IMPLEMENTATION OF A COMPUTER-BASED READING PROGRAM: TEACHER
EXPERIENCES, IMPEDIMENTS AND SUPPORTS

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Abstract

Reading for comprehension is an essential skill students graduating high school need, but are often inadequately equipped to master. The purpose of this study is to examine the implementation of a computer-assisted reading instructional program called Achieve 3000 at a small, suburban public school in the middle south with attention to what facilitated and impeded program use along with understanding teacher experiences surrounding the program and its use in their classrooms. The researcher, acting as an implementation coach, conducts an action-research case study with phenomenological interviews to investigate the (1) impediments (anticipated and unanticipated) to fidelity (2) mechanisms of support to overcome impediments and (3) teacher experiences during a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents. Knowles andragogy was used as a theoretical lens in considering the vital role of teacher as learner in the implementation process. Through intensive study of the five phenomenological interviews, six themes emerged: too many "pans on the stove"; "Ugh, Again?"; meeting quota to support student growth; hit or miss – finding the right articles; see it is working – following the numbers; and it is kind of helpful, and sometimes you hit the jackpot. Additionally coaching, professional learning communities, and celebrating growth emerged as recommended supports. Practitioners are advised to consider how intensely teachers feel the pressure of time in their daily work. Professionals implementing a new computer-based program across curriculums need to make sure that each educator understands his or her role in relation to the whole implementation. The study suggest additional research exploring student experiences, using a larger school setting, reviewing longitudinal effects, and quantitatively exploring program effectiveness.

Acknowledgements and Dedication

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Chapter 1 - Introduction

Research Problem

Students are graduating high school without the foundational literacy skills they need to thrive, arguably survive, in the twenty-first century. Over a third of students graduating in 2015 were not ready at the end of their high school education for college and career level reading and writing coursework according to the ACT English Benchmark (ACT, 2015). More than 34% of students in eighth grade and 37% in twelfth performed below grade level expectation for reading competency in a nation-wide assessment (U.S. Department of Education, 2017). In 2006, over 6 million students needed some form of remediation in reading skills in order to be considered on grade-level in language arts (Biancarosa & Snow, 2006). While only 5-10% of those required intensive remediation, too many students are not on target to be college and career ready at graduation. The implications for students that cannot read well in secondary school are significant. Struggling readers are less likely to graduate high school or seek post-secondary education opportunities; they are more likely to be unemployed or underemployed than the student body at large (Peterson, Caverly, Nicholson, O'Neal, & Cusenbary, 2000, p. 6).

This nationwide problem also impacts students in Tennessee. In 2003, 13% of people over the age of 16 in Tennessee lacked basic prose literacy skills (NCES, 2017). The 2016 Tennessee Comprehensive Assessment Program (TCAP) results indicated that 27.3 percent were below course level expectations (Tennessee Department of Education, 2017). In 2015, like national averages, only 38% of Tennessee students taking the ACT performed at the college ready benchmark level in Reading. That same year, the National Assessment of Educational Progress (NAEP) showed the state of Tennessee improved in three of four tested areas, but

remained stagnant in their performance on literacy, in which only a third of students tested were proficient in eighth grade reading scores.

While much study has been given to literacy in the primary grades, exploration of literacy in adolescence is minimal (Herrera, Truckenmiller & Foorman, 2016). Even more restrictive is the number of studies that have been completed targeting literacy development in the high schools. Herrera, Truckenmiller and Foorman's report (2016) reviewed 20 years of research on literacy and found only 33 studies of adolescent literacy programs and practices that were completed with a rigorous research design and from which causal implications could be drawn (Herrera, Truckenmiller & Foorman, 2016).

This is concerning because most of the academic literature on literacy focuses on early literacy. While early literacy is foundational, advanced literacy has its own set of skill requirements. The transition from learning to read to reading to learn is further complicated by the fact that successful reading requires different processes in each subject at the secondary level (Heller & Greenleaf, 2007). Secondary school literature requires a student to read in math class to learn the relationship between different real or created scenarios and to learn algorithms. In science class, students need to read lab directions carefully and be attentive to detail; they are expected to accept the author's straightforward information. That same day students in English class will be critical of the author's words determining tone, purpose and style; in history class, they may question the motives behind the word choices or find the bias in text. Each subject's works are styled and purposed differently, yet our students are expected to navigate those textbooks as well as the alternate source publications such as newspapers, journals and internet blogs.

At the secondary level, students are expected to know how to read and use their reading time to build purposeful understanding of the text (Heller & Greenleaf, 2007). Some comprehension strategies can universally support understanding such as introducing vocabulary before reading, predicting, summarizing or questioning during reading and by discussing or journaling after reading. But nothing can replace repeated exposure to literature across the content areas.

Teacher preparation for content areas in secondary school also has little to no emphasis on how to help students learn to read for comprehension (Irvin, Meltzer, & Dukes, 2007). Content teachers are expected to cover a vast curriculum with less than five seat hours per week, and they often do not believe they have time or expertise to teach subject-specific reading strategies (Allen, 2000; Cziko, 1998). Yet for the literacy deficit to change, every teacher needs to support students in increasing reading capacity (Council of Chief State School Officers (CCSO), 2010). Teachers must be supported in developing a literacy-rich classroom and providing reading instruction through ongoing, supportive, professional development related to reading for adolescent learners (Meltzer, Smith, & Clark, 2001).

Purpose of the Study

Students need increased exposure to expository texts in the content areas (Biancarosa & Snow, 2006). Teachers are not consistently fulfilling that need and require supports to do so (Irvin, Meltzer, & Dukes, 2007). A proprietary computer assisted instruction program called Achieve 3000 claims significantly higher than expected gains in reading levels for adolescents when used as intended (Achieve 3000, 2016). Previous studies have found Achieve 3000 effective in producing the company's touted gains for adolescent students (Shannon & Grant, 2015; Borman, Park & Min, 2015). However, similar gains were not produced when students

received less than the recommended two contacts per week while utilizing the program's five-step lesson plan (Hill, Lenard & Page, 2016).

A small public school of choice (meaning no students are zoned for the school and each student chooses to apply for enrollment in lieu of attending their school of zone) situated in a large, affluent, successful mid-south school district was undergoing the initial implementation school year of Achieve 3000 use. The English Language department, researcher and school leadership believed the program would help their students by increasing individual reading capacity. Other content teachers varied in their commitment and capacity for implementing the program with their existing knowledge.

The purpose of this study was to examine the implementation of Achieve 3000 with attention to what facilitated and impeded implementation along with understanding teacher experiences with the program and its use in their classrooms. When finding facilitation measures, this study sought to capture and categorize them for replication. While determining impediments, both anticipated and unexpected, this study sought mechanisms of support to overcome obstacles to program adherence and attempt to increase fidelity in content teacher application of the program.

This study took place during an initial implementation in this small high school (approximately 160 students in grades 9-12) and attempted to simultaneously improve implementation fidelity through coaching, professional development, professional learning community involvement and leadership support. Additionally, the study sought to determine what mechanisms of staff support contributed to increased fidelity. This study attempted to identify and clarify both impediments and supports to be considered and utilized in a larger scale implementation.

Research Questions

1: What impediments (anticipated and unanticipated) to fidelity are experienced during a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents?

2: What mechanisms of support overcome impediments and increase fidelity during a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents?

3: What are teacher experiences in a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents?

Rationale for the Study

This action research case study with phenomenological interviews sought to contribute to the growing, but still insufficient, body of work on effective strategies to improve reading comprehension in secondary schools using computer-assisted instruction. Studies show that a proprietary CAI program Achieve 3000 provided measurably significant gains only when students complete 80 or more activities in a year (Shannon & Grant, 2015; Borman, Park & Min, 2015). Additional studies indicate that most schools using the program have far fewer contact hours than necessary. Believing that educators truly want what is best for their students and that full implementation of Achieve 3000 is beneficial to student growth in reading, this study sought to identify what the impediments were to fidelity when using the program and further explore what characteristics of educator support could improve usage rates. Using action research allowed the study participants to explore solutions, implement them and reflect on them to improve the overall process. A phenomenological interview of participating teachers allowed multiple firsthand accounts to fully shape understanding of teacher experiences in program use.

By fully immersing in one school's journey to utilize a proprietary reading improvement program, the researcher had access to each implementation step. This study took place during the first year of program use at a small high school and attempted to simultaneously report impediments, improve implementation fidelity and track mechanisms of staff support to overcome barriers.

The first phase of the study was to brainstorm impediments, anticipated and experienced, during the pre-study early implementation of the program. The school began implementing Achieve 3000 without study supports near the beginning of the school year in August. Teachers were provided a three-hour introduction to Achieve 3000 during summer in-service meetings. They were also provided guidance that each teacher was expected to utilize the program one or two times per school calendar month. The school agreed that English, Science and Social Studies would utilize the program twice a calendar month in their classrooms while all other subjects would implement once each month. Immediately prior to study support implementation, the researcher participated in a brainstorm with several current teacher-users and the administrator of the school being studied to uncover as many of the existing and anticipated supports that aided the program and impediments against meeting contact hours and program five-step alignment.

This study began in January with the second semester of the first year of implementation. Within this study, teachers were intended to receive three guided professional learning community meetings (conflicts in schedule and weather factors reduced this to a single professional learning community meeting dedicated to Achieve 3000), direct coaching and feedback. The researcher observed full-length classes to determine if the program was being utilized with fidelity. The researcher, functioning as a coach, met individually with instructors to

overcome impediments. The researcher also interviewed teachers to ascertain if supports led to increased program fidelity and what supports could be replicated in a larger setting.

It was anticipated that elements of professional learning communities, coaching, and transformative leadership would affect the school's progress toward implementation fidelity. Through a professional learning community, educators could come together to grow in their practice by sharing the successes and failures from the classroom and increase the collective strength of the team (DuFour & Eakert, 1998). Coaching was found in previous studies to be more effective than workshops or other single-application professional development strategies (Guiney, 2001). Through coaching, teachers were provided support while integrating new theories or programs into their individual classrooms (Powell & Diamond, 2013). Transformative style of leadership was credited with inspiring successful adoption of reform and best practices. These and other elements worked in concert to create the environment in which the program was utilized.

The Researcher (Background and Relationship to Problem Discussed)

The researcher in this study was a doctoral candidate with a focus on educational leadership. She served as an educator in the school for this study for nearly four years – first as a math and physics teacher and now as a special educator with a focus on inclusion. In the year preceding the study, the researcher implemented an different proprietary reading comprehension program with six students.

The researcher was asked to oversee implementation of a school-wide, three-grade program use of Achieve 3000 focused on increasing reading levels for adolescents. The researcher provided staff support and ensured the program was implemented with fidelity to the intended model. The researcher acted as a leader in the work sessions and a participant in the

study. She provided direct support and coaching for teachers undertaking the implementation. The school in this study was a small, tight-knit school with twelve certified teachers.

Definition of Terms

According to *The Glossary of Education Reform*, **professional learning communities** (which have also been called professional learning groups, collaborative learning communities, critical friends groups or communities of practice) are defined as a group of educators that meets regularly, shares expertise, and works collaboratively to improve teaching skills and the academic performance of students (Great Schools Partnership, 2014). Groups of educators work in a PLC to improve the skills and abilities of the educators and improve student achievement.

Lexile is the proprietary leveling system originated by MetaMetrics (Harvey, 2011). The Lexile reader scale tests students on their reading comprehension and provides a numerical range for appropriate independent reading. The Lexile materials scale rates written works according to their word frequency (semantic) and sentence length (syntactic). The two scales work together to allow students and materials to be appropriately matched.

College and career ready is a vague and overarching concept that has been defined differently by a multitude of state and federal organizations. While multiple valid definitions exist, for this research, we will consider the definition set forth by the Advancement Via Individual Determination (AVID) program, which breaks the concept of college and career ready into four critical components related to what a student can think, know, act and go (Conley, 2012). In this definition "thinking" refers to the thinking necessary for college and entry level work, including the ability to formulate hypotheses, develop problem-solving strategies, identify sources, collect information, analyze and evaluate findings, organize and construct work products in a variety of formats, and monitor and confirm the precision and accuracy of all work

produced. "Knowing" refers to the major concepts that must be understood from secondary coursework to successfully complete entry college or work activities. "Acting" incorporates the myriad of activities young adults in the workplace or college classroom need to complete to be successful including: goal setting, persistence, self-awareness, motivation, progress-monitoring, help-seeking, self-efficacy, time management, study skills, strategic reading, memorization techniques, collaborative learning, technology skills, and self-monitoring. "Going" refers to the awareness a student has of requirements to college or career goals in his or her chosen field.

