an online product vendor, suggests "Not only is blended learning a growing model, it is increasingly embraced and adopted by districts of all sizes and at all stages of the technology implementation continuum."

Software research is another area of cost-saving. Open source applications are free alternatives to commercial software (e.g., Moodle as a competitor to Blackboard's learning management system) (Harvey, 2009). "Free" may exclude add-on features and technical support for example, but open source can be a lower-cost option. Once developed or acquired, the content is reusable and able to be shared within the school and district, barring site licenses. Furthermore, educators "have discovered that this instructional model helps them increase capacity without commensurate increases in budget or staff" (U.S. Department of Education. Office of Educational Technology, 2010).

Blended instruction can be a response to address continuity of learning for students who need more time with the content, for students who are absent or have been suspended, and when there is a weather-or health-related closure. "If [students] don't have access, then the formulation of a plan or policy for expanding access in the short- and long-term" should be considered (Patrick, Munk, & Owen, 2009). Currently "some districts are experimenting with a four-day school week, which can help them achieve savings in facilities operation and transportation" (Blackboard K-12, 2009).

Delimitations

Despite gender being identified as a gap in the literature related to this topic, the researcher is more interested in addressing learning differences and age. Determining if students' gender has a defining role in blended instruction is a potential direction for future research. The scope of this study is limited to public, pre-kindergarten to grade 13 schools in North Carolina with close to or better than one-to-one students per instructional computer, to better understand if, with the available resources, teachers have developed promising instructional practices in integrating digital technology to achieve a blended model.

CHAPTER TWO

Blended instruction, a combination of face-to-face and online environments, provides another medium for differentiation and opportunity for student learning through social engagement, and the Millennial generation is poised to transfer their knowledge of social media to their formal education and developing 21st century skills for today's workplace. The needed digital technology is accessible in many areas and possibly monetarily sustainable as it could be an alternative to other resources. Research on blended instruction strengthens the belief that it may have a positive impact on learning outcomes. For example, Digital Harbor High School, a public, magnet school in Baltimore, Maryland for computer studies with a cross-section of students, boasts an 8.5 percent increase in attendance and 27 percent increase in graduation over its school district's overall rates, in addition to maintaining federal Adequate Yearly Progress (AYP) on standardized tests (Blackboard K-12, 2009). This study will contribute a greater awareness of the less understood processes leading to these outcomes.

Research Questions

Of the teachers who blend face-to-face and online instruction in one-to-one computing schools:

1) what are their current practices in integrating hardware and online tools to differentiate instruction and facilitate higher order thinking, and

2) what obstacles did they have to overcome related to integrating hardware and online tools, and how did they overcome them?

Theoretical Framework

The review of literature on blended instruction reveals a framework for how to employ digital technology to differentiate and facilitate higher order thinking. This chapter includes an overview of two learning theories applicable to the topic (i.e., differentiated instruction and Revised Bloom's Taxonomy) and a consideration for blended learning's long-term assimilation through educators' willingness to adopt innovation. Finally, gaps in the literature will be summarized to support the need for this study.

Learning Theories

Differentiated instruction. Differentiation is the instructional variation needed by all learners, not only low- and high-ability students. The information that follows is an explanation of what to differentiate and how the instruction may look in a blended course.

General theory. According to Flavin (2001), "Understanding that using the right tool, in the right situation, for the right purpose should be the guiding principle." This quote is poignant because no one approach to education will meet the needs of all students, which is an inherent strength of blended instruction because it, by its very nature, is multi-modal. Figure 1 depicts the points of entry for differentiation in the learning cycle (Hall, Strangman, & Meyer, 2011).

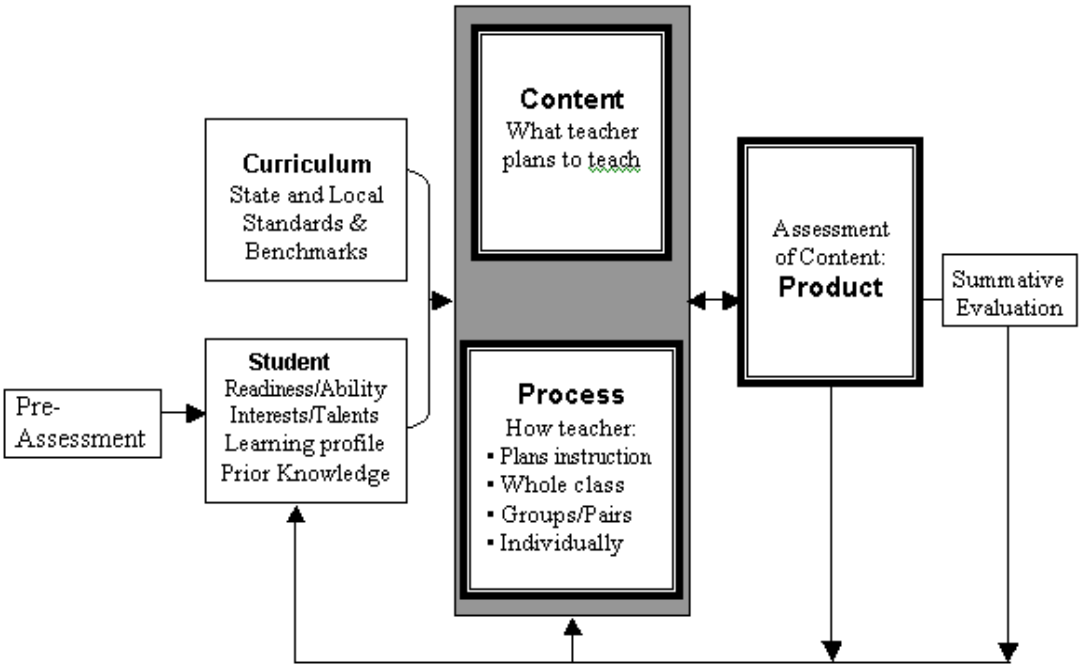

Figure 1. Carol Tomlinson's Learning Cycle and Decision Factors Used in Planning and Implementing Differentiated Instruction.

Although educators must implement mandated curricula and evaluative measures and cannot alter students' prior knowledge, flexibility exists in other phases of the learning cycle (i.e., content, process, and product). Differentiation means exposing students to content from the theoretical concepts to practical skills and offering more than one way to make sense of it and demonstrate understanding. The figure above states what the teacher will do, but students have a

role in what they will learn and how they will do it. Hall (2002) provides the following recommendations to ease into differentiated planning: “clarify key concepts & generalizations; use assessment as a teaching tool to extend versus merely measure instruction; emphasize critical & creative thinking; engaging all learners is essential; & provide a balance between teacher-assigned & student-selected tasks.”

Online application. The U.S. Department of Education Office of Educational Technology (2010) published a National Education Technology Plan to promote a national vision for embedding 21st century technology in learning, assessment, teaching, infrastructure, and productivity. With digital technology, learning can be more self-directed in regard to content exposure and mastery. Formative assessments can be used to inform practice with instant results available disaggregated and/or aggregated. Teaching can be more facilitative because the frequency of individual interactions with students increases face-to-face and online. Infrastructure addresses the resources available and productivity, which has been viewed historically as students progressing through disparate courses in cohorts at the same pace and accruing a certain number of seat-time hours, is being re-thought by instructional leaders as online learning offers more flexibility. Rovai and Jordan (2004) described the institution of school being in transition:

> With the move from an agrarian to an industrial economy, the small rural schoolhouse was supplanted by the big brick schoolhouse. Four decades ago we began to move to another economy but have yet to develop a new educational paradigm, let alone create the schoolhouse of the future, which may be neither school nor house…offer[ing] students both flexibility [times and places for learning] and convenience.

The National Education Technology Plan has a long-term goal also. Authors of the plan issue the directive that “21st century competencies and expertise such as critical thinking, complex problem solving, collaboration, and multimedia communication should be woven into all content areas...using the technology that professionals in various disciplines use” (U.S. Department of Education. Office of Educational Technology, 2010). Students need to be prepared to engage actively in the adult world, and this foundation has to include the most current skillset.

Therefore, teachers in blended environments should be mindful of content, as well as procedural and technical instruction to give an advantage to students with exposure to and mastery of professional tools.

Instructional planning for blended learning is of the utmost importance. Not unlike face-to-face instruction, teachers must "establish learning outcomes/objectives; provide timely and appropriate feedback; facilitate information presentation; monitor and evaluate student performance; provide learning activities; initiate, maintain, and facilitate discussions; and determine learning needs and preferences" (Hirumi, 2002). Other considerations include:

1. With whom or what the student will interact (i.e., the teacher, a peer, and/or the content) to achieve the intended learning outcomes? Multimedia content may be free or for purchase, customized, and reusable. Adding graphics to text and explaining graphics with audio improves learning further (Carman, 2005). Whether face-to-face or online, students will need guidance on effective, cooperative peer learning.
2. Will the activity be face-to-face, online, or both and instructor-led (synchronous), self-paced (asynchronous), or collaborative (synchronous or asynchronous)? Through live events, teachers are able to gain and maintain their students' attention, as well as reinforce relevancy and more easily assess student confidence and satisfaction. To have the best online experience, the teacher should test the hardware and software, as if s/he is a student-user, to minimize technological hurdles.
3. What tools are most appropriate? Murray and Olcese (2011) asked if multi-touch technologies, specifically, allow educators and students to do things in educational settings they could not do otherwise. The answer was yes because, in part, they can be automatically updated, synchronized, and shared wirelessly. In June 2010, 30,000 applications were categorized by the developers of the iPhone, iPod, and iPad as educational for tutoring, exploration, a tool, communication, and collaboration (Murray & Olcese, 2011). As stated by Manzo

> (2010), "Applications for defining and targeting students' academic strengths and weaknesses can help teachers create a personal playlist of lessons, tools, and activities that deliver content in ways that align with individual needs and optimal learning methods."

Rovai and Jordan (2004) reflect that "It is unlikely that the blendedness makes the difference in such courses, but rather the fundamental reconsideration of course design in light of new instructional and media choices and the learning strengths and limitations of each."

Although Blackboard and Moodle are the more common online learning management systems that house online instruction, the Public Library of Charlotte and Mecklenburg County and local schools in North Carolina worked together to build a teen library in the Second Life virtual world environment. Second Life is Linden Lab's three-dimensional virtual world, in which users create an avatar (a graphical representation) for social, educational, and business interaction. The impetus for this partnership is that "text-based content [is] less effective than animation, video, simulations and other engaging and illustrative content that can convey concepts visually and dynamically, more effectively than either paper or an instructor drawing on the blackboard" (Watson, n.d.).