Transformational leadership is characterized by emotionally intelligent, energetic and passionate leaders. Transformational leaders attempt not only the organizational growth, but also the individual growth of the group's members. Transformational leaders are usually visionaries with an eye toward what the organization could become (Cherry, 2006). Transformational leadership seeks collaboration of all stakeholders on decision-making and implementation toward a common goal. They seek to inspire all levels of the organization to develop into the best support they can offer and to take ownership of their roles in the common organizational goal (Pepper, 2010). Advantages of this type of leadership include an invested group of members who are more together than the sum of their parts. A shared vision can invigorate, and the consistent support of growth for all members creates a dedication to that shared vision.

Fidelity is the extent to which the delivery of an intervention adheres to the protocol or program model as intended by the developers of the intervention (Dane & Schneider, 1998; Domitrovich & Greenberg, 2000; Mowbray, Holter, Teague, & Bybee, 2003). In the case of implementation of Achieve 3000 in the district in which this study was conducted, fidelity consists of every student completing seven activities each school month, every student completing one thought question and receiving feedback on that thought question. Additionally,

according to an internal document circulated in the school district in 2017, teachers were expected to incorporate the articles into their curricula with engaging and meaningful lesson plans.

Summary

Too many students cannot read well enough to be college and career ready (ACT, 2015; U.S. Department of Education, 2017; Biancarosa & Snow, 2006; Peterson, Caverly, Nicholson, O'Neal, & Cusenbary, 2000). Teachers feel ill-equipped to support students in learning to become better readers (Irvin, Meltzer, & Dukes, 2007; Allen, 2000; Cziko, 1998). A proprietary system has shown promise when used with fidelity, and the school studied was implementing that system (Shannon & Grant, 2015; Borman, Park & Min, 2015). This study attempted to determine what impediments may prevent fidelity in the implementation. The researcher mitigated those impediments and reported on mitigations that brought the school closer to intended implementation. Additionally, this study reviewed teacher experiences during the implementation process.

Chapter 2 – Review of the Literature

For secondary students, a significant gap exists between reading performance and reading expectations (ACT, 2015; Biancarosa & Snow, 2006; Tennessee Department of Education, 2017; U.S. Department of Education, 2017). Furthermore, a lack of research addressing this need exacerbates the problem by offering few proven solutions (Herrera, Truckenmiller & Foorman, 2016). Reading for content understanding requires a complex set of skills (Heller & Greenleaf, 2007) that content teachers are unprepared to instruct (Allen, 2000; Cziko, 1998; Irvin, Meltzer, & Dukes, 2007). A growing body of research on the use of computer assisted instruction suggests that programs like these can support learning in the secondary classroom (Fenty, Mulcahy, & Washburn, 2015; Kim, McKenna & Park, 2017; Larwin & Larwin, 2011; Regan, Berkley, Hughes & Kirby, 2014; Saine, Lerkkanen, Ahonen, Tovanen, & Lyytinen, 2011; Stetter & Hughes, 2011; Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010). More specifically, computer aided instruction has been effective in increasing reading capacity under specific circumstances (Cuevas, Russell & Irving, 2012; Chiang & Jacobs, 2010; Zorfass & Clay, 2008). One program in particular, Achieve 3000, had two promising studies indicating increased reading comprehension when used in a heterogeneous, whole-class setting (Borman, Park & Min, 2015; Shannon & Grant, 2015). Another study on the same program showed minimal improvement but noted the desired number of contact opportunities was not met (Hill, Lenard & Page, 2016).

This review looked at the **effectiveness** of computer aided instructions (CAI) in the school setting and how the **requirements and impediments**, **mechanisms of support** and **teacher experiences** affected the use of these programs by narrowing the scope from all CAI to CAI for secondary reading improvement and finally to the program of focus for this study

Achieve 3000. Before progressing though the types of CAI, there was an exploration on three of the four major themes woven throughout the document: **requirements and impediments** of program implementation; **mechanisms of support** that could contribute to increasing classroom capacity including professional development, professional learning communities, coaching, leadership and systematic systems support; and **teacher experiences**.

Methodology

I was tasked with helping the teachers at a small high school implement Achieve 3000, a content-area, computer-assisted, instructional program intended to increase reading capacity with fidelity in a small suburban high school. I began by querying the Carson-Newman Library repository with the terms "computer assisted instruction + reading + secondary school." Because of the rapid advances in technology, I limited the search to the last seven years. To increase credibility of the information provided, I further limited the search to peer-reviewed journal submissions. After gaining some insight into general programs, I searched for peer-reviewed research on Achieve 3000 specifically. Next, I interviewed district representatives who were working the implementation of Achieve 3000 in other schools for anecdotal best practices in implementation. Common topics to address included: teacher experience, professional development, professional learning communities, coaching, leadership and systems support. Each of these topics were researched to find relevant direct studies, including the topic and combinations of "CAI, computer assisted instruction, technology, literacy." In several instances the original search yielded only literature reviews and experiential advice, so I began searching relevant source documents from these articles. In the end, I patched together a significant, relevant body of literature on best practices to implement a new school-wide program. Additionally, I wanted to explore the systems or processes that would facilitate successful

implementation. I searched for scholarly work regarding effective change supports by searching combinations of "organizational change," "process improvement," and "change management." During the review of measures to support change in educational settings, the literature repeatedly mentioned the role of "teacher leaders." Therefore, I followed with a search for "teacher leaders" in the literature.

Theoretical Framework - Knowles Andragogy

Teachers using CAI need to be taught the pedagogy and the technology of the program they will be using in their classrooms. The experience of lifelong learning, or the adult as a learner, can be traced as far back at Pluto, even though Dewey began the formalization of thought on the process in 1916 (Henry, 2011). In 1926, Lindeman published *The Meaning of Adult Education* where he suggested that adults did not learn in subjects, but rather as a means to overcome challenges or achieve goals that they set for themselves. Lindeman's assertion later became the foundation for Knowles' development of formal Andragogy Theory. Knowles also credits his early versions of theory to three works: Nathaniel Cantor's *Dynamics of Learning* (1946), which discussed notions of learner-centered education and learners' ego-involvement; Dewey's *Experience and Education* (1947), which clarified the value of experience in the learning process; and Kurt Lewin's *Resolving Social Conflicts* (1948), which discussed the ideas of field theory and social force effects on learning. Knowles' early versions of work centered around the dual needs of the learner and the society, which would both benefit from ongoing, adult education. Post-World War II growth in adult education in America brought additional focus to the experience of the adult learner and additional awareness of the unique characteristics of the adult learner.

Now formally defined, andragogy is the method and practice of teaching adult learners. Unlike pedagogy, which is generally the method and practice of teaching (presumably children), andragogy is more student-centered than teacher-driven. Knowles (1990) last developed framework for andragogy before his death the following year states that successful adult learning is based on six fundamental principles:

1. The learner's need to know. Adults need to understand the value of what they are learning and the potential cost of not learning it. Adults generally are investing time and energy of their own free will to participate in the learning process and need to know that learning will help them in some way before they expend energy in capturing it.

2. Self-conception of the learner. Adults need to believe they are making a conscientious choice to adapt based on their newly acquired knowledge; they may become resistant to ideas that are perceived as being pushed onto them.

3. Prior experience of the learner. Adults come into the learning environment with a myriad of backgrounds and experiences. These experiences contribute to the learning.

4. Readiness to learn. If they perceive a benefit or a need for the material, adults are prepared to progress in their knowledge.

5. Orientation to learning. Unlike children, whose learning is mostly subject-centered, the adult learner is problem-based, or solution focused and acquires knowledge or learns to that end.

6. Motivation to learn. Adult learners often have different and more intrinsic motivations that drive their learning process than younger students.

Knowles' andragogy has been adopted for use across disciplines including education, medicine, criminal justice and management (Chan, 2010). Additionally, the theory influences

work in the United States, Germany, England, Poland, France, Finland, Netherlands, Czechoslovakia, Russia, Hungary and Yugoslavia. This theory is important to the study at hand because the growth and experiences of the teachers and the classroom integration of the program ultimately lead to usage high enough to support student growth. The theory will be used in later chapters to analyze the learning process of teachers in their implementation of a computer-aided instruction (CAI) program in content classrooms.

Requirements and Impediments to Successful CAI Use

        Requirements. In the most effective programs, teachers support students in technology use until students become more confident and independent with the CAI (Ahmed & Khurshid, 2012). For CAI to be effective, it needs to be combined with evidence-based, best practices in teaching (King-Sears & Evmenova, 2007). Lee and Vail found that students using a specific reading CAI sometimes would appear to be gazing at the screen rather than engaging in the computer task, but when teachers implemented appropriate prompts and redirection, all four participating students were able to complete the computer work (2005). Stetter and Hughes determined that teachers needed to scaffold students through their work with CAI as well as provide active feedback within the class setting (2011).

        Impediments. Implementation of purchased programs can be challenging at the school level, and a myriad of potential impediments can hinder program success. The ten most common impediments shown to inhibit major program reform are financing; leadership; commitment; perceptions of the public, of parents, and of students; program staffing; curriculum; political pressures; racial problems; insufficient facilities; and problems of management and scheduling (Schaffer, 1997). Lack of resources (hardware and software), time constraints, misalignment to required curriculum, technology malfunctions, classroom management challenges, lack of

familiarity with the technology, preference for previously used materials, and extensive preparation for lessons involving the technology, scheduling resources are the top reasons teachers do not fully implement CAI programs (Chiang & Jacobs, 2010; Ahmed & Khurshid, 2012; Howell, Lewis, & Johnson, 2012). When new programs are introduced with the right mechanisms of support, the impediments can be overcome.

Mechanisms of Support for Implementation

While numerous things may help improve the effectiveness of CAI in the classroom, this study focused on professional development of educators, professional learning communities, coaching, leadership and organizational structure. Each of these categories offereded insight into requirements for and impediments to meaningful inclusion of a CAI program into content classrooms.

Professional development. Professional development in education refers to the myriad of post certification teacher learning intended to improve professional knowledge, competency, skill and effectiveness. It varies greatly in levels of formality and modality ranging from an internally sourced one hour topic presentation to a multi-year degree seeking program (Adams, 2014). The professional development used to promote effective CAI included coaching, workshops and PLCs.

Requirements. Important to the discussion of incorporating a specific CAI into multiple classrooms is the study by Howell, Lewis and Johnson, which found that the amount of professional development a teacher received correlated directly with the number of times the teacher used that technology in class (2012). Additionally, teachers with a high efficacy rating, who believe that they can and do make a difference to their students, interacted with professional development differently than teachers with a low efficacy rating (Scribner, 1998). Teachers with

high efficacy share intrinsic motivation toward professional development and report that professional development is a highly individualized process that incorporates professional learning in their immediate classroom practices. When professional development focused not only on success in other settings, but also individualized instruction to promote success for the teacher in his or her classroom, it increased teacher expectations of success for implementation and impacted the overall use of technology in the classroom (Howell, Lewis & Johnson, 2012). Clearly, successful integration of new techniques is a tapestry of the teachers' experiences and exposures to several practices interwoven into a practical application in their rooms, and successful professional development programs recognize and appreciate the nonlinear nature of progression for both teachers and students. According to andragogy, one size does not fit all when it comes to adult learning.

Equally important to the availability of professional development is the culture of the school as a safe learning space for teachers to grow (Poulson & Avramidis, 2003). A safe learning environment for teachers includes rewarding effort and allowing teacher control over methodology. School administrators support a culture of learning by providing resources, including access to other staff members, physical space and a time to meet. Purposeful peer teacher collaboration is a potential powerhouse for growth in ongoing teacher development (Sjoer & Meirink, 2016).

An analysis of the current literature regarding professional development (as it pertains to potential coaching paradigms) identified five characteristics of high-quality professional development (Gibbons & Cobb, 2017). Those characteristics include intensive and ongoing instruction, focus on the problems teachers encounter in their daily work, focus on student thinking, fostering the development of teacher communities and investigates and enacting

specific pedagogical routines and practices. In order for teachers to effectively implement strategies presented during professional development, time for reflection is required (Whitehead, 2010). While reflection is not sufficient in itself as a development vehicle, it is a necessary component to growth after the presentation of new material (Poulson & Avramidis, 2003).

Impediments. Many of the professional development opportunities offer a workshop or a training session to implement specific measures with a focus on the mechanics of using a program, such as platform familiarization or the use of specific materials rather than the richer process of developing teacher personal connection to implementing a strategy or program into the complex structure of the classroom (Poulson & Avramidis, 2003). Much of staff education rests on the premise that standardizing content delivery will reduce variability in quality of education in different classrooms.

Effective professional development toward school-wide literacy improvement cannot be a prescriptive, standardized approach (May, 2007). Because each school's staff is at a different level of preparedness for receiving the professional development, professional development happens in cycles and can vary greatly depending on staff changes and external issues. Furthermore, teachers report that they rarely implemented a single strategy or pedagogy learned in a single sitting (Poulson & Avramidis, 2003).

Professional learning communities (PLCs). In order engage in professional dialogues to improve practices, a professional learning community should be formed within the building. According to the *Glossary of Education Reform*, professional learning communities (which have also been called professional learning groups, collaborative learning communities, critical friends groups or communities of practice) are defined as a group of educators that meets regularly, shares expertise, and works collaboratively to improve teaching skills and the academic

performance of students. Groups of educators work in a PLC to improve the skills and abilities of the educators and improve student achievement (*Great Schools Partnership*, 2014). Additionally, professional learning communities (PLCs) share a focus on learning (Ryan, 2011). Through the interconnected efforts of the group, the organization is able to evolve into a better version of itself. Hord conducted a literature review and reported that PLCs accomplished the following: decreased the degree teachers work in isolation; increased commitment to mission, goals, and lasting change; increased shared responsibility for student achievement; increased meaning and understanding of content taught and the roles teachers played in helping all students achieve; increased likelihood that teachers were well-informed, professionally renewed, and inspired to inspire; increased satisfaction, increased morale, and decreased absenteeism; increased the rate at which adaptations and changes were made and increased the likelihood of undertaking fundamental, systematic change (1997).

One study took a closer look at the development of a new Professional Learning Community (PLC) as it began its formation (Sjoer & Meirink, 2016). The participants, six elementary school teachers in a Montessori setting, enjoyed a shared vision, leadership support, comfort with collaboration and a similar level of education. During the meetings, there were examples of both promoting factors (such as sharing ideas or discussing differences in needs, ideas and vision) and constraining factors (such as failing to delve into each other's instruction to get deeper understanding of the strengths and opportunities presented). Sjoer and Meirink (2016) observed a five-step pattern to the shared meeting:

1. Exchanging past and current teaching experiences in education (horizontal exploration)

2. Synthesis of ideas and practices: what do the teachers have in common? (vertical exploration)

3. Exploring tensions, formulating dilemmas: what are the difficulties in developing curriculum?

4. Decision-making: what steps are needed for a curriculum?

5. Action: experimenting in teaching practice.

The authors' hypothesis was that a continuation of the PLC would result in a sixth step to reflect and develop for a continued cycle of improvement. The pattern observed by Sjoer and Meirink creates a framework for further delving into the professional learning community as a support mechanism in education (2016).

Exchanging past and current teaching experiences in education. In practice, professional learning teams each have a pattern of conversation; those patterns correlate to the effectiveness of the group dialog (Horn & Little, 2010). More specifically, when implementing CAI for reading intervention, teachers participated in a three-hour staff meeting biweekly to discuss instructional or behavioral issues during intervention (Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010). These collaborative opportunities were viewed by the teachers involved as valuable toward the implementation process.

Synthesis of ideas and practices. Districts with the most student growth, have the most teacher-centered, collaborative and research-based learning activities (Horn & Little, 2010). The level of interdependency experienced in a PLC could impact its level of effectiveness. PLCs with a low level of interdependency, as experienced during storytelling and scanning, take place often in informal settings and are simply a brief exchange of anecdotes (Meirink, Imants, Meijer, & Verloop, 2010). In moderate interdependence, peers aid and assist each other through challenges experienced in the classroom. An even higher level of interdependence results when instructional materials and ideas are shared. The highest level of interdependence experienced

by a PLC is joint work when teachers come together to conduct instructional problem-solving and planning. This level of interdependence is expected to be effective because "teachers feel a collective responsibility for the work" (Meirink, Imants, Meijer, & Verloop, 2010). Deeper, more meaningful levels of interdependence resulted in increased teacher learning and fostered greater growth in the measured categories.

   Exploring tensions, formulating dilemmas. Informal professional development conversations have also correlated to larger student gains, presumably because those conversations center on immediate problems in classroom instruction and provide strategies for immediate implementation (Akibaa & Liang, 2016). It is not unusual for classroom problems shared in the group setting to be normalized, setting the defined problem as a normal challenge in the evolution of a classroom. A notable distinction in the productivity of the conversation is whether the problem is normalized toward solution development or away from solution development. When normalized toward solution development, further exploration of practice to solve the problem ensues. When normalized away from solution development, empathy is provided and conversation soon turns toward the next agenda item. This leaves the problem presenter in the position of inadequate support to make meaningful changes. One group studied utilized a conversation routine that involved: "(a) normalizing a problem of practice, (b) further specifying the problem, (c) revising the account of the problem (its nature and possible causes), and (d) generalizing to principles of teaching" (Horn & Little, 2010). Groups that turn away from solution, or even fail to normalize instructional problems, often do so to stay focused on other professional requirements at hand (lesson planning, curriculum guidance, etc.). It is difficult to maintain a balance between "getting things done" and "figuring things out" (Horn & Little, 2010).

Decision making. Interdisciplinary PLCs benefit from the diversity of perspectives from different content areas, which allows decisions to incorporate more varied experiences and be better for it (Meirink, Imants, Meijer & Verloop, 2010). When teachers participate in the decision-making process, the educators become even more dedicated to utilizing the technology and supporting the implementation in the classroom (Chiang & Jacobs, 2010).

Action. One study looking at increasing student talk in the classroom noted that the strength of each school's implementation directly correlated to the effectiveness of the PLC and leadership culture embedded in that school (Cooper, Stanulis, Brondyk, Hamilton, Macaluso, & Meier, 2016). While PLCs were beneficial to all the individual teachers participating and to the organization as a whole (Peppers, 2014), new teachers benefitted even more than seasoned teachers.

When some members of the teaching team are less experienced or skilled than the rest of the team, the support of peer teachers in a PLC is invaluable. While professional learning communities are an excellent, research-based method for supporting teachers through change, additional, targeted support may be necessary to increase program use. When peer interaction is insufficient for providing enough support to novice or struggling teachers, the role of a coach may better support those individuals.

Coaching. Coaching offers a highly individualized and supported professional development experience that is gaining traction in the literature over more traditional forms like seminars and coursework. A coach is another professional who can support and mentor an educator in a facet of his or her profession (Wang, 2017). Three dimensions of coaching include providing professional practitioners with the rationale behind the research-based, best-practice implementation; providing direct and specific feedback to initial attempts at implementation of

the program; and providing a safe and supportive coach-teacher relationship (Powell & Diamond, 2013). While the first component to provide teachers the rationale behind implementation is simple enough, the latter two are more challenging and warrant further attention.

Providing direct and specific feedback. The advantage of coaching is that teachers receive support that works in their unique environments through the most challenging task of integrating a new theory into classroom practices (Powell & Diamond, 2013). One successful model is for coaches to meet teachers "where they are" both physically and intellectually in their own practice settings to help providers learn through modeling and demonstrating practices (Poglinco & Bach, 2004). Other coaching models include student-focused coaching and cognitive coaching. Student-focused coaching is where the coach acts as a partner with the teacher and actively avoids taking on the role of "expert" or otherwise parceling advice (Wang, 2017). In this model, coaches support teachers in collecting student data and looking for ways to improve student outcomes. While this method appeals to theorists, there is not enough empirical data to illustrate the student-focused coaching as a best-practice in the field of education. Cognitive coaching as a methodology is both more common and more researched in the field of education (Wang, 2017). In cognitive coaching, the coach helps modify teacher-classroom interactions through direct instruction, modeling, observation, and consulting conversations in the absence of students.

The Classroom Strategies Coaching (CSC) Model uses the empirically validated classroom assessment, the Classroom Strategies Assessment System (CSAS) to gather data on current classroom practices (Reddy, Dudek, Lekwa & 2017). The coach utilizes the CSAS over a series of observations to monitor implementation and provide formative assessment and

feedback loops. CSC coaching is a series of four sessions with the coach and the teacher. In the first session, the coach reviews the CSAS, which includes Tier I effective educational practices in instruction (concept summaries, academic response opportunities, academic praise and academic corrective feedback) and behavior management (clear one or two step directives, behavioral praise, behavioral corrective feedback). The coach also conducts a brief interview about the teacher's current strategies and works with the teacher to develop a plan. One advantage of the CSC Model is that it is not content specific, allowing coaches to support a wide array of teachers.

Effective coaching encourages reflective practices. Rather than providing directive instruction on practice improvements, effective academic coaches support the mentored teacher through exploration and reflection to come to his or her own best answer (Tofade, 2010 as quoted by Wang, 2017; Guiney, 2001).

Providing a safe and supportive coach-teacher relationship. To be effective, coaches need to have a good relationship with the professionals they are coaching. Coaches act in multiple roles including facilitator, instructor, collaborator and supporter (Wang, 2017). Coaches need to be competent in the skills they are supporting and able to model and support building teachers (May, 2007). Mutual trust and respect allow the coach and teacher to have the difficult conversations that foster growth (Herll & O'Drobinak, 2004). Additionally, coaches need to be cognizant of the way they are communicating. If they are perceived as evaluative or judgmental, they will lose credibility and trust in the relationship and impede their own effectiveness (Gallacher, 1997). A coaching relationship is directly linked with student progress and also benefits the teacher relationships with building leaders.

Coaching is often more effective than workshops or coursework when coaches involve teachers in ongoing continuing education (Guiney, 2001). While the coach is one teacher-leader a practitioner may have the opportunity to work with, the building leadership is significantly influential in determining whether or not an initiative will take root.

Leadership. Transformative leadership is, in educational research, the touted style for change (Hallinger, 2003). It is characterized by emotionally intelligent, energetic and passionate leaders, who attempt to not only grow the organization, but also increase the individual achievement of the group's members (Cherry, 2006). Transformational leaders are usually visionaries with an eye toward what the organization could become (Pepper, 2010), and they seek the collaboration of all stakeholders in decision-making and implementation toward a common goal. Additionally, they inspire individuals at all levels of the organization to develop and to take ownership of their roles in the common organizational goal.

A quantitative study of the implementation of Response to Intervention (RTI) program showed a direct correlation between principal's leadership type and the level of implementation success in the school (Maier, Pate, Gibson, Hilgert, Hull, & Campbell, 2016). Response to Intervention (RTI) was a requirement for all schools stemming from the 2004 update to the Individuals with Disabilities Education Act (IDEA). Principals who illustrated actions characteristic of transformational leaders on the Multifactor Leadership Questionnaire (MLQ) had schools that scored higher on the RTI Essential Components Integrity Rubric. Conversely, principals who scored as passive/avoidant leaders led schools scoring lower on the RTI Essential Components Integrity Rubric. While this study focused on one broad-based initiative (RTI), it does imply that transformational leadership in schools may correlate with improved implementation for programs in general.

Shared leadership also greatly impacted results in a study of PLCs. Conversely lack of leadership became a systemic problem in completing the task the group was formed to complete (Sjoer & Meirink, 2016). In this instance, the authors noted that a volunteer or assigned singular leader may have improved the process. Another study noted that a major change initiative failed to take root a grow, in part, due to the school leader's top-down leadership style (Cooper, Stanulis, Brondyk, Hamilton, Macaluso, & Meier, 2016). In contrast, in other studies transformative leadership was identified as a critical component to PLC success in directly affecting student outcomes (Peppers, 2014). The leader in the study who participated on the steering committee as an active, supportive member, who, without taking charge or losing interest in the initiative, played a critical role in the school's high level of reform use (Cooper, Stanulis, Brondyk, Hamilton, Macaluso, & Meier, 2016). Transformative leaders are credited with creating a climate where teachers routinely collaborate and share their learning with each other.

Teacher leaders are another level of leadership that can contribute to the building leadership team. While there are many definitions for teacher leader, the one that is most applicable in this study is that of Thorton, Langrall, Jones, and Swafford (2001) as referenced by Angelle and Schmid (2007) referring to teacher leaders as supporters of change who may plan and provide professional development, facilitate communication, or address problems throughout a change initiative. Angelle and Schmid found that teacher leaders are viewed as educational role models; therefore, they have influence beyond their own classrooms (2007). The roles of leadership, both formal and informal, in the school support the school's vision and initiatives in working toward that vision.

Supporting organizational changes. When implementing any new initiative that requires significant investment of class time across multiple content areas, the implementation is essentially organizational change. An organizational change is a vast undertaking with multiple dimensions, which could benefit from a guiding model. One study looked at a reform effort using "discussion-based teaching" in an urban, high-needs school district to compare models of influence and models of change (Cooper, Stanulis, Brondyk, Hamilton, Macaluso, & Meier, 2016). The study found that teacher leaders that used a specific organizational change model, known as Kotter's Eight Steps, had significantly more classrooms meeting the goal of active student participation during 75% of class time. In that same study, one school did not meet the goal to dedicate significant class time to student discussion. The practice was not part of the school's vision or integrated into a cohesive initiative (Cooper, Stanulis, Brondyk, Hamilton, Macaluso, & Meier, 2016). In fact, that school had multiple competing initiatives in that school year, which pulled resources and teachers in multiple, seemingly unconnected, directions.