Van den Bel (2008) acknowledges that "most online networkers tend to stay five years in one phase of their online evolution." After approximately five years, the number of users may continue to increase but frequency of use stays the same or declines. At present, early adopters of innovation are monitoring the direction of social media to tweak for educational purposes:

> In general, we are seeking to get a real human experience and to be very selective with whom we share that experience. In order for that to happen, we need quality profiles, not just showing words, but also profiling rich material such as video and photos. Furthermore, we want tools to directly interact by voice and (online) personal presence if possible (web-conference and sharing)…Web 3.5 is where we start interacting using avatars (like in Second Life or liveplace.com) and are able to use our other senses as well as 'touch' or 3-D experiences. Web 4.0 is where we have left the road of avatars and are using holograms to represent ourselves instead…Web 4.5 is the environment where

> we can sense holograms using our senses…In web 5.0 we are able to interact using special suits using holograms meeting with other holograms in a virtual but very real world. (Van den Bel, 2008)

Although Web 4.0 and 5.0 could be perceived as science fiction, current digital technology may have seemed futuristic and unattainable at its inception. Although a hologram may not appeal to everyone, it could help others connect to the content.

Support services are being delivered in blended formats also:

> Although most school counseling programs are finding these tech tools useful for up-to-the-minute announcements – 'Don't forget parent's night tonight!' – many are also motivated by the closer connections they can build with students and find more effective and efficient ways to serve them…We use Twitter and Facebook primarily for announcements and updates, but our blog serves in a more guidance-related capacity. Our school is academically demanding, so I'll use our blog to post articles on balance-overload…And when we do want feedback on a guidance topic, then I can use the blog's settings to open up comments on a particular post…At our school teachers can talk one-on-one with students on Facebook if they need to assist them with a homework project. And I can be there for personal and social issues, too. (Turner, 2009)

It is important for school staff to know their system administrator's position on interacting with students via social media before utilizing this tool. There is a misconception that access to social media at school violates Children's Internet Protection Act (CIPA). However, the Federal Communications Commission (2011) issued the following statement:

> Although it is possible that certain individual Facebook or MySpace pages could potentially contain material harmful to minors, we do not find that these websites are *per se* "harmful to minors" or fall into one of the categories that schools and libraries must block. In addition, the statute states that local school and library authorities are the appropriate bodies to determine what online content is inappropriate for minors accessing the Internet through their facilities. Indeed, the U.S. Department of Education recently found that social networking websites have the potential to support student

> learning, stating that students can "participate in online social networks where people from all over the world share ideas, collaborate, and learn new things."

Still, it is a local decision, by which educators must abide.

Previous examples of blended instruction make use of digital technology outside the face-to-face classroom. One-to-one computing is a way to blend instruction inside the classroom because each student has access to a mobile device. According to Martinez and Schilling (2010) and Warschauer (2007), the goal of this design is an increase in student achievement, as a result of more individualized learning and greater development of 21st century skills. From the teachers' perspective, they can better take advantage of "teachable moments," when worthwhile but unplanned opportunities present themselves because they have the technological resources available to pursue the topic. Also, it offers more options for instruction, as well as assessment, and provides another method of communication with students and their parents (Martinez & Schilling, 2010). In Maninger and Holden's (2009) study, the teachers observed that students more quickly submitted make-up work when emailed. Also, they reported a mean of 4.2 days per week of student computer use, and all teachers agreed that one-to-one computers benefited students with learning disabilities.

For students, having a school-issued computer can be an equalizer for those whose parents or guardians cannot afford one at home and motivator if used to encourage student-centered learning (Li & Pow, 2011). PBS KIDS Ready to Learn Cell Phone Study: Learning Letters with Elmo provided parents of three- and four-year-old children with a video-capable Sprint phone and asked them to stream letter video clips to the preschoolers. Results of the study showed that "video content and delivery pairing made the most impact among those participating households at or below the poverty level…because they always had their cell phones with them, they found it extremely easy to fit literacy activities into their daily routine; and they appreciated the transportability and accessibility" (McReynolds & Elek, 2006). Garthwait and Weller (2005) found in their study that students benefited from being able to digitally edit their work, correcting mistakes as part of the learning process.

Two uses of one-to-one digital technology are polling and back-channeling, which employ Internet-connected devices to provide visible feedback to a group concurrently with a presentation. With polling, teachers can instantaneously assess students' understanding, for example by having them answer a multiple-choice question. Students' responses can be viewed anonymously or in aggregate. Similarly, back-channeling encourages students to comment virtually on a lecture or ask a question while it is on their mind and without interrupting the presenter, and the teacher has a record of students' participation. Dybwad (2009) shared the following observation from an instructor experimenting with back-channeling: "Professor Sugato Chakravarty, whose personal finance course is one of [Purdue University's] pilot tests [with an institutionally-developed application], said, 'I'm seeing students interact more with the course and ask relevant questions.'"

Revised Bloom's Taxonomy. In the mid-1950s, Benjamin Bloom and a group of other educators developed a classification system, or taxonomy, of learning outcomes. According to Krathwohl (2002), "The categories were ordered from simple to complex and from concrete to abstract. It was assumed that the Taxonomy represented a cumulative hierarchy; that is, mastery of each simpler category was prerequisite to mastery of the next more complex one." Then, during the 1990s, Lorin Anderson, a former student of Bloom, along with cognitive psychologists, curriculum theorists, instructional researchers, and testing and assessment specialists, reviewed the original taxonomy and updated the terminology and order of the categories based on what skills are necessary to progress to the next level (Lam & McNaught, 2006).

General theory. In the Revised Bloom's Taxonomy, "knowledge" has been divided into *factual* knowledge of basic elements, *conceptual* knowledge of how the basic elements relate, *procedural* knowledge of how to do something, and *metacognitive* knowledge of one's own cognition (Krathwohl, 2002). Then Anderson, et al. described the levels of knowledge within the revised taxonomy. *Remember* is the base of the model (i.e., the abilities to recognize and recall information). Next is *understand*, which includes interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining. Building on remembering and understanding, the third level of the taxonomy is *apply* or being able to execute and implement a procedure. In

analyze, students can differentiate among parts, organize, and attribute how the parts relate to the whole. The next-to-last level is *evaluate*, checking one's judgments based on criteria and critiquing. The consummate learning outcome is to *create* an original product from generating ideas to planning how to make something concrete from those ideas and actually producing that something concrete (Krathwohl, 2002). Because we retain "20 percent of what we read, 30 percent of what we do, and 90 percent of what we see, hear, say, and do," it could be argued that knowledge will be more internalized the more sophisticated the learning objective is (Lam & McNaught, 2006).

According to Guskey (2007), Bloom and his team spent time observing in classrooms as they developed their taxonomy: "Most teachers taught all of their students in much the same way…Students for whom these instructional methods and time were ideal learned successfully." "Mastery Learning" was designed for the other students, who comprised the majority. Bloom proposed that teachers administer a formative assessment after initial instruction to identify gaps in the students' learning. For students who need remediation, have them complete just-in-time, corrective activities in class, followed by a second formative assessment. As Guskey (2007) states, "to be effective, correctives must be qualitatively different from the initial teaching." For students who perform well, offer them student-selected, enrichment activities. In this framework, individualized instruction is divided into two categories, corrective and enrichment, so instructional planning need not be overwhelming.

Online application. Lim and Morris (2009) conducted a study and concluded that learning differences and the levels of student learning are important considerations when planning for blended instruction. Glennan (as cited in VanHook-Schrey, 2008) wrote in a report for the Office of Science and Technology Policy and the U.S. Department of Education that "computer technology can have a positive influence on student learning and the development of higher order thinking." One possible reason for the improved learning and satisfaction is the dual environments for the teacher and students to communicate. Better communication can lead to deeper interpersonal understanding and a stronger sense of community to pursue more challenging learning objectives.

According to Fang (2006), “[The online medium] seemed to modify and reverse [the students’] personalities. The shy ones gathered courage online, while the friendly, interactive ones were quieter online.” The combination of environments provides the opportunity for both extroverts and introverts to participate and be heard. Teachers’ direction and reinforcement is helpful when given audibly and in writing also: “Group size influenced their interactions in the classroom as well as online. Most of the trainees were in their element working with their project groups of four” (Fang, 2006). Establishing group norms is important whether face-to-face or online. Hirumi (2002) observed that “In traditional classroom settings, [learner-learner] interactions occur through speaking and listening, two modes of synchronous communications that take far less time and effort than reading and writing, which are the predominate forms of communication during elearning.” Pape (2010) relates the use of blogs (i.e., an online journal) to help students develop their writing voice and wikis (i.e., an online space, editable by multiple persons) as a shared reference of key vocabulary.

Multimedia resources, such as digital “animations and simulations, can be effective in explaining complex concepts and ideas that can only otherwise be represented by a series of sequential diagrams in text” (Lam & McNaught, 2006). However, multimedia is not only for instruction; students can create multimedia to demonstrate understanding also, which relates to Revised Bloom’s highest level of knowledge internalization. As reiterated and cited in Lam and McNaught (2006), “Green and Brown (2002) suggested that this type of project has a higher educational value than the more common text-only projects…improving their media literacy skills as well.”

The Figure 2 shared by Fisher (2009) reflects online applications that align with Bloom’s Taxonomy. The applications may be appropriate at varying levels, depending on use.