Kotter's Eight Step Model of Change provides a framework for effectively implementing change (1990). While the eight steps are initiated systematically, they are not always sequential and sometimes multiple steps are conducted simultaneously. Often the organization will need to cycle back to reinforce work from previous steps. The first step of the model is to establish a sense of urgency. In the school setting, that would include evidence (such as recent test scores) that reflect that what is currently being done is insufficient to the task. Another way to raise the urgency is to set goals that cannot be reached through business-as-usual mentality.

The second step is to create a guiding coalition consisting of enough experience, diversity of opinion and leadership talent to drive the change. A mistake made in a lot of change

initiatives is to have a guiding coalition that is too small or too weak. In order for a guiding

coalition to be effective, it must include trust within the team and a common goal.

The third component of the model is to create a vision of what the organization will be

like after the change along with a strategy for accomplishing that vision. A good vision, that is

one that is imaginable, desirable, feasible, flexible, and communicable, allows individuals on the

team some autonomy of decision-making and execution if they know they are taking steps

toward achieving that end state.

Once the vision and strategy are created, it is important to communicate the change

vision throughout the organization clearly and often as part of step four. Effective

communication of a vision should be simple; contain a metaphor, analogy or an example to

create a verbal picture; be conveyed in multiple forums; be repeatedly conveyed; be emulated by

the leadership of the organization; have any seeming inconsistencies explained; and include two-

way communication.

The fifth step in Kotter's change model is to empower employees for broad-based action.

In the context of a school, this includes properly training teachers on the new method or

program, aligning systems with the vision and confronting teacher leaders who are working in

opposition to the change. The next step is to create short-term wins. Quality short-term wins are

visible, unambiguous and clearly related to the change imitative. They are important because

they provide evidence that the sacrifices made for the change are worth it, reward change agents

with a pat on the back, help fine-tune vision and strategies, undermine critics and build

momentum.

The seventh step is to consolidate gains and produce further change. This step

emphasizes the need for continuous assessment and growth as interconnected systems improve.

The final step in the ongoing process is to anchor the new approaches in the culture of the school. The Kotter model for change encompasses more elements than Sjoer & Merrick's model, which focuses more deeply into one agent of change, the PLC. Both models require the buy-in of the teachers in the building to effectively implement change (2016).

Teacher Experiences with CAI

Whenever a new program is being implemented, teacher experiences play a key role in the success or failure of the implementation. A limited study of the CAI program Study Hall 101 conducted an in-depth analysis of two science teachers as they implemented a new CAI (Howell, Lewis & Johnson, 2012). The teachers reported that the program increased both student motivation and independence. The read-aloud feature of the program allowed teachers to fluidly move around the room, instead of standing near struggling readers to directly read the text. The ability of the program to individualize instructional experience was a significant benefit to its use. Despite both teachers feeling the program was value-added to their classroom, they both discussed difficulty getting the recommended number of treatments (three times for 10-15 minutes) each week as well as technology glitches that caused trouble in the classroom.

As difficulty getting required contact hours is a recurring theme in the literature for effective CAI implementation (Howell, Lewis & Johnson, 2012; Hill, Lenard & Page, 2016), it is important to review methods of support for teacher implementation. Commitment to literacy change initiatives may be addressed by sharing with the staff the problem of literacy in that school as well as the importance of literacy to the students (May, 2007). Teacher buy-in is critical to supporting meaningful practice adaptation. A broader study exploring the attitudes of 764 K-12 teachers about technology use in the classroom found a correlation between teacher's self-reported comfort level with the technology and the amount of technology used in his or her

classroom (Howell, Lewis, Johnson, 2012). Teachers new to or uncomfortable with technology need to be scaffolded like any student because higher teacher technology skills correlates to increased use in the classroom.

In a study of teacher perceptions of another reading support program, researchers asked participating teachers: 1) to describe the benefits and limitations of using Computer Based Instruction (CBI), 2) to describe the change (s) they witnessed after using the specific program implemented, 3) to describe the possible reasons for changes, and 4) to describe the strengths and weaknesses of the specific program utilized (Chiang & Jacobs, 2010). In that study teachers said that when the technology was simple, they liked to use it because the technology engaged students and enhanced learning. Other teachers complained that using technology took too much preparation, created difficulties in managing the class and created barriers in scheduling. Some teachers simply preferred a more traditional approach to their classrooms that did not rely heavily on technology.

Another study that looked at professor perceptions utilized a Likert scale to determine the use of Computer Aided Instruction (CAI), perceptions on CAI, hindrances in CAI development (Ahmed & Khurshid, 2012). They found that while the majority of professors felt the programs were beneficial to students and supported learning, many were frustrated by the lack of access to reliable technology and the difficulty of using the program. One professor lamented that the use of CAI in the classroom reduced the interpersonal interaction between student and teacher.

Computer Aided Instruction (CAI)

Having provided an initial introduction into **requirements and impediments** of program implementation; **mechanisms of support** that can contribute to increasing classroom capacity including professional development, professional learning communities, coaching, leadership

and systematic systems support; and **teacher experiences,** this review will now look at the

effectiveness of computer-aided instructions (CAI) in the school setting and how the

requirements and impediments, **mechanisms of support** and **teacher experiences** affected the

use of these programs by narrowing the scope from all CAI to CAI for secondary reading

improvement and finally to the program of focus for this study Achieve 3000.

Computer aided instruction (CAI) is one avenue to improve differentiation for the diverse

needs of learners in a classroom (Regan, Berkley, Hughes & Kirby, 2014). It allows for more

academic rehearsals, which may lead to increased student processing (Fenty, Mulcahy &

Washburn, 2015). Effective CAI programs provide frequent opportunities to respond and/or

practice through multiple choice comprehension questions or writing activities; opportunities for

self-correction and immediate corrective feedback; engagement and motivation for students; as

well as embedded teacher-directed instruction (Kim, McKenna & Park, 2017). Despite the

recent proliferation of CAI use in the classroom, there is not enough research at this time to

definitively call the practice research-based effective (Kim, McKenna & Park, 2017; Regan,

Berkley, Hughes & Kirby, 2014). Larwin and Larwin found that in a post-secondary statistics

courses, the use of CAI was most beneficial when used as a tutorial for computational purposes

or for simulations (2011). Smaller effect sizes were noted when using CAI for drill and practice

or to enhance lectures, and a negative effect size was realized when the CAI was used strictly in

an online format.

Through a myriad of applications from first-graders struggling with basic reading to

students in postsecondary statistics courses, CAI has been found to improve test scores for

students (Larwin & Larwin, 2011; Torgesen, Wagner, Rashotte, Herron & Lindamood, 2010;

Saine, Lerkkanen, Ahonen, Tovanen & Lyytinen, 2011; Stetter & Hughes, 2011) or at least keep

pace with traditional instruction (Fenty, Mulcahy & Washburn 2015). A meta-analysis of 71 studies implementing CAI in postsecondary statistics courses showed significant percentile achievement growth (from 50th to 73rd) in students using CAI over students who completed only traditional course activities (Larwin & Larwin, 2011). Although it focused on a student population different from the current review, the study is worthy of inclusion here because of the magnitude of the focus across multiple postsecondary environments. Early elementary reading students identified as struggling readers showed significantly greater reading improvement with CAI interventions over control groups conducting traditional interventions (Torgesen, Wagner, Rashotte, Herron & Lindamood, 2010; Saine, Lerkkanen, Ahonen, Tovanen & Lyytinen, 2011). In both cases, follow-up testing indicated the gains were sustained over a year after treatment was completed. Other studies showed CAI intervention results closely paralleled the results of teacher-led intervention with struggling readers (Fenty, Mulcahy & Washburn 2015) or indicated that the specific CAI program used was not as impactful as the repeated exposure to content computer interaction allowed (Stetter & Hughes, 2011). These studies indicate that CAI may be a viable route to provide coursework that is effective in increasing student test score outcomes, at least as much as traditional methods and possibly more.

While most of the aforementioned studies focused in part or in whole on the early reading skills of phonics and decoding, Stetter and Hughes sought to determine if use of a specific CAI program could directly impact reading comprehension (2011). They recruited nine high school students with specific learning disability in reading to participate in CAI on story mapping as a comprehension strategy. Participants were divided into a baseline group, initial treatment group and delayed treatment group. Interestingly all student groups, including the baseline group, improved reading comprehension levels, leading researchers to hypothesize that exposure to

multiple stories via the computer affected comprehension rather than the intentional method of teaching story mapping using CAI.

One benefit of CAI over traditional methods is that CAI can be customized to support students with learning rates that differ from the average learning rate often catered to in the heterogeneous classroom (Fenty, Mulcahy & Washburn, 2015). It offers students individualized instruction at the student's own pace with consistent and specific feedback that allows for a sense of student control over the learning. Additionally, CAI allows more practice opportunities without any human judgement, impatience or frustration with the repetition (Fenty, Mulcahy & Washburn, 2015; Stetter & Hughes, 2011). CAI has been linked to motivational aspects of practicing a challenging skill and may help students engage in reinforcement activities they may otherwise avoid (Saine, Lerkkanen, Ahonen, Tovanen, & Lyytinen, 2011). Programs utilizing CAI also allow students to pick up where they left off when they are absent from lessons (Stetter & Hughes, 2011). The multiple benefits resulting from the use of technology in the classroom warrant additional attention, but CAI is not without challenges.

Requirements and impediments. Even though CAI has been effective within school settings, some have been more successful in achieving the desired results than others. None of the studies compared CAI to teacher-led instruction in a heterogenous class make-up where there are students of multiple capability bands in the same classroom. Except for the post-secondary review of CAI in statistics course, these studies focused on a homogenous group of students within a small band of initial competency (Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010; Saine, Lerkkanen, Ahonen, Tovanen, & Lyytinen, 2011; Fenty, Mulcahy, & Washburn 2015; Stetter & Hughes, 2011). This limits the transferability of findings to the general population where class sizes create vast differences in student interest, exposure and capability.

It is important to note that these studies utilized CAI as supplement to, not a replacement for, quality teacher-led instruction (Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010). Success was attributed, at least in part, to the close integration between classroom experience and the instruction provided on the computer. The quality of delivery for CAI is dependent on teacher implementation and "good teaching" practices (Saine, Lerkkanen, Ahonen, Tovanen, & Lyytinen, 2011). To make CAI effective in the classroom, teachers need to effectively plan and implement its use with an emphasis on student learning (Stetter & Hughes, 2011). Teacher engagement in supporting student use of the technology well includes scaffolding students through the initial technology learning curve and aiding students in metacognitive awareness as they utilize the program.

Student engagement in CAI program varies. Program features developed to improve engagement, such as interactivity or animation, can also be distracting (Fenty, Mulcahy, & Washburn, 2015). Little is known about which students are likely to successfully be engaged by CAI. Studies have found that when the CAI does not provide immediate feedback to student work, it is not effective in increasing student test performance (Stetter & Hughes, 2011). The use of CAI is shown to be most effective in conjunction with or as a supplement to more traditional teacher-led instruction.

Because CAI is consistently found to be at least as effective as traditional methods, a cost-benefit analysis can determine if it is more fiscally responsible to incorporate CAI into certain educational settings (Fenty, Mulcahy, & Washburn, 2015). When looking at cost effectiveness, the program cannot be considered in a vacuum, but as one element included in the equation that should incorporate teacher availability, time and space requirements. If proven reliably effective, CAI could provide a cost savings for providing small-group remediation and

intervention opportunities necessitated by response to intervention (RTI) mandates (Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010).

Challenges with the technology itself can limit the number and effectiveness of student sessions with CAI (Fenty, Mulcahy, & Washburn, 2015). In one study, student challenges with testing the software's microphone and errors in student dialect caused lost instructional time. In Larwin's review of 40 years of research regarding the use of CAI in post-secondary statistics courses, positive effect size grew in each of the four decades under review; a phenomenon the authors attribute to user and teacher comfort level with technology as well as technological advances (2011). Yet the study participants consistently fall short in number of times they use the program when compared with how many times they were supposed to use their CAI within studies' design (Fenty, Mulcahy, & Washburn, 2015). For teachers to provide the quality and number of interactions students need with quality programs to be effective, they need proper supports before and during implementation.

Mechanisms of support. Successful implementation of CAI requires the use of proven mechanisms of support. Computer aided instruction is implemented more consistently when teachers and students are provided instruction on the software and practice with the program prior to executing ongoing use (Fenty, Mulcahy, & Washburn, 2015). Prior to successfully utilizing CAI programs in an implementation of reading intervention, teachers were provided eighteen hours of instruction on the program (Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010). Additionally, teachers using the programs met bi-weekly in a professional learning community that included supervisors with expertise in the programs they were utilizing. Unfortunately, many schools have invested in the hardware required to implement CAI without

investing sufficiently in the staff development and quality software required to make that technology meaningful for student improvement (Stetter & Hughes, 2011).

While some educators mistakenly expect computers to be a "panacea" for students, especially for those who struggle in specific academic areas, due to implementation pitfalls and lack of quality software, that has not been the case (Stetter & Hughes, 2011). Several CAI programs incorporate content-specific, meaningful, informational text while also supporting development of reading skills (Fenty, Mulcahy, & Washburn, 2015). When teachers can connect the CAI to the content they are already teaching, they are more likely to implement the program.

Teacherexperiences. Teacher experiences during the implementation of CAI also impact the overall outcomes. Instructors' comfort level of technology implementation may cause increased use and increased effectiveness in CAI applications (Larwin & Larwin, 2011). When teachers are not comfortable with the technology, they are less likely to incorporate it into their lesson plans and are more apt to ditch it when problems arise.

CAI for Secondary Reading

Effectiveness. The use of CAI to enhance reading in secondary school settings has gained traction in recent years (Zorfass & Clay, 2008; Chiang & Jacobs, 2010; Cuevas, Russell & Irving, 2012). Zorfass and Clay combined the unlikely challenges of meeting the course requirements for content in a biology classroom and the goal of improving reading comprehension (2008). Through direct teaching strategies and the use of CAI, two of three classrooms showed not only improved test performance in biology, but also notable gains in reading comprehension. When computer-assisted, individual, sustained reading was used in American Literature classes, students performed better than the control group or the individual sustained reading (without computer module) treatment group on content quizzes (Cuevas,

Russell & Irving, 2012). The overall effect was not generalized fully to standardized reading comprehension levels, but the study shows promise. These three studies indicate that CAI could be used to improve reading comprehension in high schools.

However, test scores only tell part of the story. Student confidence and motivation may also increase with CAI. Students with disabilities who interacted with the program Kurzweil 3000 indicated a self-perception of being better readers after six months of utilizing the programs supports (Chiang & Jacobs, 2010). Additionally, students who read with supports provided by the proprietary program Kurzweil 3000 indicated increased confidence and desire to read. Students reading from the computer-assisted passages showed a marked increase in motivation to read over students reading directly from the textbook (Cuevas, Russell & Irving, 2012). This finding is significant as motivation is a key contributing factor to student improvement in reading skills (Meltzer, Smith, & Clark, 2001; Guthrie, 2001).

Requirements and Impediments. For computer-assisted instruction to be effective, it must be user-friendly. While several educational software platforms are available, it is not easy to discern what will be desirable to individual users. Some of the programs available do not have a user-friendly interface. One popular reading program intended for students with disabilities, Kurzweil 3000, is regarded by many students as not having an intuitive platform, having "creepy" read aloud voices, and sporting an unattractive layout (Chiang & Jacobs, 2010).

In addition to being user-friendly, programs must also be cost effective. Kurzweil 3000, at $2,695 for a five-computer license and $1,500 for at home use, may be cost prohibitive in some educational environments (Chiang & Jacobs, 2010). A less costly CAI option involved a researcher-created reading scaffold delivered to tenth-graders during their language arts class in a Title I school (Cuevas, Russell & Irving, 2012). However, this is an extremely time intensive

endeavor and virtually eliminates the hope of providing consistency across multiple environments.

The availability of technology is also paramount to successful adoption of computer-assisted technology. In Zorfass and Clay's study, every student had a laptop assigned and every classroom had a SMART board available (2008). Lack of accessibility is noted by teachers as a primary discouragement for integrating technology into their classrooms (Chiang & Jacobs, 2010). Teachers who are required to use computer labs to access technology cite the time to transition from classroom to lab and back as another impediment to ongoing use. Cuevas, Russell and Irving noted limitations on their study because the school of 2,200 students had only 110 computers available for use (2012).

The comfort levels of teachers with using technology in the classroom is also an important factor. Teachers noted the initial preparation for integration of technology into lesson plans was very was time intensive, requiring all the traditional planning factors plus practice in the platform as well as time to build familiarity with the technology (Zorfass & Clay, 2008). Other teachers admitted that they stopped using CAI because they were more comfortable with traditional methods of instruction; some stated they did not have time to seamlessly incorporate the technology into their existing program materials (Chiang & Jacobs, 2010). In addition, classroom management during CAI can be a challenge that limits use of technology (Chiang & Jacobs, 2010). It's obvious that a live teacher who is active and engaged is still an important part of CAI.

To be sure, the challenges brought forward by the difficulty of navigating some programs, the cost of many programs, the lack of availability of technology and the time investment in utilizing technology appropriately should give pause to those considering

implementation. However, the success experienced when CAI is used well calls for consideration of how to overcome these hurdles to provide access to students.

Mechanisms of support. In order for a program to be implemented successfully, teachers need mechanisms of support to help reach their goals. Teachers using the SOLO blend of software (the blend of four proprietary software components Read: OutLoud (2006), Draft:Builder (2006), Write:OutLoud (2006), and Co:Writer (2006)-into one software tool) invested three 45-minute periods to train students on how to use the program, including how to highlight selected text, how to copy and paste important information, and how to organize information into an outline (Zorfass & Clay, 2008). The time invested in front of the intervention led to increased teacher comfort and correlated to increased classroom use of the program.

The teacher's ability to use the platform goes hand in hand with the teacher's capacity to properly implement technology seamlessly into their ongoing instruction. Teachers newly implementing SOLO into their class structure were provided guidance from the research team to develop class lessons using best practices while incorporating the program (Zorfass & Clay, 2008). Teachers did not release students to work independently on the program, but provided intentional, engaging and scaffolded tasks as would be expected for any classroom tool. While two classrooms using SOLO to support their biology reading comprehension tasks improved in overall reading comprehension, one class actually fared worse after using the program. The study authors indicated that it may be due to the fact the third class was taught by a student teacher that had not yet mastered the art of motivation in a high school science class.

Teacher experiences. Teacher experiences are also crucial when implementing CAI. After using Kurzweil 3000, both teachers and students reported a higher confidence in student reading comprehension and fluency. Teachers reflected that the ability to use headsets helped

students with attention-deficit challenges, and students with emotional-behavioral difficulties benefited from the independent work (Chiang & Jacobs, 2010). The program also individualized student goals and work, and teachers believed this individual accountability helped keep students from holding back on their efforts. Teachers also noted that students began interacting with biology texts in a more complex way than they had before utilizing software to integrate comprehension strategies (Zorfass & Clay, 2008). While teachers appreciated the differentiation available by individually adapting lessons, they also missed the opportunities for social learning and reported having to build that component into their classrooms in other ways.

Teachers are more likely to use technology they feel is easy to use. When students have a positive interaction with CAI, it encourages teachers to use the approach (Chiang & Jacobs, 2010). Teachers believe that students like CAI because it is more audio-visual, it allows tracked-read aloud that helps struggling readers, and it is individualized, allowing students with emotional challenges to work without the barriers of directly interacting with other people. In the study, teachers who worked with students with disabilities also found that CAI assisted students by tracking while it reads aloud, a feature missing in audio books or when a student it read to by an adult.

Lexile as a Tool of Measurement

While the work above has begun to shed light on the possibilities of CAI in the high school setting, none have focused on cross-curricular adoption of a program that is intended to simultaneously offer content support and increased reading capacity. Achieve 3000 is a proprietary, cloud- based program that is intended for use in multiple classrooms to help students increase reading ability as measured by their Lexile reading levels.

To determine the effectiveness of a specific reading program, it is useful to first provide a standardized measure to examine growth. That measurement needs to accurately portray reader capability. Students who read at their current reading levels continue to grow and evolve, whereas students that are always forced to read materials beyond their current independent reading level suffer a reduction of self-confidence which can inhibit growth in reading development (Stenner, Burdick, Sanford, & Burdick, 2007). Most traditional measures of text complexity involve determining the frequency of the words used and the length of the sentences in the writing (Stenner, Burdick, Sanford, & Burdick, 2007). One measure of text difficulty is the Lexile level. Lexile is the proprietary leveling system originated by MetaMetrics (Harvey, 2011). The Lexile readability indicator is based on traditional readability formats where shorter sentences with more high-use words are scored lower, or easier to read, than complex sentences with less common vocabulary (Benjamin, 2012). In a complex mathematical process, Lexile assigns the word frequency measure as the mean log word frequency from a 5-million-word corpus; the sentence length measure is the log of the mean sentence length of the text (Stenner, Burdick, Sanford, & Burdick, 2007). To scale the difference between texts, the Lexile system measures seven basal primers (early readers) to calibrate the low end of the measurement and the Electronic Encyclopedia at the high end. The difference between the two measured ends is incremented such that a Lexile, by design and definition, is 1/1000th of the difference between the text expected in the middle of first grade and the text level encountered in mid-career. The popularity for Lexile use in education is its high correlation (Benjamin, 2012). When a student is matched with a text based on the student's Lexile level and text's readability number (also labeled in Lexile), the student has a 75% chance of answering comprehension questions over the text (Benjamin, 2012; Stenner, Burdick, Sanford, & Burdick, 2007). In a study linking

standardized tests to Lexile predictions correlations for well-known texts (such as Stanford Achievement Test, the Iowa Tests of Basic Skills, the Texas Assessment of Academic Skills and others), the correlation for 9 of the 14 tests were over .9, the lowest was a range of .6-.73 (Stenner, Burdick, Sanford, & Burdick, 2007). One CAI program in use in classrooms today which measures student progress based on Lexile growth is Achieve 3000.

Achieve 3000

"Reading Next: A vision for Action and Research in Middle and High School Literacy in 2004" is a report provided to the Carnegie Corporation originally intended to guide funding decisions for education grants, the report provided direction of focus to researchers, policymakers and educators (Biancarosa & Snow 2006). Reading Next is clarified as "acquiring the reading skills that can serve youth for a lifetime." (Biancarosa & Snow 2006) The analysis of the report centers around the fact that work in supporting students learning to read for understanding in secondary settings should combine as many of the fifteen elements of effective adolescent literacy programs as possible. The fifteen research-based elements to improve reading outcomes are:

1. Direct, explicit comprehension instruction

2. Effective instructional principles embedded in content

3. Motivation and self-directed learning

4. Text-based collaborative learning

5. Strategic tutoring

6. Diverse texts

7. Intensive writing

8. A technology component

9.   Ongoing formative assessment of students

10. Extended time for literacy

11. Professional development

12. Ongoing summative assessment of students and programs

13. Teacher teams

14. Leadership

15. A comprehensive and coordinated literacy program.

Addressing most, if not all the fifteen elements established by the Reading Next report, Achieve 3000 is a proprietary, computer-aided instruction (CAI), internet-based program that brings literacy instruction to every content classroom (Biancarosa & Snow, 2006; Achieve 3000, n.d.). Implementing the Achieve 3000 program with fidelity clearly incorporates seven of the elements listed including: effective instructional principles embedded in content, diverse texts, a technology component, ongoing formative assessment for students, extended time for literacy, ongoing summative assessment of students and programs, and a comprehensive and coordinated literacy program (Achieve3000, 2016; Biancarosa & Snow, 2006). The remaining eight elements listed in the study could arguably be supported in concert with implementing Achieve 3000 with fidelity including: direct, explicit comprehension instruction, motivation and self-directed learning, text-based collaborative learning, strategic tutoring, intensive writing, professional development, teacher teams and leadership.

Because Achieve 3000 is a cloud-based program, it can house thousands of content area articles for assignment by teachers in the classroom (Achieve 3000, 2017). Achieve 3000 claims its programs are influenced by the work of R.C. Anderson (1984) on activating prior knowledge, Carol Ann Tomlinson on differentiation, Michael Kamil or the use of technology and Linda

Duncan on vocabulary development (2008). Prior to beginning the program, each student

completes the LevelSet exam. LevelSet is intended to determine each student's independent

Lexile reading level in order to provide students with articles adjusted to their independent

reading capacity (Achieve 3000, 2017.) The LevelSet was created in collaboration with

MeaMetrics ®, the makers of the Lexile framework. The program offers 12 differentiated bands

in English and seven in Spanish. For each assignment, teachers are encouraged to utilize a five-

step model:

1. Build background through the before reading poll.

2. Close reading of multiple sources with the article.

3. Embedded assessment within the activity that drives acceleration.

4. Learn the value of evidence through the after reading poll.

5. Synthesize information from multiple sources in the thought question.

The program allows vast differentiation of reading through Lexile bands (Achieve3000,

2016) because each article assigned to students is differentiated into comprehension bands

(Biancarosa & Snow 2006). Differentiation in the classroom has long been touted as the

quintessential best-practice for education and Achieve 3000 automatically provides this for

teachers (Tomlinson, 2000; 2008). The thought question is differentiated not only in the Lexile

of the reading required to complete it, but also in the requirements for a successful response.