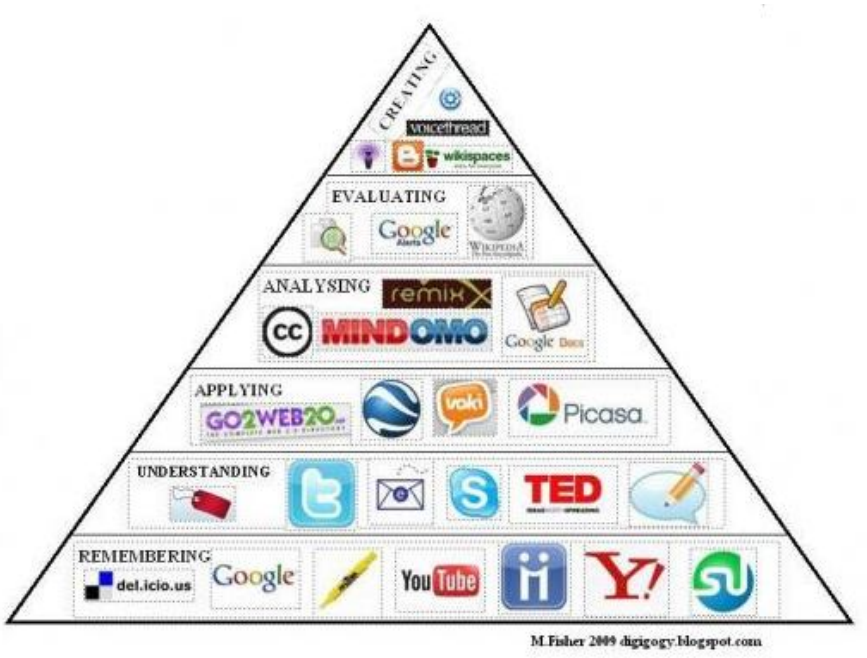

Figure 2. Educational Objectives Taxonomy and Web 2.0 Tools

Teacher Adoption of Innovation

People approach technology in three waves. There are early adopters, who want to be the first to experiment with the innovation. The second group waits until something is more developed and commonplace before trying it. Holding off for the innovation to become passé, the remaining resist until it becomes necessary that they buy-in (Galvez, 2009). The innovation will be used simplistically at first as users gain familiarity with it (Maninger & Holden, 2009). According to a study by VanHook-Schrey (2008) of secondary English Language Arts teachers, "Survey results suggest that change regarding technology integration in the ELA classroom is in the implementation [intermediate] phase, but that the change has not become institutionalized." Previous research acknowledges that while national, state, and local entities propose curricular changes, schools, represented by individual instructors, maintain the status quo (VanHook-Schrey, 2008). So, does blended instruction have a future?

Although there are national and state technology plans, school systems in North Carolina draft a plan of their own that combines national and state directives with local needs. Yet, VanHook-Schrey (2008) found that half of the North Carolina teachers in her study were unaware

of a state technology plan, and 42.00 percent of the same sample had not read their system's plan:

> [North Carolina's] Educational Technology Plan…recognizes teachers as 'change agents' in the best position and with the most power to bring about changes in the use of instructional technology within the classroom. North Carolina's Educational Technology Plan refers to technology as the 'ultimate tool in the professional educator's repertoire' with the advantages of increasing productivity, bringing 'worldwide experience and expertise into the classroom', and stimulating interest in learning. (VanHook-Schrey, 2008)

In short, blended learning's success depends on teachers' belief in it. However, "insistence on faculty control is a double-edged sword: undirected, blended learning can become a centrifugal force, creating courses so different in format that it becomes impossible to generalize (and plan around) student experiences of them; nevertheless, faculty must have ownership" (Niemiec & Otte, 2009). To facilitate buy-in, administrators can demonstrate support by addressing potential pitfalls before they become issues (e.g., communicate the purpose and expectations; ensure that the necessary infrastructure is in place; offer and participate in ongoing training; and use data for improvement). If approached as "blended learning is a mixture of the familiar and unfamiliar", perhaps the battle will be viewed as half-won (Niemiec & Otte, 2009).

In her study, VanHook-Schrey (2008) asked if classroom teachers actually are employing the use of computer technology in all classrooms on a regular basis as a tool to expand student development of critical thinking and problem-solving abilities beyond the level of traditional classroom learning and thus better preparing students for an ever-changing global technological society and workforce. She found a lack of awareness, time, equipment, and training to be the barriers to classroom technology integration (VanHook-Schrey, 2008). According to VanHook-Schrey (2008), 88.67 percent of participants reported using technology daily or weekly, but only 48.08 percent used it daily or weekly for instruction. Interestingly, "although only 37.84 percent of those with more than 20 years' experience consciously utilize the school technology plan in lesson planning, they are more likely than teachers in other experience categories to do so,"

which challenges the assumption that older teachers resist and younger teachers embrace technology (VanHook-Schrey, 2008). Perhaps it is because teachers must have confidence with their content before expanding instructional strategies.

Teachers implement blended instruction for a variety of reasons from administrative directive to a professional belief that students benefit from this model. Regardless of the impetus, blended instruction does not occur simply through the employment of digital technology. According to Watson (n.d.), "in the same way that online teaching is recognized as different than face-to-face teaching, blended learning is also unique and requires new methods of instruction, content development, and professional development." In addition to more deliberate lesson planning, the instructor also must reconsider her or his role in the learning process; once the content is in digital format, s/he is more of a facilitator than anything else (Blackboard K-12, 2009; Watson, n.d.). A teacher with background knowledge and support will experience change before someone without them (Garthwait & Weller, 2005).

School reform occurs more quickly at the elementary school level, possibly because teachers plan instruction for all core subjects, which allows greater flexibility for integration, for example. Fullan (as cited in VanHook-Schrey, 2008) asserted "you can turn around an elementary school in about 3 years, a high school in about 6 years, and a school district (depending on size) in about 8 years." In the Apple Classrooms of Tomorrow Project, the researchers acknowledged, after ten years of study, that one-to-one computing had changed the roles of teachers (Garthwait & Weller, 2005).

Gaps

The concept of blended instruction is relatively new. Therefore, exploratory studies are warranted (Oh, 2006). Niemiec and Otte (2009) observed that "why is given precedence over the how" in research related to blended instruction, which means that more studies exist related to learning outcomes. When process has been examined, it most often has been at the middle school and higher education levels. Other researchers cite methodological shortcomings in addressing students' learning style and age differences (Fang, 2006; Rovai & Jordan, 2004). Garthwait and Weller (2005) identify a lack of knowledge about the impact of teacher's gender on

one-to-one implementation. This study will help to fill these gaps in the literature by asking practitioners *how* they integrate digital technology to provide additional opportunities for millennial students to customize their learning and produce a greater range of objects that demonstrate their understanding. VanHook-Schrey (2008) identified a need for training in: 1) technology integration for current and future teachers and 2) collaborating with technology support staff. These groups could be an audience for the findings.

CHAPTER THREE

Niemiec & Otte (2009) observed that "why is given precedence over the how" in research related to blended instruction. This study helps to fill that gap in the literature by asking practitioners *how* they integrate digital technology to provide additional opportunities for millennial students to customize their learning and produce a greater range of objects that demonstrate their understanding. The participants' current practices and obstacles encountered will establish a basis for conversations with teachers and teacher education programs, both of which VanHook-Schrey (2008) found needed support in instructional technology. This chapter provides details of the design of the study, specifically the description of the sample, variables, instrumentation, data analysis, summary of the procedures, and limitations.

Research Questions

Of the teachers who blend face-to-face and online instruction in one-to-one computing schools:

1) what are their current practices in integrating hardware and online tools to differentiate instruction and facilitate higher order thinking, and

2) what obstacles did they have to overcome related to integrating hardware and online tools, and how did they overcome them?

Description of the Sample

The prevalence of mobile computers and wireless Internet connections have led some schools to pursue one-to-one computing, so that every student has an Internet-ready device for the purpose of immediate access to digital, technology-based curricular and instructional resources at school and possibly home. The target population for this study was pre-K to grade 13 schools with a one-to-one, student-to-computer ratio because they could have the infrastructure to maximize blended instruction. The sampling frame was public, pre-K to grade 13 schools in North Carolina with fewer than 1.24 computers per student because it is the researcher's state of residence. Unfortunately, a comprehensive database of North Carolina schools with a one-to-one initiative does not exist because there are various funding sources, etc. However, public schools in North Carolina submit to the Department of Public Instruction an

Annual Media and Technology Report, which includes each school's enrollment [Average Daily Membership (ADM)] and the number of students per instructional computer. Not knowing the situation of every school, 1.24 was identified as the cut-off in the 2012 report to be as inclusive as possible without jeopardizing the intent of one student per computer. Three hundred and eight schools constituted the sampling frame. It was hoped that this strategy would lead to a better understanding of the population's size, in addition to addressing the research questions. "Practitioner" was not limited to classroom teachers; anyone with an instructional role and a standard course of study (e.g., school counselors) was encouraged to participate.

Variables

Blended instruction and one-to-one computing schools are the independent variables of the study. What varies—the dependent variables—are individuals' use of hardware and online tools and the obstacles experienced in implementing. Use includes accessibility to and choices of hardware and applications, as well as who is using (i.e., teacher and/or student) and with what frequency. Table 2 summarizes the variables in this study, the type of variable (i.e., independent or dependent), and how the variables were presented, measured, and analyzed.

Table 2

Variables of Study

Variables	Type of Variable	Presentation of Variables	Measures of Variables	Analysis of Variables
Blended Instruction	independent	Defined in the Informed Consent as "combin[ing] online delivery of educational content with the best features of class-room interaction and live instruction"	This question served as a "yes" or "no" filter question that (dis)continued the survey.	self-report
One-to-one computing	independent	Defined in Question 2.2 as "every student in at least one of your classes hav[ing] daily access to a school-provided, internet-connected computing device"	This question served as a "yes" or "no" filter question that (dis)continued the survey.	self-report

Hardware	dependent	Commonly-found hardware for educational use were listed with an opportunity to add others.	Participants marked the frequency of their and their students use (i.e., daily, weekly, monthly or less, never, or not applicable) inside and outside of the face-to-face classroom.	descriptive statistics
Online Tools	dependent	Commonly-found online tools for educational use were listed with an opportunity to add others.	Participants marked the frequency of their and their students use (i.e., daily, weekly, monthly or less, never, or not applicable) inside and outside of the face-to-face classroom.	descriptive statistics
Obstacles	dependent	Participants responded to open-ended questions about obstacles in integrating hardware and online tools and providing blended instruction in general, as well as how they overcame them.		category system of common responses

Instrumentation

The self-administered survey was researcher-developed. The questionnaire used by Oh (2006) provided a framework for this study's instrument. While Oh (2006) was interested in what blended instruction looks like also, her focus was at the university level, and some questions reflected this different environment. The survey was piloted to a group of teachers who practice blended instruction in a one-to-one school.

Demographic and background questions were included in this pre-K to grade 13 study to provide a context for the sample and their responses. Participants answered a combination of closed, semi-closed in the forms of nominal and Likert-type interval scales, and open-ended questions for the researcher to gain a better understanding of the variables above. While the responses of practitioners who blend instruction were of particular interest, another primary goal was to better identify the population. Three filter questions were designed to capture the feedback of those who consented to the study, have one-to-one devices in their school, and blend instruction. Every participant did not see every question; those who do not have one-to-one accessibility or blend were forwarded to a demographic section if they did not meet the criteria of the filter questions.

Data Analysis

Descriptive statistics and a category system of common responses for open-ended questions were used to analyze the data. Descriptive statistics, such as frequency and proportion, were common analyses for categorical variables, as well as means for quantitative variables. Both Qualtrics and IBM SPSS Statistics softwares were used to in data analysis.