Quality differentiation occurs not just with the material accessed, but also with the product

required.

Effectiveness. To determine statistically significant impacts of program use, Magnolia

Consulting LLC was commissioned by Achieve 3000 to study and report on its effectiveness

(Shannon & Grant, 2015). Students were given the Gates MacGinite Reading Test, fourth

edition (GMRT-4) as their pretest and posttest. Teachers also administered the LevelSet Achieve Incorporated proprietary test pretest and posttest. Classes were randomly assigned as a control group, a school program as usual without the use of Achieve 3000, or as a treatment classroom with Achieve 3000. In this multi-grade, one-year study, older students improved more dramatically with treatment than younger students, but most sub-groups reported statistically significant gains attributable to program use. Students using the program showed statistically significant learning gains on the GMRT-4 vocabulary, reading comprehension and total reading tests (effect sizes of .43, .47 and .48 respectively) and LevelSet Lexile point gains (effect size .33). Magnolia Consulting worked hard to eliminate the obvious bias inherent in reporting on your client's product. All studies reported strict adherence to industry best practices for study.

Another report provided the results of a district-wide implementation study of Achieve 3000 usage in 1,957 students in fourth – eighth grade as compared to a 7,598-student control group. The study concluded that Achieve 3000 did show effective growth in comparison to the control. This growth was larger in seventh and eighth grades than lower grades and was correlated heavily with increased usage of the program (Borman, Park & Min, 2015). This phenomenon reinforces that the Achieve 3000 program success is highly dependent on implementing the program as intended with a focus on maintaining the required contact hours.

In a randomized control group study of the effectiveness of Achieve 3000 in a large, diverse school district in North Carolina, Achieve 3000 did not significantly impact performance in Lexile scoring (Hill, Lenard & Page, 2016). The program was tested by randomly selecting half of the 32 elementary schools volunteering participation for treatment and the other half as a control. The sample included nearly 35,000 students in about 745 classrooms grades 2-5. It is

important to note that students were not exposed to the program as often as the company indicates is necessary to see benefit.

Requirements and impediments. In order to be successful, full implementation of Achieve 3000 requires that students have frequent contact with the program. In order to have a significant impact on increasing student reading levels, Achieve 3000 claims students need 80 or more activities per year. The researchers concluded that empirical effects are less than theoretical with this program and recommended that implementation of such programs come with oversight and feedback (Hill, Lenard & Page, 2016). When implementation fidelity increases 10% (or approximately for each 9 minutes of time added up to recommended amount of 90 minutes), students showed an associated average gain of 31 Lexile points (Shannon & Grant, 2015).

One of the biggest impediments to full implementation of Achieve 3000 is the number of contacts students have with the program, and implementations routinely fall short of the required amount of student interaction with the program (Hill, Lenard & Page, 2016; Shannon & Grant, 2015). Teachers in one treatment group using Achieve 3000 showed 71% adherence of the requested 90 minutes per week of use, which is considered moderate implementation fidelity (Shannon & Grant, 2015). In the study conducted by Hill, Lenard and Page, the schools involved did not implement the program as intended (2016). Two-thirds of students in the treatment group completed fewer than 40 activities in the second year and over 20% of students never accessed the program. It is unclear how students in the study would have fared if they interacted with the program for the full recommended dosage. In addition to time constraints, teachers also reported challenges in nearly a quarter of the weeks they utilized Achieve 3000 through their weekly journals (Shannon & Grant, 2015). Their concerns included: software and hardware issues, Wi-Fi access issues, competing assessments, lack of time, Lexile levels too

hard, poor engagement, program glitches, sick days, school activities and insufficient training. Technology challenges were a problem again when the program was studied district-wide (Hill, Lenard & Page, 2016).

Often teachers are concerned that implementing a new program will require more time for planning lessons. Shannon and Grant found that teachers in the control class without Achieve 3000 spent more time in lesson preparation than those utilizing Achieve 3000 during class time (2015). Two teachers from that study were uncomfortable with the program's technology requirements and completely dropped out of the study. Other teachers reported supplementing Achieve 300 with additional materials in 12.58% of their weekly logs with materials like: reading books, self-made power points, videos, Google images, 3D strategies, short example papers, constructed responses, summarization strategies, using capitals and commas and textual evidence to support arguments, graphic organizers, literacy templates, teacher-created curriculum, required district curriculum, nonfiction texts and articles, online dictionaries, fiction texts, incentive programs, small groups, Prezis, SOAPS strategies, argument writing, notebooks, and Rigby (Shannon & Grant, 2015). In classrooms where the teachers that utilized other materials, the students showed more Lexile growth. In theory, these are materials and strategies teachers are already using and require little additional planning or preparation.

Mechanisms of support. One of the most significant mechanisms of support is teacher training. In Shannon and Grant's study of Achieve 3000 effectiveness, they speculated that if teachers had received additional training earlier in the study they may have been able to increase their implementation fidelity (2015). Half the participating teachers never used any of the multitude of Achieve 3000 teacher support materials. Teachers who implemented Achieve 3000 had the following suggestions for teachers new to the program:

·   Do more pre-reading activities before the lesson.

·   Select articles and thought questions that better align with the curriculum.

·   Have students use a notebook or journal to track articles read and scores.

·   Use more of the graphic organizers.

·   Use more of the teacher recommendations.

·   Use more of the various reports.

·   Use more suggestions from support staff for implementing the program & tracking student progress.

·   Use incentives earlier.

·   Grade more writing components.

·   Do more stretch article work.

Teachers stated that they would do better with the program if they received more in-depth training, more follow up training or training sessions earlier in the year with implementing Achieve 3000 (Shannon & Grant, 2015). A district that implemented Achieve 3000 and showed statistically significant benefits to students purchased professional learning services that included 1-3 days of on-site support from an implementation manager provided by the vendor along with their program licenses (Borman, Park & Min, 2015). These services included training for teachers new to the program, classroom modeling and on-on-one consulting sessions to review student data with participating teachers. Teachers using the program requested more time for planning and practicing as well as training with teachers throughout the year to discuss problems/questions and in-depth activities (Shannon & Grant, 2015). Hill, Lenard and Page concluded that districts investing in Achieve 3000 should develop strict implementation plans

that account for consistent monitoring, central-office-to-school feedback loops and accountability for weak implementation (2016).

  Teacher experiences. In the Shannon and Grant study, teachers had positive and negative responses after the implementation of Achieve 3000. Most of the teachers interviewed had overall positive things to say about the program (Shannon & Grant, 2015). Teacher perceptions of the program showed that they spent less time in lesson preparation and liked the differentiation the program provided as well as the student engagement when using the program.

  However, some teachers were frustrated by the amount of time invested in the program and technical glitches. Other teachers reported that the program was too monotonous and that students were not as engaged as they had been with other activities. While some teachers anecdotally described students as not engaged, 58% of teachers using Achieve 3000 reported a high level of student engagement and 37% reported average engagement. In comparison, the control group conducting standard language arts had 35% of teachers report a high level of student engagement and 48% report average engagement. While 21% of teaches in traditional language arts felt their program did not adequately meet student needs, only 5% teaching with Achieve 3000 reported the same lament (Shannon & Grant, 2015).

  Using a Likert scale to assess program components as "not useful at all," "not very useful," "moderately useful," "useful," "very useful," or "not applicable," more than 87% of teachers rated student work as useful or very useful; over 90% found the usage and performance report as useful or very useful; more than 76% found the assessment tools useful or very useful and just over half found the home communication component useful or very useful (Shannon & Grant, 2015). When the same scale was used to rate teacher components, 65% of teachers rated all nine components of the program as being useful or very useful. When asked to compare

Achieve 3000 to programs teachers had used in the past, many had favorable ratings based on the level of differentiation available and the student engagement when using the program.

Teachers of students with learning disabilities and English Language Learners (ELL) indicated concern that the program does not go far enough to support students at the lower end of the reading levels; they said that students became frustrated and gave up on the program (Shannon & Grant, 2015). Teachers also reported concern for the highest achieving students who weren't used to engaging with the highly challenging texts they were subjected to in the Achieve 3000. Another reported frustration was that low number of current articles available in the program. Some teachers felt the investment in completing articles took too much time from their district-mandated curriculum.

As with any initiative, the response to using Achieve 3000 in the classroom varies greatly, but empirical and anecdotal benefits warrant further investigation. If a program can simultaneously increase student exposure to written text, improve reading comprehension, differentiate in diverse classrooms and ease the burden of planning for teachers, it deserves additional consideration.

Summary -Need for This Study

A staggering number of students are leaving the public education system ill-prepared in their reading development (ACT, 2015; U.S. Department of Education, 2017; Biancarosa & Snow, 2006; Peterson, Caverly, Nicholson, O'Neal, & Cusenbary, 2000). Students need reading comprehension support across the content areas to make desperately needed gains in reading capacity (Allen, 2000; Massey & Heafner, 2004; Irvin, Meltzer, & Dukes, 2007). Content teachers often have little or no training in teaching reading comprehension (Irvin, Meltzer, & Dukes, 2007; Allen, 2000; Cziko, 1998). Achieve 3000 has shown to be an effective program in

creating reading gains through content areas (Shannon & Grant, 2015; Borman, Park & Min, 2015). However, it is only effective when implemented with fidelity. Unfortunately, Achieve 3000 has often been implemented without the necessary contact hours for improvement (Hill, Lenard & Page, 2016). Impediments to effective implementation may include financing, leadership, commitment, perceptions of students, program staffing, or problems of management and scheduling (Schaffer, 1997). Developing a professional learning community to engage in professional support and development may help overcome impediments (DuFour & Eaker, 1998). Coaching is another professional development source that has been effective (Powell & Diamond, 2013; Poglinco & Bach, 2004; Guiney, 2001; Herll & O'Drobinak, 2004; Gallacher, 1997). A review of the systems in place to support the initiative may benefit from an understanding of Kotter's model to support change (Kotter, 1990).

The education technology market consumes over $8 billion of education spending yearly (Herold, 2016). The 2015-2016 school year marked the first time in history that more state-mandated testing was completed online than on paper. It is imperative that educational leaders evaluate how that money is spent and what advantages students are realizing by trading time spent in traditional classroom activities for additional interaction with aligned technology.

A limited body of research on the advantages of computer assisted instruction (CAI) in the classroom has been conducted. The existing studies are predominantly situated in small group settings while supporting students already struggling or identified for special education services (Fenty, Mulcahy, & Washburn 2015; Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010; Saine, Lerkkanen, Ahonen, Tovanen, & Lyytinen, 2011; Chiang & Jacobs, 2010). Only three studies have been published in peer reviewed literature specifically about the proprietary reading program used in this study, Achieve 3000 (Shannon & Grant, 2015; Hill,

Lenard & Page, 2016; Borman, Park & Min, 2015). Those studies had conflicting conclusions. Two of the three indicated the program resulted in larger-than-expected growth while one showed no discernable difference. However, the study showing no discernable difference between treatment group and control group did not have the recommended exposure to the program within the treatment group (Hill, Lenard & Page, 2016). Other research laments the difficulty in achieving specified contact hours for treatment (Zorfass & Clay, 2008). None of the studies found reviewed the use of Achieve 3000 in a high school setting.

In order to accurately discern the effectiveness of a treatment, in this case use of CAI, it is first necessary to ensure implementation fidelity, primarily in contact hours. The content classroom teachers are the link between the CAI and the student; therefore, it is appropriate and necessary to ascertain how to help teachers provide the number of contact hours needed for the program to be effective. In searching each of the potentially beneficial practices for improving CAI contact hours, few, if any, studies addressed how these components applied to implementing a cross-curricular CAI throughout an entire building. No studies implemented multiple supports and evaluated the effect. As is the case for most action research, this study attempts to implement the theoretical best practice and evaluate its effectiveness making adjustments as resources (including time) permits. This study will attempt to support teachers in implementing a CAI through professional development, PLCs, coaching, leadership and systems support. This study marks a small, but critical, step in adding to the body of literature available for scaffolding teachers through the process of incorporating a possibly effective CAI in their classrooms for group results.

Chapter 3 – Methodology

This chapter is a description of the proposed research project to explore the

implementation of Achieve 3000 into three grades of a small high school observing the

impediments to implementation, mechanisms of support to overcome impediments and teacher

experiences. The chapter begins by reviewing the types of research used, including the broad

scope of qualitative research, narrowing to action research (specifically the case study), and

finally conducting phenomenological interviews. After exploring the foundational research

principles, I describe the participants and setting of the study and ethical considerations. Then I

go into more detail regarding the data collection and analysis proposed through this study.

Qualitative Research

Towards the end of the 20th century, qualitative research began to emerge as a viable

alternative to quantitative study in the field of education (Ary, Jacobs, Sorenson, & Walker,

2012). Previously dismissed as lacking rigor and reliability, researchers began to embrace the

flexibility qualitative methods provided to examine phenomena with attention to the details of

the complex interactions studied. Qualitative research is concerned about the context and

meaning behind human behavior in naturally occurring settings using descriptive data, emergent

design and inductive analysis.

Research and Interviews

Action research. Action research is a type of research generally carried out by

practitioners attempting to explain or solve a current occurrence in their field; as such, action

research is generally geared toward practicality rather than theory (Edwards & Willis, 2014).

Kurt Lewin's work in the 1940's popularized the method as a research tool that can lead to social

action. He articulated that action research must either create and implement an action for study

or study a context to develop understanding in order to initiate action. Lewin proposed a field analysis to identify local factors that would affect the attempted change and provide opportunities to influence the outcome.

Three recognized paradigms operate as a basis for action research: positivism, interpretive theory and critical theory. Positivism attempts to align with more traditional, scientific-method-based research to provide generalizable knowledge. Interpretative theory attempts to find local solutions to local problems, usually through collaboration of the participants. Critical theory looks at local instances of broad issues and customizes established solutions for the local setting. Stinger, a proponent of interpretive theory, which is the most relevant of the three action research models to the advent of phenomenology, supports his model based on the assumptions that:

1. The more traditional positivist model does not and cannot work to solve the complex, locally nuanced issues of practice.

2. The constructivists, who believe that people construct their own knowledge through their experiences, are right that local, contextually knowledge collaboratively gained and implemented is a necessary component of beneficial action research.

3. Since critical action research focuses on criticizing the current state and emancipating researchers from erroneous thought patterns, it is often divisive, which limits its effectiveness in developing long-term solutions (Edwards & Willis, 2014, p. 80).

As modeled by Kemmis and McTaggart and Symour-Rolls and Hughes in Edwards and Willis, action research progresses through several spirals of four moments: reflect, plan, act and observe (2014). During the reflection phase, researchers work with participants in an effort to understand and define the problem. In planning, researchers conduct literature reviews, gather

information, visit other locations and look for optional solutions to implement. The study then takes action using the plan. Then the researcher observes the implementation of the solution set and gathers information on the effectiveness. The cycle repeats as many times as necessary until participants are satisfied with the results.

This study closely parallels the study conducted by St. George, which was featured as a chapter in the book *Action Research: Models, Methods, and Examples* edited by Edwards and Willis (2014). Like the current study, St. George began with a school-based problem and, to thoroughly study the problem, used participatory action research to benefit from the insider's direct knowledge of the setting and participants. The current study used a participatory action research method incorporating interpretive theory as a practical approach to seeking a locally adapted implementation strategy for using CAI in one school's classrooms.

Phenomenological interviews. Phenomenological studies are rooted in the belief that multiple realities are intertwined in participants' perspectives (Ary, Jacobs, Irvine & Walker, 2012). The phenomenological interview is lengthy (often an hour or longer) and unstructured to examine the lived experience of the person interviewed. Phenomenological interviews strive to get to the essence of a shared experience (VanManen, 1990). The purpose is to extract from interviewees enough richness and depth of description of the experience "to construct a possible interpretation of the nature" of that experience (VanManen, 1990, p. 41). A phenomenological interview does not provide factual responses or Likert scales but attempts to create a deeper understanding of the phenomena explored.

The existential, hermeneutic phenomenological interview approach used in this study is based on the work of Merleau-Ponty, a philosopher who found fascination in the practical, everyday experiences of people (Sohn, Thomas, Greenberg, & Pollio, 2017). He believed that

people perceive things as whole, but elements of that perception are figural and open to interpretation; therefore, perceptions need to be considered contextually. Van Manen advanced Merleau-Ponty's concept into four existential themes: corporeality, temporality, relationality and spatiality. Sohn, Thomas, Greenberg and Pollio translated those existential themes for the common practitioner to discuss body, time, others and world (2017).

In action research, the participant investigator must be aware of and deal with his or her bias. This is even more necessary with the use of a phenomenological interview. The bracketing interview allows the researcher to explore and acknowledge his or her bias, to not only document those preconceived notions, but to intentionally and purposefully put those biases aside and allow full curiosity in question during the interview process (VanManen, 1990). The use of a phenomenological interview into teacher experiences with Achieve 3000 will allow a rich, deep understanding from a first-person perspective of what teachers are experiencing and how attitudes are shaped.

Description of the Study, Participants, and Setting

A small public school was undergoing a three-grade simultaneous implementation of a cloud-based, differentiated content literacy program conducted via computer aided instruction (CAI). The program required eight contact periods per student per month to be completed with fidelity. Additionally, the program encouraged the use of the five-step lesson model for use with each student-contact event. During the implementation, the action-researcher facilitated on-going program support while attempting to answer the research questions.

The research was conducted at Creative (a pseudonym) High School. Creative High was a school of choice nestled inside an affluent, high-achieving school district in the southeastern region of the United States. The 141 students attending Creative High in the 2015-2016 school

year would have been attending any of the district's nine zoned high schools had they not applied

for and enrolled to Creative High. The school had 23 students with an IEP (nearly 15%); the free

and reduced lunch rate was 0 %; minority rate was 10%. Students applied and interviewed in

order to attend the school, which had a mission to provide district students a "unique choice for

their high school education that unleashes and channels their creativity to seek solutions to

authentic problems in a smaller, more intimate, and personalized learning community." The

school was a one-to-one technology center, meaning that every student had access to a single

Chromebook or laptop for the entire school day. The one-to-one access virtually eliminated any

challenges in scheduling technology for use.

Data Collection

This was an action-research case study incorporating phenomenological interviews with

the full participation of the action researcher. Participants for this study included ten classroom

teachers, the researcher (as student support services teacher) and 100 students in grades nine

through eleven. Six teachers had four classes of implementation; four teachers had three classes;

and one teacher had two classes of implementation. The staff made the conscious decision to

keep seniors out of the implementation to allow more flexibility in content delivery. Supporting

the exclusion of seniors was the staff's agreed upon focus to use the program as a mechanism to

increase ACT scores. Seniors would have completed their second ACT opportunity before

program implementation could be effective.

The researcher worked with district-level support staff to create a list of supports required

in other schools that had successfully adopted Achieve 3000 and were getting the appropriate

student contact hours with students on the program. Those staff members offered a list of

supports that have been effective in other places at helping teachers meet their expected class

time interactions. They included: a master schedule to illustrate who was using the program

when, technical support, coaching, ongoing professional development and a dedicated PLC to

provide opportunities for beneficial conversations regarding classroom practice. The researcher

then worked with the building administrator to put these supports in place. Specifically, a PLC

was formed to focus on Achieve 3000 support. It was noteworthy that PLC groups were not new

to this group of educators. Flexible grouping PLCs were used throughout the year at Creative

High School to address a multitude of collaborative efforts. Additionally, three meetings spaced

2-4 weeks apart were reserved to conduct professional development within the context of the

PLC. Due to scheduling conflicts caused by competing initiatives and the weather, only one of

the scheduled three meetings took place in its entirety. One was cancelled when there was not

school the day it was scheduled (due to snow) and there were no makeup date opportunities. The

researcher was named as a coach to support individual efforts and aid with resolution of

technical concerns.

The researcher had undergone a bracketing interview, the procedure to help the

researcher understand her own bias and prevent it from limiting study interviews, with an

experienced phenomenological researcher from the Phenomenology Research Group (PRG) at

University of Tennessee at Knoxville (UTK). The researcher was adequately trained to bracket

the interview by suspending her own beliefs to gain perspective through the participant. The

bracketing interview was transcribed and presented to the PRG for discussion. The process of

bracketing provided an opportunity to explore researcher topic bias and limit its effect on study

interviews. After participating in the group discussion, the researcher conducted a pilot

interview, not intended for data collection, transcribed and presented findings to the PRG. After

receiving feedback on the pilot interview, the researcher interviewed four participants. After

four interviews were coded and analyzed, the researcher reviewed what themes had emerged and determined that the data had not yet reached saturation (Francis, Johnston, Robertson, et al., 2010). As there was merit to continue, the researcher interviewed a fifth participant and checked again for saturation finding that no new themes had emerged from two consecutive interviews.

When conducting the phenomenological interview with each teacher, the researcher initially asked participants only to describe their experiences with Achieve 3000. The researcher recorded and transcribed responses for analysis. The purpose of the interviews was to collect in-depth responses and determine teacher experiences related to Achieve 3000. In this process, we sought to understand the life-world of the participants in relation to the study question.

The researcher conducted two or more full-class observations per teacher for three selected teachers to evaluate changes in class presentation of CAI lessons. The researcher used detailed field notes to analyze the fidelity of intended implementation within the classroom and determine any differences between self-reported compliance and actual compliance. Additionally, the researcher noted the employment methods of the teacher during these lessons and captured precedents to student engagement within Achieve 3000.

The researcher directly transcribed the recording for the staff implementation meeting conducted as a purposeful PLC. This transcription was analyzed to support data collected through interview and observation. The meeting transcript provided an opportunity to record anticipated and unanticipated implementation impediments, discussed experiences, dismissed ideas and implemented ideas with results.

Additionally, the researcher acted as a coach and mentor throughout the implementation refinement period providing check points and intervention for teachers struggling with the implementation process. Anticipated impediments included math and science implementation

due to concerns in curriculum alignment, handling absentee students for contact hours, and teacher discomfort with the program.

Ethical Considerations

This study included students actively engaged in the program under review. All caution was exercised to ensure students' access to quality education was in no way affected by the ongoing study. This study involved deep revelation of practicing professionals; to respect their privacy and allow for candor in response, all names and identities have been protected by the researcher. Another ethical consideration was the bias of the researcher as a participant. In the bracketing interview, the researcher acknowledged multiple biases with regards to the program use, the teacher participants and the larger school environment. The inherent challenge was to put aside those biases and present findings that would enhance the body of literature. To that end, the researcher participated in the PRG at UTK to audit and support unprejudiced presentation and practice reflexivity throughout the data analysis and development of conclusions. The PRG was consulted to validate themes and to analyze initial interviews as well as confirm researcher bias to create awareness.

Data Analysis Procedures

The observations helped the researcher validate alignment with program fidelity. The researcher created field notes containing direct observations with sufficiently rich detail to recreate the scene and later reflections and analysis. This helped determine that classes were following the five-step model provided by the company, and some were using classroom best practices in implementing the lesson. For each observation, the researcher noted that the five step learning model was consistently utilized, and program fidelity with respect to individual lessons adhered. The researcher did not see any adherence changes over time in respect to the

five step model. As with most qualitative analysis, the data analysis of the observations began

after the first observation where, after transcribing the process, the researcher began to attempt to

describe the phenomena of the classroom use of Achieve 3000 and create a working hypothesis

to test as future observations occurred (Ary, Jacobs, Irvine, & Walker, 2012). The observations

were reviewed to determine any impediments to implementation, mechanisms of support to

overcome impediments and any indication of teacher experiences.

Since the phenomenological interview method was used in this study, the analysis was

centered around trying to understand the essence of teacher experiences with Achieve 3000. In

order to analyze the phenomenological interview, each interview was first transcribed. Then the

researcher thoroughly reviewed the transcription for the essence of the interviewees experience

(Sohn, Thomas, Greenberg, & Pollio, 2017). Attention was paid to word choice, including the

etymology of and alternative meanings of specific words. Additionally, analogies and metaphors

were reviewed for not only direct context, but also for the intensity of the experience and core of

the phenomena.

The PLC transcription was analyzed to determine what impediments were found in the

implementation of Achieve 3000. They were also reviewed for mechanisms of support and any

information teachers provide about their effectiveness. Finally, teacher experiences as illustrated

through their conversation in the meetings were analyzed and reported.