Summary of Procedures

This non-experimental, descriptive study with a cross-sectional design was developed to illustrate trends in behaviors and beliefs among the teachers who identify themselves as blended instruction practitioners. During the summer, the superintendents of the applicable schools were contacted via email and then phone, if necessary, regarding the survey. If the superintendent or her/his designee agreed to allow the researcher access to the system's employees, the school's principal was emailed and asked to provide an electronic list of email addresses for her/his certified staff, so that the number of potential participants could be tracked. The teachers received an initial and three follow-up emails to encourage their participation.

Obtaining Superintendent Support

As required by the university's Institutional Review Board (IRB), the researcher had to demonstrate an accessible sample by documenting the support of the applicable school systems. A list of superintendents and their contact information was obtained from North Carolina's Department of Public Instruction website. Ninety-six of the 116 school systems have at least one school with a student-to-instructional computer ratio of less than 1.24, according to the 2012 Annual Media and Technology Report. A system-specific email was sent to 95 superintendents; the remaining school system, which is the employer of the researcher, served as the pilot site to prevent bias in the data analysis but still make use of their experience. All electronic correspondence with the superintendents, principals, and teachers was sent through the researcher's work address to identify herself as a colleague, in the hope of yielding greater participation than the university email.

The initial response rate from superintendents was 32.6 percent with 17 of them granting permission to survey, nine requesting more information, four declining, and one acknowledging

that the system does not possess any true one-to-one schools. Two additional general emails were sent before securing support from 34.7 percent of the school systems (n=33). The superintendents' messages were submitted to the IRB roughly a month-and-a-half after beginning the process. Approximately a week elapsed between solicitous communications.

A few roadblocks delayed or prevented additional participation. When a notification was received about a disabled account, the researcher called the system's central office and re-sent the message to the updated address. Initial emails were set up to initiate a read receipt, but the responses were found not to be accurate, so this strategy of monitoring communications was discontinued. However, the most unexpected and time-consuming hurdle was compiling and submitting individual applications to conduct research within 12 systems. It was not possible to meet a few of their deadlines, and the timing for a decision did not always coincide with the researcher's schedule for administering the survey. In a couple of cases, the school systems required documentation of IRB approval before they would consider the request, which was counter to the IRB's process. Other reasons for non-participation that were shared include systems in transition, no external studies permitted, protection of instructional time, and no direct benefit to the system was perceived.

Pilot Study

While the IRB assessed the re-submitted application to conduct research, the researcher created the survey in the Qualtrics online software licensed by the university. IRB permission was received in early August, and the nine persons comprising the pilot group, who blend instruction in a one-to-one school, were invited to review the survey mid-August. These co-workers of the researcher were asked to evaluate the survey by completing it as a participant and then providing written feedback on its length, clarity and difficulty of questions, and content omissions as suggested by Punch (2003). Only four of the nine persons in the group responded to the survey as the school year was beginning at the same time.

Two of the respondents were caught by a filter question that asked if all students have an Internet-connected computing device. In the pilot school, the one-to-one initiative has been phased in with entering freshman classes. During the 2012-2013 school year, only the seniors

lack netbooks. In both of the above cases, the educators work with seniors, which prematurely ended the survey after seconds of beginning it, so they received a hardcopy of the survey on which to provide hand-written notes about the remainder of the survey. This survey question was edited to be more inclusive by saying "Does every student *in at least one of your classes* have daily access…" The other pilot members completed the survey in approximately 20 minutes, which affirmed the estimated time stated in the Informed Consent.

Five other comments were considered. One teacher acknowledged that her answers varied by the academic level of the course (e.g., standard, honors, or Advanced Placement), so clarifying language such as "on average" was added to some questions. This same teacher asked for a category between "Monthly or less" and "Never" about the frequency that hardware and online tools are used. The researcher determined that anything less than monthly negates blended instruction, so no change was made. Another teacher was confused by the use of certain hardware in an online setting where not applicable and online tools, such as email, face-to-face. These questions were further broken down to categorize items found more commonly face-to-face and those used more often outside of the brick-and-mortar classroom. The same strategy of simplifying complex questions was used to better understand teacher use versus student use. Finally, more tools were included based on suggestions from the pilot group, and a back button was added to each page to allow participants to edit previous responses.

Obtaining Principal Support

After the survey was modified, the researcher forwarded each superintendent's email of consent to the appropriate principal(s) in that system, along with more procedural information. Only a few superintendents volunteered contact information for their principals, so the researcher searched online for the others. The goal sampling frame was the 308 potential one-to-one schools out of 2,420 public, pre-kindergarten to grade 13 schools in North Carolina, but only 98 schools served as the target group as they are the ones that the researcher had permission to contact via superintendent approval. Superintendents granted access to 102 schools, but four admitted to not having one computer per student and subsequently were excluded by the researcher. Two additional schools were included because the researcher received notification

that they have a one-to-one initiative, and two schools merged with other schools. The same problem of changes in command was experienced, requiring that phone calls be made to the schools to retrieve an email address for the principal. Sixty-eight principals (69.4 percent of the principals invited) allowed the researcher to contact their teachers.

Obtaining Teacher Support

Data was collected through an electronic survey using Qualtrics software. As suggested in the sampling protocol, obtaining a high response rate was of the utmost importance. Within the control of the researcher was proper notification and clear instructions via email, an appeal to the participants' interest in the topic, and adequate follow-up. Voluntary participation, the right to withdraw, purpose of the study, procedures, right to ask questions and obtain results, risks, and benefits were explained in the message, and a submitted survey implied consent. Confidentiality was and continues to be protected, but responses were not anonymous, in the case that clarification or follow-up was needed. In this report, teachers, schools, and school systems are not identified. In short, there were no anticipated risks for participation.

Communicating with the teachers was the most cumbersome and arduous step for a few reasons. First, the provided email addresses were received in a variety of formats because it was thought that the more flexible the researcher was, the more willing the principals would be to assist in the process. The majority were shared via email attachment but not in a way that could be copied and pasted into a master spreadsheet of the sample. The next group of email addresses was taken from schools' websites. As addresses were being added to the spreadsheet, the researcher attempted to clean up the sample by excluding non-instructional staff (e.g., administrators, teaching assistants, custodians, and food service workers). Given that "instructional" varies, the sample was likely overly inclusive. A couple of school counselors replied to the researcher via email, thinking they should not complete the survey but received the following response, "You may take the survey as a counselor. It could be that you have an instructional role or use technology with students in your caseload." Six principals asked to forward the consent email with survey link to their teachers, and one sent a group email address that would reach all staff. The researcher tried to determine how many staff the survey reached,

but only three principals reported back for a total of 90 persons. In addition, 1877 addresses were input in the spreadsheet, but, again, the actual sample was larger because one address represented many staff in a few cases.

The first email to teachers in mid-September was a blast of messages with addresses copied and pasted from the spreadsheet into the blind carbon copy field with a survey link and sent by school system. Emails went out over a weekend, so that they would be opened around the same time, and respondents would have two full weeks to complete the survey. One thousand one hundred and fifty-plus emails were delayed and/or failed due to sending and receiving filters with the following error message, “Technical details of temporary failure: Google tried to deliver your message, but it was rejected by recipient domain…” The researcher consulted her school system and university’s technicians. Troubleshooting began with re-sending the original email to individual recipients who, according to the alerts, did not receive the first one to determine if this message would bounce back also. This test did not result in any denied emails, so the address had not been “poisoned,” according to one technician. The school system “opened up” the researcher’s account, and the technician recommended that each message be sent to no more than 10 addresses to avoid blocks by the receiving school systems’ filters, resulting in 188 emails.

A third round of messages was sent, and the survey window was extended to mid-October. This time when emails were undeliverable, addresses were checked for mistyping; some were corrected, and some were determined to belong to people who were no longer employed by the school system. Two hundred and nine surveys were completed, which accounted for 11.1 percent of the emails sent but less of the total sample since the exact number is unknown. The dissertation committee agreed that another reminder, sent the same way, should be done to facilitate a higher response.

The final response rate can be found in Chapter 4. The researcher received the following explanations via email from participants for not completing the survey. A small number notified the researcher of issues with Qualtrics: “I tried last week and had difficulty with the web page. I just tried and received the same message ‘diagnostic difficulties’” and “I’ve tried to open the

survey." This feedback was not confirmed on the researcher's end. Another group of messages acknowledged that non one-to-one schools were in the sample: "I do not believe that any schools in [***] County have a computer for every student," and "I find that I am unable to answer many of the questions in your survey…While the teachers at my school employ technology at every opportunity, we are not capable of providing blended instruction for [***] students at this time." Also, "I just completed your survey, however it left me feeling that I could not really explain what I do now, or what I have done in the past. While I do not have or teach an online class, I do make use of internet sites such as Kahn Academy, You Tube, and other learning sites that augment my lessons on a weekly basis. I wish I could say I do it every day; however, I have more students than I do computers, so it makes it difficult." Finally, personal reasons were offered, "I am quite overwhelmed right now with Grad. Project and part-time work as well as full-time job. Please accept my apologies for not participating."

Limitations

The sample size was impacted at five points in the process. First, the sampling frame is limited by whether or not a school has 1.24 or fewer computers per student. Second, the superintendent must grant access to her or his staff. Next, the researcher relies on the principals to provide an electronic list of teachers' email addresses and encourage their participation. Ideally, principals would have allowed the researcher to contact instructors directly in order to make contact consistent, but the researcher accepted nine singular points of contact (i.e., a group address and the principal forwarding) as a trade-off for increased participation. Then the teacher chose whether or not to complete the survey, and, finally, she or he may or may not teach in a blended format. Another method of data collection—for example a series of focus groups by level, in addition to the survey—would provide triangulation, a double-check of data and another point-of-view.

CHAPTER FOUR

This study explored to what extent and how teachers in digital technology-rich schools are blending instruction. Digital technology integration appears to be occurring with some regularity when face-to-face, but computing devices and Internet access do not seem to be widely available for students at home to continue a true blended environment. Nonetheless, the information shared helps to produce a better picture of brick-and-mortar classrooms in the 21st century. Included in this chapter are response rates, a description of the sample, findings, and conclusions.

Research Questions

Of the teachers who blend face-to-face and online instruction in one-to-one computing schools:

1) what are their current practices in integrating hardware and online tools to differentiate instruction and facilitate higher order thinking, and

2) what obstacles did they have to overcome related to integrating hardware and online tools, and how did they overcome them?

Response Rate

The survey window closed at the end of October with 430 completed and 27 partially completed surveys, which is an estimated response rate of 23.7 percent (n=1926 known recipients). Messages were undelivered to 41 persons, so this number was subtracted from the list of email addresses generated (n=1877-41=1836). As previously mentioned, the actual sample size is unknown. First, in seven cases, staff were represented by a singular email address, either that of the principal or a group. The researcher received the number of certified staff at only three of these schools (n=1836+90=1926). Second, a couple of teachers emailed the researcher that they completed the survey more than once because of receiving reminders. To identify duplicate cases, the database was searched for matching email entries. None were found. Finally, the rate of 23.8 percent includes persons who opened the survey but did not meet the criteria of the three filter questions (i.e., informed consent, one-to-one computing, and blended instruction), yet they answered the demographic questions. Three hundred and three persons consider themselves

blended practitioners in one-to-one schools. Punch (2003) suggests 60 percent as a goal, but this type of research (i.e., an educational survey) usually yields a 30 to 40 percent response rate.

It is important to note that 31 persons dropped out of the survey. While four were excluded from the response rate, the remaining 27 offered valuable data, although it was incomplete. Eleven left after answering whether or not they blend instruction, which ten did. Nine withdrew after choosing the frequency with which students use certain hardware. The remaining seven left at varying points. The data set was cleaned as it was analyzed. For example, a participant marked that s/he was not a teacher, even though s/he is an Exceptional Children's inclusion teacher as denoted in the "other" field. The researcher changed the response to teacher.

Description of the Sample

Of the 68 schools that the researcher had permission to contact, 60 schools and 30 of 33 systems were represented in the survey results, according to the 286 participants who chose to identify their school(s) and did so clearly. North Carolina is divided into eight Regional Education Service Alliances (RESAs). When looking at the 286 survey-takers by RESA, each RESA was represented by one to six systems and 14 to 71 persons. Although they are not equally distributed, it demonstrates that there are schools statewide with one-to-one, Internet-connected computing devices.

Three filter questions ensured that the desired group had access to the content of the survey. If the answer "no" was given to any of these questions, the participant was forwarded to a demographic section, thereby skipping the questions related to blended instruction. The first filter question addressed informed consent. The second question restricted survey-takers to those at one-to-one computing schools. The third filter question was, "Do students receive both face-to-face and online instruction in at least one of your classes?" The middle column in Tables 3 through 6 indicates the number of responses by all who opened the survey and provided demographic data, which was 207. The column on the right reflects the answer choices of only those who blend instruction and provided demographic data.

Instructional staff from all levels of North Carolina's pre-kindergarten to grade 13 public schools responded to the study. ~~A~~s shown in Table 3, there were participants who work in more than one school or their school comprises the grades of multiple levels.

Table 3

Participants by Level

Level	Percentage of total respondents by level (n=207)	Percentage who blend instruction (n=105)
Elementary	10.3% (n=24)	38.1% (n=8 of 21)
Middle	28.9% (n=67)	69.0% (n=29 of 42)
High	54.7% (n=127)	70.8% (n=68 of 96)
Other (e.g., pre-k, k-13, k-8, 6-12, 8-12, and early college)	6.0% (n=14)	Pre-k was grouped with Elementary and early college with High School for these calculations.

The percentage of teachers who blend instruction increased as the grade levels did, but the difference in percentages between the middle and high schools was minimal.

Ninety (89.9) percent (n=186) of survey respondents categorized themselves as teachers. The "other" 10.6 percent (n=22) included, in order of frequency, school counselors, librarians, instructional facilitators, technology coordinators, Academically and Intellectually Gifted specialists, online facilitators, and an English as a Second Language specialist. Five had dual roles. Sixty-seven (67.3) percent of teachers (n=103 of 153) blend instruction, and 55.6 percent, who do not consider themselves teachers (n=10 of 18), blend. A greater percentage of teachers blend instruction than other instructional personnel.

Participants belonged to a variety of departments. Those that tend to be larger are better represented here, too. Again, there are duplicate counts in Table 4 where respondents teach more than one subject in the total column. The column on the right for blended instruction is unduplicated. In fact, where participants marked more than one subject area, their data were excluded this one time to more cleanly relate the roles within the schools. For example, some teachers in the Exceptional Children's (EC) department marked the subjects they support. The researcher was more interested in the participant being an EC teacher than the subject areas that

they co-teach, etc. The sacrifice was the teachers who are certified in more than one content area.

Table 4

Participants by Department

Departments	Percentage of total respondents by dept. (n=207)	Percentage who blend instruction (n=94)
English Language Arts	32.4% (n=67)	68.0% (n=17 of 25)
Mathematics	23.7% (n=49)	83.3% (n=10 of 12)
Science	25.1% (n=52)	70.6% (n=12 of 17)
Social Studies	20.3% (n=42)	66.7% (n=8 of 12)
Healthful Living	7.2% (n=15)	<5
World Languages	4.3% (n=9)	75% (n=6 of 8)
Arts Education	6.3% (n=13)	62.5% (n=5 of 8)
Career Technical Education	8.7% (n=18)	72.2% (n=13 of 18)
Other (e.g., JROTC, Exceptional Children, Academically Gifted, and English as a Second Language, Counseling, and Media)	23.2% (n=48)	 <5 68.0% (n=17 of 25) <5 <5

Of those who blend, math, world languages, and Career Technical Education had the highest percentages.

Recall that instructors' gender was a gap in the literature. Table 5 summarizes, by gender, who provided survey responses and who considers themselves blended instructors.

Table 5

Participants by Gender

Gender	Percentage of total respondents by gender (n=207)	Percentage who blend instruction (n=114)
Female	77.3% (n=160)	64.4% (85 of 132)
Male	21.7% (n=45)	69.2% (27 of 39)

Although a majority of the participants in this study were women, there was a less than five percent difference between women and men in terms of who blends instruction. Note, in the

middle column, that 160 plus 45 equals 205, not 207. Only two survey-takers viewed the question but did not answer, indicated by a “99” in the data set; this number is consistent in the demographic section.

The average age of respondents was 41.7 years within a range of 22 to 64 years. One hundred and four participants entered their age and answered they blend instruction. The mean age of those who blend was 42.0 years. Fifty-six persons entered their age and do not blend. Their mean age was 38.4 years. Blended practitioners were older than their non-blended peers.

The survey-takers had on average 13.8 years of teaching experience within a range of 0 to 40 years and 4.0 years of blended teaching experience within a range of 0 to 12 years. One person responded 25 years of blended instruction. Since the same technologies were not available then, it was considered an outlier and excluded from the calculation. Perhaps 2.5 was intended, but this is unknown. Among those who blend instruction (n=104), the mean years of experience was 13.4 years. Among those who do not blend (n=58), the mean years of experience was 12.2 years. When asked if they, as students, were taught in a blended format, they responded as follows in Table 6:

Table 6

Participants by Student of Blended Instruction

	Total percentage of respondents who were blended students (n=207)	Percentage who blend instruction (n=114)
Yes	19.3% (n=40)	76.5% (n=26 of 34)
No	79.7% (n=165)	63.8% (n=88 of 138)

The large majority of participants were not students of blended instruction. Perhaps the average age of the survey-takers (i.e., 41.7 years) is the cause, as this method of instruction has developed since they were in college, if they were traditional students. However, a little over three-fourths of those who were blended students are blended instructors as well. More impressively is the percentage of blended instructors who were not blended students and are trying this different methodology without any prior knowledge of it.

Findings

Seventy percent of persons (n=303) who accessed the survey blend instruction; they are the target sample of this study. Only these participants were able to continue the survey, as the following questions asked how they do so. The majority of respondents marked blended instruction as effective or very effective, on a 4-point scale of very ineffective to very effective, for differentiating content (95.2 percent, n=170 effective and n=90 very effective), differentiating process (96.7 percent, n=161 effective and n=103 very effective), differentiating product (92.3 percent, n=178 effective and 74 very effective), promoting socialization (75.3 percent, n=154 effective and n=50 very effective), building 21st century skills (95.6 percent, n=141 effective and n=117 very effective), and challenging higher order thinking (85.3 percent, n=158 effective and n=74 very effective). On average, 49.7 percent of class time includes digital technology, and 54.2 percent of time outside of class for coursework is digital technology-based. Use of a digital textbook was listed as a reason for the time outside of class. The rest of the findings are organized by question.

Question One

Of the teachers who blend face-to-face and online instruction in one-to-one computing schools, what are their current practices in integrating hardware and online tools to differentiate instruction and facilitate higher order thinking?

Hardware. The first question in this section addressed hardware used more often in face-to-face instruction because of being less portable in some cases: “On average, how often are the following computer hardware used during instruction?” The answer choices were daily, weekly, monthly or less, never, or not applicable. Daily and weekly are frequent enough to be routine use and warrant reporting as blended. Digital projector and interactive whiteboard were most popular, being used at least weekly by 72.3 percent (n=188) and 77.8 percent (n=203) of respondents respectively. A little over a third (38.5 percent, n=100) use a document camera at least weekly, and response system came in last at 11.7 percent (n=30). A slate (n=4), which is a portable writing surface that projects, proscope (n=1), which is a digital microscope, and speakers (n=1) were offered as other hardware incorporated in instruction.

The next series of questions asked about teacher and student use of hardware inside and outside of the face-to-face classroom. For context, 96 percent (n=482) of the respondents' schools have wireless Internet, and 86 percent (n=432) of their students have one-to-one Internet connected devices, which was a filter question that would preclude participants from continuing in the survey. Only 48 percent (n=208) of the teachers' students may take their devices home. Table 7 indicates the frequencies and percentages of devices that teachers use at least weekly:

Table 7

Teacher Use of Hardware

Hardware	Face-to-face	Outside physical classroom
Laptop	90.0% (n=234)	68.5% (n=159)
Tablet	19.6% (n=50)	21.6% (n=49)
Smartphone	18.0% (n=46)	27.7% (n=64)
Media player	18.2% (n=46)	14.6% (n=33)
Microphone	9.7% (n=25)	9.6% (n=22)
Digital video camera	16.4% (n=42)	14.5% (n=33)

Table 8 shows frequencies and percentages of teachers' perceptions of student use of various devices at least weekly:

Table 8

Student Use of Hardware

Hardware	Face-to-face	Outside physical classroom
Laptop	85.8% (n=223)	61.1% (n=135)
Tablet	16.8% (n=43)	12.4% (n=27)
Smartphone	15.6% (n=40)	22.1% (n=48)
Media player	15.7% (n=40)	14.4% (n=31)
Microphone	7.9% (n=20)	5.5% (n=12)
Digital video camera	13.4% (n=34)	14.1% (n=31)

The more traditional computer in laptop form by an overwhelming number is the device used. It could be that, as more statewide assessments are delivered online, the devices of choice will be those on which the tests can be taken. Other considerations, based on conversations outside the scope of this study, could be versatility and durability of the tool and deals from the manufacturers or suppliers for buying in bulk.

Online tools. Whereas teachers and students are limited by the hardware available to them, many online tools can be used by anyone at no cost. Users simply have to know about them and be willing to experiment. The first question in this section addressed online tools used more often outside the classroom. The frequencies and percentages in Table 9 reflect combined daily and weekly use.

Table 9

Teacher and Student Use of Online Tools Outside the Classroom

Online Tools	Teacher use	Teacher perception of student use
Email	88.8% (n=207)	66.1% (n=150)
Instant messaging	40.2% (n=92)	47.3% (n=107)
Avatar	2.7% (n=6)	7.8% (n=17)
Video conferencing & screen sharing	9.5% (n=22)	18.9% (n=42)
Blog	12.2% (n=28)	19.5% (n=43)
Discussion board	25.1% (n=58)	24.4% (n=53)
Wiki	29.3% (n=67)	21.8% (n=48)
Shared word processing documents, spreadsheets, presentations, drawings, & forms	65.9% (n=151)	43.3% (n=94)

The three most frequent responses were the same for teachers and students (i.e., email, shared documents, and instant messaging). Participants offered two additional tools. Educreations is a website accessible on any computer with Adobe Flash Player installed and application on the iPad tablet that allows users to present information in a video format. Moby Math is a for-purchase, online program to assist with remediation in math.

Table 10 shows the frequencies and percentages of online tools teachers use at least weekly:

Table 10

Teacher Use of Online Tools

Online Tools	Face-to-face	Outside physical classroom
Teacher/class webpage	66.7% (n=156)	61.7% (n=132)
Learning management system	55.9% (n=128)	44.2% (n=92)
Social media	23.8% (n=55)	29.6% (n=63)
Electronic textbook	29.6% (n=69)	23.7% (n=50)
Multimedia presentation	44.8% (n=104)	29.1% (n=62)

Virtual fieldtrip, lab, simulation, or video game	28.9% (n=67)	20.9% (n=44)
Electronic polling	12.9% (n=30)	10.8% (n=23)
Virtual notebook	15.8% (n=36)	14.3% (n=30)
Online assignment submission	57.5% (n=134)	46.9% (n=99)
Student-accessible, online Gradebook	55.2% (n=128)	44.5% (n=94)

According to Watson (n.d.), "The presence of software that organizes the course [is] a distinguishing characteristic between a truly blended course and face-to-face course that simply incorporates a few digital elements." More than half of the survey-takers have a teacher or class webpage or use a learning management system, both of which could satisfy this claim.

Table 11 shows teachers' perceptions of student use of online tools both face-to-face and outside the physical classroom at least weekly:

Table 11

Student Use of Online Tools

Online Tools	Face-to-face	Outside physical classroom
Teacher/class webpage	64.5% (n=147)	53.9% (n=111)
Learning management system	52.8% (n=121)	41.6% (n=87)
Social media	26.6% (n=61)	35.1% (n=73)
Electronic textbook	25.7% (n=59)	20.6% (n=43)
Multimedia presentation	40.5% (n=94)	25.7% (n=53)
Virtual fieldtrip, lab, simulation, or video game	26.8% (n=62)	16.9% (n=35)
Electronic polling	13.4% (n=31)	10.5% (n=22)
Virtual notebook	15.4% (n=35)	10.6% (n=22)
Online assignment submission	57.1 % (n=132)	45.5% (n=95)
Student-accessible, online Gradebook	44.3% (n=101)	38.8% (n=81)

From the teacher's perspective, students do more instructionally with social media. This and electronic polling are the areas that the students' percentages were higher face-to-face. Outside of class, students use social media and a learning management system more frequently possibly to work in groups (n=1). Participants offered Netflix (streamed movies), YouTube (user-generated videos), webquests (activities that require students to search online for answers), and Quia and Quizlet study tools as other online tools.

Question Two

Of the teachers who blend face-to-face and online instruction in one-to-one computing schools, what obstacles did they have to overcome related to integrating hardware and online tools, and how did they overcome them?

Question 2.10 asked participants to "note all obstacles experienced in blending [their] face-to-face and online instruction, as well as if/how they were overcome." The most frequent out of 99 responses were, first of all, students being easily distracted by other online content (n=29). This problem has been solved in a few cases with SMART Sync, a classroom management software that allows teachers to monitor and restrict what students are doing on their devices. Twenty-six persons mentioned interruptions in Internet connection and problems with hardware. The need for a full-time technician was offered as a solution.

In third place, students not having a device and/or Internet connection at home was shared as an obstacle to blended instruction (n=24). "Forty percent of my students do not have internet access at home…In an effort to mediate these issues, I have taught the kids to download files or websites they need to complete their work as a pdf and save it to the World History folder so they can access it without internet later on." Maintenance on and sustainability of student devices, for example ensuring regular updates and compatibility of devices and tools, was a concern for 11 persons.

Students' knowledge of digital technology for instructional purposes was a problem for nine survey-takers; only two mentioned instructors' knowledge of digital technology for instructional purposes as a barrier. "Student use of electronics is 24/7 but involves more social media interaction than instructional use." "Not all students have the same level of understanding in using technological devices", and "I think that the most difficult obstacle is making sure that all of the kids are able to use the software properly. What I have done is provided detailed step-by-step instructions in order to facilitate the use of said software." In the "other" category, respondents identified academic integrity (n=7) as "students are challenged in thinking critically" because of the ability to copy and paste selections; students neglect to bring their device to class (n=5), and time for lesson planning (n=5).

Question 2.14 asked participants to "note all obstacles experienced with integrating computer hardware." The most frequent responses (with most frequent first) were problems with the digital technology (e.g., troubleshooting, lack of support, and delays) (n=19), unreliable internet connection (n=13), the initial and maintenance costs of digital technology (i.e., money and time) including trial-and-error lessons of learning the devices' quirks (e.g., too small keyboard on netbooks; unable to print from Chromebook; Adobe Flash Player incompatibility; and limited memory) (n=12), training for students in use and care (n=11) versus training for teachers (n=5), working with the policies of what is (not) allowed (n=3), physically keeping up with the devices (n=1), and keeping track of passwords (n=1).

Question 2.20 asked participants to "note all obstacles experienced with integrating Internet tools." The most frequent responses (with most frequent first) were teacher training (n=11), student training (n=10), blocked content (n=5), digital technology problems (n=4), policies of what can(not) be integrated (n=3), cost (3), and relevance (n=1).

Conclusion

Blended instructors shared successes also. Related to their instructional audience and 21st century skills, millennials are learning their phones can be used for learning. "A lot of the kids work we work with do not have the means or the technology at home so this gives them that experience," said one respondent. Also, teachers are training the parents of millennials how to participate in their world. "Many parents are not yet computer savvy enough to [look at their child's online gradebook]…we conducted workshops with them and instructed them one-on-one as needed."

Regarding pedagogy and differentiation of content, process, and product, participants offered the hardware and online tools they are using with success. Clickers (n=1) and Google forms (n=1) were suggested to pre-assess students. Digital textbooks with audio (n=5); YouTube and TeacherTube videos (n=11); visual notes via PowerPoint (n=2), Prezi (n=1), or wiki (n=1); and online fieldtrips (n=6) are four ways that teachers are using digital technology to reinforce content.

As for the format of instruction, some students begin face-to-face and then move to online practice (n=4); others are introduced to the topic online and process the material face-to-face. In both cases, students are able to socialize as part of the learning process. “I have the first half of my class being delivered with whole group instruction via the smartboard using 2.0 tools (videos/notes/etc.). I then let the second half of my class be delivered with small group instruction in the form of three groups (high, medium, and low – based on a unit pre-assessment).” Another respondent said, “Our classes are often using a flipped model. Students watch short video clips, submit basic responses to them through Google forms, and have access to preview all activities, games, and reading prior to class. Then, they complete a short quiz on previously covered content before beginning practice and mini-lessons on quiz…Then, they are in small groups based on assessment data from the previous night’s form.” One respondent uses lab simulations when hands-on is not available; another prepares for hands-on labs with lab simulations. Two additional participants were complimentary of co-teaching with North Carolina Virtual Public School online teachers.

Online tools for process include Brain Pop (n=1), Khan Academy (n=1), Achieve 3000 (n=1), Accelerated Reader (n=1), RAZkids (n=1), IXL (n=2), Moby Math (n=1), Moodle (n=4), Angel (n=3), Edmodo (n=5), Haiku (n=7), Quizlet (n=2), Quia (n=1), Study Stack (n=2), webpage (n=1), wiki (n=4), school fusion (n=1), and Gizmo (n=1). Online tools for product include MS Office (n=1), Google Docs (n=1), Prezi (n=2), Glogster (n=2), iMovie (n=1), iPhoto (n=1), Voki (n=1), online portfolio (n=1), wiki for student folder of work (n=1), turnitin.com for plagiarism and audio feedback (n=1), and online assessments (5). Additionally, hardware to produce and present information are needed (n=2).

A few participants seemed to be offering advice to their colleagues: design plans based on standards (n=2), facilitate rather than teach (n=1), and know that blended instruction requires continued implementation. One participant said, “I believe that blended instruction works if you begin to implement it from the first day of school. I think that if you don’t practice the procedures associated with it, the level of success will lessen dramatically.”

CHAPTER FIVE

This study of the extent to which and how teachers blend instruction in digital technology-rich schools was exploratory and accomplished at least three things. First, there is a better understanding of the population of pre-kindergarten to grade 13 teachers~~,~~ who work in one-to-one computing schools in North Carolina. Currently, this is the only known assessment of this population in North Carolina and provides a first look at this group of instructors. Participants represented schools with 0.37 to 1.22 students per instructional computer, and although there was some inconsistency among staff at the same schools, blended instruction was present on all campuses. Second, more is understood about which hardware and online tools are being used and with what frequency, thus establishing a starting point in documenting how the instructional resources of one-to-one computing are being used statewide in blended classrooms. A next step could be researching how the hardware and online tools are being used in context to assess best practices. Finally, the obstacles that these teachers have experienced are considerations for all school system and school-based leaders, Regional Education Service Alliances, and teacher education programs.

Summary

Three theories served as the conceptual framework for this study on blended instruction. The first idea is that differentiation in delivery improves learning and student satisfaction, possibly improving attendance and graduation rates. Survey-takers responded that blended instruction is an effective or very effective approach to differentiating content (95.2 percent), process (96.7 percent), and product (92.3 percent). Many online tools were shared for each step in this differentiated learning cycle. The second theoretical base was Revised Bloom's Taxonomy. Eighty-five (85.3) percent of participants agree that blended instruction is effective or very effective in challenging higher order thinking. Given this high percentage, instructors seem to believe in blended instruction. More specifically, they think they are seeing an improvement in student learning as a result of blended instruction. Research on best practices would provide additional information that could increase these numbers, if teachers were provided with the information that would make them more familiar with how the hardware and online tools could

best augment the students' educational experience with formative assessment and corrective or enrichment activities, which could positively impact teachers' adoption of innovation.

Knowing and relating to one's instructional audience may be as important as the content itself, and literacy involves reading and writing using the most current media forms. Based on related literature, blended instruction is necessary for preparing students to be college and career ready, and 95.6 percent of the survey participants believed that blended instruction is an effective or very effective method for teaching 21st century skills. The University of Central Florida's President Hitt is quoted in a North Carolina Virtual Public School (2009) publication saying that professors will teach either online or in a blended environment (i.e., not 100 percent face-to-face). High school graduates without knowledge of a learning management system, such as Blackboard, Moodle, or Haiku for example, would be at a disadvantage. Similarly, professional training can be found online.

VanHook-Schrey (2008) found that 88.7 percent of her sample of secondary English Language Arts teachers used technology daily or weekly but only 48.1 percent for instructional purposes, and computer use decreased in high school. In this study of how pre-kindergarten to grade 13 educators are blending instruction, 90.0 percent of teachers reported using a laptop daily or weekly face-to-face with students. Students in 85.8 percent of the teachers' schools have a one-to-one laptop and use it daily or weekly during face-to-face instruction. Accessibility to laptops was more predominant than tablets (16.8 percent), media players (15.7 percent), and smartphones (15.6 percent), perhaps because the laptops will run the North Carolina summative assessments that will soon be administered exclusively online. Ninety-six percent of classrooms represented in the survey had wireless Internet connection. Teachers estimated that 61.1 percent of students use a laptop outside of class for instruction also. Math, world language, and Career Technical Education teachers more frequently blend instruction than other content areas.

The variety of online tools was less encouraging. Teachers and students alike emailed, shared documents, and instant messaged most frequently. The majority of teachers and students never incorporated an avatar, video conferenced and screen shared, blogged, posted to a

discussion board or wiki. It makes sense that the teachers would not ask students to do something they do not do themselves.

This study's definition of blended instruction included organizing software. Over 64.5 percent of teachers reported daily or weekly student use of a teacher or class webpage during face-to-face instruction, 52.8 percent daily or weekly student use of a learning management system while face-to-face, and 26.6 percent daily or weekly student use of social media during face-to-face instruction. Although not specific to these tools, answers to open-ended questions about obstacles reflect a frustration with an unreliable Internet connection and a need for full-time technical support. Both are reasons for why teachers may not experiment more with blended learning.

Conclusions

It is clear from this survey that, overall, blended instruction is not yet engrained in school culture statewide. Perhaps some systems and/or schools have established an institutionalized framework and seek emerging technologies, but adoption of innovation is slow for others, even among those that have one-to-one computing. One teacher shared a pursuit for an educational multimedia advanced degree as an indication of buy-in.

In addition to the majority of survey participants claiming that blended instruction is effective or very effective in differentiating for students and addressing learning styles (above), this study helped to fill three other gaps in the related literature. First of all, because elementary and high schools have not been researched as much as middle schools and colleges on the topic of blended instruction, pre-kindergarten through grade 13 teachers were invited to participate in this survey. High school teachers accounted for 54.7+ percent of survey takers, with elementary teachers representing 10.3+ percent. The plus is inclusive of those who do not fit in kindergarten through 5th grade and ninth through twelfth grade categories. Thirty-eight (38.1) percent of elementary school respondents blend instruction; 69.0 percent of middle school; and 70.8 percent of high school.

The age of teachers who employ a blended instructional style was another gap.

In this 2012 survey of blended instruction, the average age of respondents was 41.7 years. Those who blend instruction are slightly older (42.0 years) than those who do not (38.4 years). In VanHook-Schrey's 2008 study, 37.84 percent of teachers with 20-plus years of experience used technology in lesson planning. Similarly, blended practitioners have a little more teaching experience (13.4 years) than those who do not (12.2 years). These characteristics may provide confidence to older educators with more experience. Of the small percentage who were blended students, 76.5 percent blend their instruction. Conversely, 63.8 percent of blended practitioners have attempted it without any prior knowledge, which contradicts the assumption that we teach the way we were taught. One teacher commented, "Blended instruction has been the biggest challenge that I have had to overcome in my 33 years teaching." While educators sometimes feel that students have the edge with digital technology, one respondent observed that "many [students] are well-versed in surfing for personal pleasure, but most have to be taught to use the computer as a learning tool." Again, the knowledge that the learning gap between students and adults is narrower than thought may lessen educators' intimidation.

This study addressed a third gap related to instructor gender and blended instruction. Although 77.3 percent of survey participants were female, there was less than a five percent difference between the women (64.4 percent) and men (69.2 percent) who blend instruction. How students respond to blended instruction by gender remains an area for study.

Recommendations

The success of blended instruction depends on teachers' belief in it and educational leaders making sure that the network, hardware, tools, and technical support for troubleshooting and maintenance are available. These were applauded in some schools, but other teachers said they need more than they have at present to move forward. It seems that only a maximum of 25.7 percent of students are using an electronic textbook on a daily or weekly basis face-to-face, less outside of the classroom. Electronic textbooks are cheaper than hardcopies, are updated regularly, and can be more interactive. Perhaps this cost saving could be diverted to investing in devices on which the electronic textbooks can be read. North Carolina's General Assembly is considering a bill that would ease the restriction of textbook money for e-readers. The use of

digital textbooks alone does not constitute a blended learning environment, but they are another technologically-forward instructional strategy.

Training on keeping students on-task with computing devices is needed, as well as solutions for extending their use at home without an Internet connection. Cell phone companies are being approached to contract with school systems to offer low-cost data plans for the devices purchased already by the systems.

Blended instruction is a mixture of the familiar face-to-face and unfamiliar online environments that supplements what educators do already to address objectives by providing another opportunity for learning. However, the end-goal is to accomplish learning gains that could not be attained without the possibilities afforded by the blended model. According to Brown (n.d.), the gold standard for blended instruction is 90-10, that is 90 percent face-to-face and ten percent online or vice versa, which is a manageable amount of change. One instructor structures class as 15 minutes whole group and 1 hour 15 minutes online.

A survey-taker admitted, “I feel like we are expected to incorporate every new tool now.” Teachers should start by maximizing the tools they have already. For example, 77.8 percent of participants marked access to and use of an interactive whiteboard daily or weekly, but are they using it as a writing space or utilizing all of its features? Teachers could then integrate one tool at a time when it is appropriate. Another respondent wrote, “I want to be able to ‘toggle’ the best program for the content”; this is at an expert level. From a leadership perspective, we must move newer users to monthly users and monthly or less users to weekly users by issuing the charge and monitoring progress with the goal of addressing higher order thinking tasks. Intentionality is key to blended instruction, and the support of full-time technicians and technology facilitators cannot be over-emphasized. Qualitative research, perhaps on how the hardware and online tools are being used in context to assess best practices, is a next step in strengthening this model and improving learning outcomes. “Blending instruction is hard to setup, but, once you have procedures set in place and have a routine that meets the needs of the students, it can be a lot easier than total teacher instruction,” a teacher encouraged. Blended instruction could be the essential foundation for building whatever it will mean to be literate in the 21st century.

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APPENDIX A

Email to Superintendents

Dear ***:

I am a doctoral student at Western Carolina University in the Educational Leadership program and seeking your permission to conduct a survey in the school(s) below as part of my dissertation:

***

Blended instruction occurs through a combination of face-to-face and online environments. I am interested in how K-12 teachers in North Carolina are using computer hardware and online tools to “blend” their instruction for the purposes of differentiation and higher order thinking. In order to assess the prevalence of these practices also, all teachers who are working in a North Carolina public school, where there is at least one computer for each student, are invited to participate. Schools were identified from the Annual Media and Technology Report.

Your teachers’ participation in this study involves answering questions about their instructional approach. The online survey will take approximately 20 minutes to complete. Their involvement will be voluntary, and they may withdraw at any time or decline to answer any question. The teachers’ responses will be confidential, and their privacy will be maintained throughout the course of this study. Moreover, no identifiable information (individual, school, or school system) will be reported or published. Should they decide to participate, there are no foreseeable risks to them.

Please reply to this email to indicate your permission to survey your teachers. If consent is given for me to contact your teachers, I then will ask the principal of the school(s) above for an electronic list of the teachers’ email addresses. The teachers will receive a message about the study in mid-August.

If you would like to discuss this research, you may contact me at ### or my dissertation chairperson Dr. Anna McFadden at 828.227.2411. If you have any questions or concerns about your teachers’ treatment as a participant in this study, you can reach the Western Carolina University Institutional Review Board through WCU’s Office of Research Administration at 828.227.7212.

Thank you for your support.

APPENDIX B

Email to Principals

Good afternoon:) This summer, [your superintendent] gave me permission to contact you regarding a survey for my dissertation. I am writing to ask for an electronic list of your teachers' email addresses. I very much appreciate your school system's support. Please contact me with any questions or concerns.

…followed by the email to the superintendent and her/his response

APPENDIX C

Email to Teachers

My name is Heather Allen, and I am a doctoral student at Western Carolina University. With permission from your superintendent and principal, I send you this survey request for my dissertation.

Blended learning combines online delivery of educational content with the best features of classroom interaction and live instruction. For my dissertation, I am researching the use of blended instruction in K-12 schools in North Carolina. Specifically, I am interested in the ways in which North Carolina teachers are using computer hardware and online tools to "blend" their face-to-face and online environments for the purposes of differentiating instruction and promoting higher order thinking. In order to assess the prevalence of these practices, all teachers working in a North Carolina public school where there is at least one computer for each student are invited to participate. Even if you do not teach in a blended format, your responses are valuable to me.

Your involvement in this study involves answering questions about your instructional approach. The survey will take approximately 20 minutes to complete. Your participation is voluntary, and you may withdraw at any time or decline to answer any question. Your responses will be confidential, and your privacy will be maintained throughout the course of this study. Moreover, no identifiable information (individual, school, or school system) will be published. System-specific data will be reported in aggregate to the system's superintendent upon request. Should you decide to participate, there are no foreseeable risks to you.

If you would like to discuss this research, you may contact me at ### or my dissertation chairperson Dr. Anna McFadden at 828.227.2411. If you have any questions or concerns about your treatment as a participant in this study, you can reach the Western Carolina University Institutional Review Board through WCU's Office of Research Administration at 828.227.7212.

Consent is assumed if you participate in the survey before or on Friday, October 5th. Additionally, you will be asked to indicate consent on the first screen of the survey. You may begin by clicking the link below.

https://wcu.qualtrics.com/SE/?SID=SV_eOG48uB7MUJl1T7

Thank you for your help.

APPENDIX D

Survey

Consent

Through this survey, the researcher seeks to understand the ways in which North Carolina teachers are using computer hardware and online tools to "blend" their face-to-face and online environments for the purposes of differentiating instruction and promoting higher order thinking. Prior to proceeding with the survey, you must indicate below your consent to participate in this study. By doing so, you acknowledge you are at least 18 years of age.

- ◯ I give permission to the researcher to use my information in her research.
- ◯ I do not give permission to the researcher to use my information in her research.

Main

Does your classroom have wireless internet connection?

- ◯ Yes
- ◯ No

Does every student in at least one of your classes have daily access to a school-provided, internet-connected computing device (e.g., laptop, tablet, smartphone, media player, etc.)?

- ◯ Yes
- ◯ No

Are students permitted to take the school-provided computing device (e.g., laptop, tablet, smartphone, media player, etc.) home?

- ◯ Yes
- ◯ No

Do students receive both face-to-face and online instruction in at least one of your classes?

- ◯ Yes
- ◯ No

How many hours per week are scheduled for your class?

[ ]

On average, how many hours per week do students use a computing device (e.g., laptop, tablet, smartphone, media player, etc.) IN your classroom for instruction?

[ ]

On average, how many hours per week do you expect students to spend on coursework OUTSIDE OF your classroom?

On average, how many hours per week do you expect students to use a computing device (e.g., laptop, tablet, smartphone, media player, etc.) OUTSIDE OF your classroom for instruction?

Based on your experience, how effective is blended instruction in addressing:

	Very Ineffective	Ineffective	Effective	Very Effective
Differentiation of content (what you teach)	○	○	○	○
Differentiation of process (how you to teach - e.g., whole class, groups/pairs, or individual)	○	○	○	○
Differentiation of product (assessment of content)	○	○	○	○
Socialization (interpersonal interaction)	○	○	○	○
21st century skills (learning and innovation; information, media, and technology; and life and career)	○	○	○	○
Higher order thinking (e.g., Revised Bloom's Taxonomy)	○	○	○	○

Please note all obstacles experienced in BLENDING your face-to-face and online instruction, as well as if/how they were overcome.

On average, how often are the following computer hardware used during instruction?

	Daily	Weekly	Monthly or less	Never	Not applicable
Digital projector	○	○	○	○	○
Interactive whiteboard (e.g., Promethean)	○	○	○	○	○
Document camera (e.g., Elmo)	○	○	○	○	○
Student response system ("clickers")	○	○	○	○	○
Other (please identify):	○	○	○	○	○

On average, how often do YOU use the following computer hardware during instruction?

	Face-to-face					OUTSIDE face-to-face classroom				
	Daily	Weekly	Monthly or less	Never	Not applicable	Daily	Weekly	Monthly or less	Never	Not applicable
Laptop	○	○	○	○	○	○	○	○	○	○
Tablet (e.g., iPad, Kindle, Nook, etc.)	○	○	○	○	○	○	○	○	○	○
Smartphone	○	○	○	○	○	○	○	○	○	○
Media player (e.g., iTouch)	○	○	○	○	○	○	○	○	○	○
Microphone	○	○	○	○	○	○	○	○	○	○
Digital video camera (built-in to device above or separate)	○	○	○	○	○	○	○	○	○	○
Other (please identify):	○	○	○	○	○	○	○	○	○	○

On average, how often do STUDENTS use the following computer hardware during instruction?

	Face-to-face					OUTSIDE face-to-face classroom				
	Daily	Weekly	Monthly or less	Never	Not applicable	Daily	Weekly	Monthly or less	Never	Not applicable
Laptop	○	○	○	○	○	○	○	○	○	○
Tablet (e.g., iPad, Kindle, Nook, etc.)	○	○	○	○	○	○	○	○	○	○
Smartphone	○	○	○	○	○	○	○	○	○	○
Media player (e.g., iTouch)	○	○	○	○	○	○	○	○	○	○
Microphone	○	○	○	○	○	○	○	○	○	○
Digital video camera (built-in to device above or separate)	○	○	○	○	○	○	○	○	○	○
Other (please identify):	○	○	○	○	○	○	○	○	○	○

Please note all obstacles experienced with integrating COMPUTER HARDWARE, as well as if/how they were overcome.

On average, how often do YOU use the following internet tools during instruction?

	Face-to-face				OUTSIDE face-to-face classroom			
	Daily	Weekly	Monthly or less	Never	Daily	Weekly	Monthly or less	Never

Teacher or class webpage	○	○	○	○	○	○	○	○
Learning management system (e.g., Blackboard, Moodle, etc.)	○	○	○	○	○	○	○	○
Social media (e.g., Twitter, Facebook, Edmodo, etc.)	○	○	○	○	○	○	○	○
Electronic textbook	○	○	○	○	○	○	○	○
Multimedia presentation (e.g., Prezi, Animoto, SchoolTube, etc.)	○	○	○	○	○	○	○	○
Virtual fieldtrip, lab simulation, or video game	○	○	○	○	○	○	○	○
Electronic polling	○	○	○	○	○	○	○	○
Virtual notebook	○	○	○	○	○	○	○	○
Online assignment submission	○	○	○	○	○	○	○	○
Student-accessible, online gradebook	○	○	○	○	○	○	○	○
Other (please identify):	○	○	○	○	○	○	○	○

On average, how often do YOU use the following internet tools OUTSIDE OF the face-to-face classroom?

	Daily	Weekly	Monthly or less	Never
Email	○	○	○	○
Instant messaging	○	○	○	○
Avatar (e.g. Voki)	○	○	○	○
Video conferencing and screen sharing (e.g., Skype)	○	○	○	○
Blog	○	○	○	○
Discussion board	○	○	○	○
Wiki	○	○	○	○
Shared word processing documents, spreadsheets, presentations, drawings, and forms (e.g., Google docs)	○	○	○	○
Other (please identify):	○	○	○	○

On average, how often do STUDENTS use the following internet tools during instruction?

	Face-to-face				OUTSIDE face-to-face classroom			
	Daily	Weekly	Monthly or less	Never	Daily	Weekly	Monthly or less	Never
Teacher or class webpage	○	○	○	○	○	○	○	○
Learning management system (e.g., Blackboard,	○	○	○	○	○	○	○	○

Moodle, etc.)								
Social media (e.g., Twitter, Facebook, Edmodo, etc.)								
Electronic textbook								
Multimedia presentation (e.g., Prezi, Animoto, SchoolTube, etc.)								
Virtual fieldtrip, lab simulation, or video game								
Electronic polling								
Virtual notebook								
Online assignment submission								
Student-accessible, online gradebook								
Other (please identify):								

On average, how often do STUDENTS use the following internet tools OUTSIDE OF the face-to-face classroom?

	Daily	Weekly	Monthly or less	Never
Email				
Instant messaging				
Avatar (e.g. Voki)				
Video conferencing and screen sharing (e.g., Skype)				
Blog				
Discussion board				
Wiki				
Shared word processing documents, spreadsheets, presentations, drawings, and forms (e.g., Google docs)				
Other (please identify):				

Please note all obstacles experienced with integrating INTERNET TOOLS, as well as if/how they were overcome.

Briefly describe and/or provide examples of how you successfully blend instruction.

If there is anything more you are willing to share about your experience with blended instruction, please do so below.

Demographic

Email address:

School(s):

Which of the following best describes your school? Check all that apply.

- [ ] Elementary school
- [ ] Middle school
- [ ] High school
- [ ] Other (please identify):

Position: Check all that apply.

- [ ] Teacher
- [ ] Other (please identify):

Department(s): Check all that apply.

- [ ] English Language Arts
- [ ] Mathematics
- [ ] Science

- [ ] Social Sciences
- [ ] Healthful Living
- [ ] World Languages
- [ ] Career Technical Education
- [ ] Arts Education
- [ ] Other (please identify):

Career Technical Education

- [ ] Agricultural Education
- [ ] Business and Information Technology
- [ ] Career Development
- [ ] Family and Consumer Sciences
- [ ] Health Occupations
- [ ] Marketing
- [ ] Technology
- [ ] Trade and Industrial

Gender:

- ( ) Male
- ( ) Female

Age (in years):

Total years of teaching experience:

Years teaching using blended instruction:

Did you experience blended instruction as a student?

- ( ) Yes
- ( ) No

Please email me a summary of the study's findings.

- ◯ Yes
- ◯ No

APPENDIX E

School Systems and Schools Named in the Survey

Buncombe County
Community High

Burke County
Walter R. Johnson Middle

Camden County
CamTech High

Chatham County
Bennett Elementary
Bonlee Elementary
Jordan Matthews High
Margaret B. Pollard Middle
SAGE Academy

Davie County
Central Davie Academy

Elkin County
Elkin High

Granville County
South Granville High of Health & Life Sciences
South Granville High of Integrated Technology & Leadership

Greene County
Greene Central High

Haywood County
Canton Middle

Hickory City
Hickory Career and Arts Magnet High

Hoke County
Turlington Alternative

Montgomery County
Candor Elementary
East Montgomery High
East Wilkes High
Montgomery Learning Academy
Mount Gilead Elementary

Nash-Rocky Mount City
Nash-Rocky Mount Early College
Williford Elementary

Perquimans County
Perquimans County High

Rowan-Salisbury County
Carroll T. Overton Elementary
Henderson Independent High
Rowan County Early College

Rutherford County
Rutherford Early College

Sampson County
Hobbton High
Horton Middle
Midway Middle
Roseboro-Salemburg Middle
Union High
Union Intermediate

Surry County
J. Sam Gentry Middle
Meadowview Middle
Pilot Mountain Middle

Thomasville City
Thomasville High

Transylvania County
Davidson River School

Vance County
Vance County Early College
Western Vance High

Wilkes County
Central Wilkes Middle
Moravian Falls Elementary
North Wilkes High
North Wilkes Middle
Wilkes Central High
West Wilkes
Wilkes Early College

Wilson County
James Hunt High

Yadkin County
Yadkin Success Academy