The use of the PLC meeting, observations and interviews triangulated to inform any

conclusions the researcher made. Member checks were conducted by verifying themes with a

peer, active listening, feedback loops and by transparent access to transcription of meetings and

interviews (only to the interview itself). Peer debriefing occurred through on-going checks with

the identified colleague and mentor staff. Three checkpoints with the PRG at UTK increased

study reliability in the phenomenological interview. Throughout the study, all transcripts included sufficient detail regarding emotion and setting as well as objective observations to provide sufficiently thick, rich descriptions of the moment. Transcripts and audio recordings of each interview and of the included PLC meetings will be maintained for five years available as appropriate. The researcher also maintained a journal through the data collection and analysis process, which will be secured for five years following the study.

The overall data analysis traditionally began with researcher familiarization of the data (Ary, Jacobs, Irvine, & Walker, 2012). In this study, the researcher was the observer and transcriber for all data, which deeply immersed the researcher within the data. Next all transcripts were culled for recurring themes around the three research questions regarding identifying impediments, mechanisms of support and teacher experiences and were deeply informed by Knowles' Andragogy, which explains the adult learning model. All data pieces that addressed one of the three major themes of the research were identified and considered. Then the data was further sorted into categories using an axial coding approach; finally, the researcher identified the themes that interwove within those categories and used them as the basis for conclusions.

One limitation to this study was the unique convenience sample provided by a small, public choice school in an affluent, high-performing school district. Another limitation was the time available. In the time the researcher was addressing the initiative, the school was undergoing implementation. The scope of this study did not allow for consideration of ongoing needs like integrating new staff members into an existing program, avoiding fatigue in maintaining a program and any other challenges faced during program sustainment. An intentional delimitation of the study was the exclusion of seniors from the program. The staff of

Creative High concurred that a driving factor in implementation was test preparation culminating in ACT testing that seniors had already completed. Additionally, teachers of seniors requested exclusion to allow greater flexibility in content in their classrooms.

Summary

This action-research case study with phenomenological participant interviews attempted to implement a robust network of teacher supports for integrating a CAI across content areas in order to improve school-wide reading capacity. The researcher coached, coordinated and led PLC meetings and provided direct support to the teachers involved. The researcher made record of these interactions and reviewed them for evidence of alignment to best practices. Five teachers participated in in-depth interviews to help determine which aspects of the network were helpful and which were superfluous to the teacher's implementation process.

Chapter 4 – Presentation of the Findings

In the first chapter, I provided research indicating a need to support implementation of Achieve 3000 with fidelity, a study of the impediments to that implementation and support to overcome those impediments as well as a need to understand teacher experiences while undergoing implementation. The second chapter provided a review of the literature beginning with how students were graduating high school without acquiring college and career level reading skills, then looking at how computer aided instruction had been used in literacy and in schools. The literature review culminated with discussion of the three peer review studies available on Achieve 3000. Chapter three provided a detailed description of the process used to collect and review data in this action research case study with phenomenological interviews. This study followed one school's implementation of Achieve 3000; it sought to understand the impediments to fidelity of implementation, the mechanisms of support to overcome those impediments and create increased fidelity and the experiences of teachers through the implementation process. Throughout the 2017-2018 school year, Creative High School conducted its initial implementation of Achieve 3000, a computer aided instructional tool to support curriculum-aligned reading comprehension. This study followed their initial implementation year.

Chapter Organization

In this chapter, I first provide characteristics of the participants in the study. After identifying the participants, I provide a brief review of the theoretical framework. I describe the data collection and analysis of the three primary sources of data for the study: The Professional Learning Community meeting, phenomenological interviews and classroom observations. A more colloquial tone will be used in providing the rich descriptions of the data collection

sources. In keeping with the tradition of phenomenology, it is my intent to immerse the reader in

the experience, which is more appropriately done with a conversational tone. Then I restate each

research question in full and provide findings related to that question. Within each research

question, major themes are explored, including the source of the information leading to the

finding and corroborating evidence from other sources. Finally, the chapter concludes with a

summary of findings for the entire study.

Characteristics of Participants

The implementing staff of Creative (pseudonym) High School consisted of twelve

certified professional teachers with between two years and thirty-six years of experience in

education. There were four male and eight female teachers on the implementing staff between

24 and 60 years old. The school itself was a public school of choice with no zoned students and

no provided transportation. The entire 160 student body population chose to attend Creative

High and went through an application process to be accepted into one of three academies within

the school (Computer Applications, Arts or Audio). This study focused on implementation for

three grade levels 9-11 encompassing 120 students aged 14 to 19 years old.

Theoretical Framework

As professionals implementing a robust program, the adult learning model was an

appropriate lens for theoretical framework and reflection of findings. Knowles six principles of

andragogy created a model to understand program implementation impediments, mechanisms of

support and teacher experiences. According to Knowles' 1990 publication of *The Adult Learner:*

A neglected species, successful adult learning was based on: the learner's need to know, self-

conception of the learner, prior experience of the learner, readiness to learn, orientation to learning, and motivation to learn.

Data Collection

      Professional Learning Community (PLC) meeting. For the past five years, Creative High School used flexible grouping PLCs to further various initiatives within the school. Members met during administrative days and during the district's "Power Monday" schedule. "Power Mondays" were implemented at the middle and high school levels district wide and provided teachers an hour first thing Monday morning during the contract scheduled working day to meet as instructional teams. Students reported for class an hour later than usual and had an abbreviated schedule on these days. There were twenty Power Monday meetings scheduled during the 2017-2018 school year. Creative High School used these collaborations to support ongoing staff development in key areas of focus.

      For this year, four meetings were scheduled to support implementation of Achieve 3000. Three meetings were intended to be incorporated into this study; however, competing requirements and snow days caused one meeting to be cancelled and another to be delayed until after the conclusion of this study. Therefore, only one meeting was used to collect data.

      The PLC meeting used to collect data was facilitated by the researcher who also acted as an implementation coach for the Achieve 3000 program use at the school; the meeting took place during the last Monday in January 2018. The agenda for the meeting included: a staff check in and sharing of personal good news (an established protocol for this group at the start of every gathering), a review of the school-specific statistics for Achieve 3000 through the beginning of January, a discussion of best practices followed by a hands-on demonstration of two possible classroom activities, a discussion of challenges and possible improvements, a request for

volunteers to participate in the phenomenological interviews, and a recap of the next steps with recommitment to the next month's requirements. The meeting was audio recorded with permission of the participants and later transcribed for data analysis.

Acting as the researcher/implementation coach, I shared the school's Achievement 3000 data with the PLC. Teachers were acknowledged for: most hours on the program, most Achieve 3000 work assigned to students, most times teachers provided feedback to student writing assessments, and greatest increase in student use. The reported usage for the school was slightly less than the district usage from August to December. This was somewhat explained by the fact that, due the school's small size, seniors had Achieve 3000 accounts but were not required to use the program as part of the implementation. Even with adjustments for seniors, usage lagged until December when additional classes began using the program. The percent of students considered on track for college and career readiness increased from 67.8% in August to 73% in January. That represents eight students, who were not on track, that have changed their reading comprehension trajectory in the first semester of school. Students from the three grade levels of focus grew slightly more than 50 Lexiles on average during the single semester. Sixteen student scores (10 percent) demonstrated regression in their tested Lexile levels; most were less than 20 points, though three students decreased more than 50 Lexiles. Thirty-five students recorded a growth of over 100 Lexiles in the first semester of implementation; a by-name list and point increase was also provided for review by the staff.

When I shared the accolades for teacher accomplishments, there was applause, exclamations and congratulations from nearly everyone in the room. While the staff received the statistics of the student increases reported by the Achieve 3000 proprietary tracking program EmPower, the energy in the room was palpable. Several slides were greeted with a round of

applause. When the by-name list of students who performed lower after a semester of working on the program was presented, teachers began discussing, trying to find a common thread or potential causes. When provided the by-name list of students who have grown over 100 points this year the group exploded with "Woooohooooo!", "WOW, Whoa", "Gessh" and "Wow."

A language arts teacher, pseudonym Jessica, who had exemplary lesson plans for implementing Achieve 3000, was asked to share activities that she had successfully used in her classroom. She illustrated two methods of getting students involved in a pre-reading poll. In the first, she had everyone in the PLC vote yes or no on an opinion question and paired yes's with no's prompting them to ask each other "curious questions" to understand the other point of view. In the second, Jessica had participants pick one of four types of car to drive and then related the different types of cars to different socioeconomic classes and, therefore, different characters in *Great Gatsby,* a novel the juniors were studying. She clarified that if you can't find a direct correlation to the content curriculum, you may find something that makes an interesting conduit into a discussion about the content. The staff participated fully as they were involved in lively discussion through the example activities Jessica led the staff through. Afterward there was a brief dialogue of other good ideas, including how to use articles that weren't directly tied to their core content (especially with math).

After reviewing best practices, the PLC began to discuss some challenges they had with implementation. One concern provided to the facilitator prior to the meeting was that student buy-in could be hampered by not knowing their own progress. I showed how to get to an individual growth report, and we discussed ways of sharing that with students. Other concerns brought out at the meeting included the program being "complicated" and difficulty with finding curriculum-linked articles within the program.

After reminding the group I was seeking volunteers for phenomenological interview, the meeting concluded with a recap of our commitment to using Achieve 3000 twice each month in every English class, at least one with a writing prompt that gets feedback; twice in every history and now wellness class, with at least one with a writing prompt that gets feedback; twice in science and one when feasible in the remaining courses.

After the meeting, the researcher created a manuscript of the entire forty-minute interaction. In a second reading of the transcript, words that related to impediments, teacher experience and supports were highlighted in coded color. Every statement coded as pertaining to the three research questions was copied into a worksheet and further reviewed for trends within the three research questions. Within the remarks coded as impediments during the PLC, program limitation and lack of student buy-in emerged as repeated themes for continued consideration. Teacher experiences were articulated directly and were implied through remarks made during the PLC. As an example, several teachers remarked during the PLC about various difficulties they experienced in navigating portions of the program. Another part of the teacher experience was seen in excitement from the results expressed indirectly by reactions made as those results were posted and included clapping and verbal announcements of excitement. Supports highlighted in the PLC included coaching, curriculum alignment, the PLC itself, reviewing results and scheduling.

Classroom Observations. Classroom observations occurred six times total over three classrooms. Each observation was for the entire class period. Detailed field notes were completed on site and later coded and analyzed to create a third source of information.

The first classroom observed was interview participant Jennifer. Her room was set with traditional desks with two rows facing the center of the room with their backs to the windows

and two rows facing the center of the room with their backs to the teacher work desk (the two rows from opposite sides were facing each other). Jennifer began standing between in the center of the back wall. The class was dimly lit with only a single lamp and the natural light emulating from the three windows with the blinds up about two feet. The class intensely debated the poll question, which asked, "In your opinion, should people receive awards for helping others?" Jennifer had some difficulty in turning attention from the ensuing discussion to the individual work of reading the Achieve article. After a couple minutes, a hush fell over the room, and the only consistent sound was the clacking of student keys responding to the program's questions. Six minutes in, one student broke the silence to inquire, "What do we do if we hypothetically fail the activity?" After receiving the teacher's response, the same student disrupted the work again, and the teacher responded. Another student asked about how to respond to synonym questions. Jennifer talked to the whole group about using context clues; the student support services teacher added that students were allowed to look up vocabulary words. Fifteen minutes into the lesson only six students were still working on the article, so the unrelated conversation and noise in the room grew. The teacher then redirected students toward other work they should be completing. Half an hour after students began, all were completed with the Achieve article, and the teacher announced the three students who earned 100% on their first try.

The second time that Jennifer's classroom was observed, the teacher had the before poll projected on the board. The class discussed the historical significance of Auschwitz before answering the before reading poll which stated: "There has been an attempt to restore Auschwitz as a memorial. Do you think this is a good idea or a bad idea?" When students were directed to complete the Achieve article, the room fell silent and all focused-on work. The teacher had an

alternative assignment for students to complete when they were done with the article, and all but three students appeared on task through the remainder of the time provided.

The second classroom that I observed was Edward's, which was brightly lit with traditional school florescent bulbs. The student desks were situated mostly in an outward facing circle where student chairs were either directed towards a wall or a window and students had their backs to the center of the room. Edward re-iterated the five steps of the Achieve lesson but did not use any pre-work engagement activity. Several students were off task when Edward took a minute to work at his desk.

The next time I observed Edward's class, he had written on the board students who had made Achieve milestones. He commended the students who had the most points for the week publicly within the class. This time Edward introduced the article they were reading by making connections to work they had been doing the previous week. He asked students to consider the "before poll" and gave them a minute to share thought with their closest neighbors. He asked students to complete the activity and the thought question and reminded the students that he would take the first activity grade for the gradebook. A hush quickly settled in the classroom after Edward released the students to complete the Achieve activity. While some students were off task each time Edward turned his back, many actively engaged in the reading and the work. Edward made three passes around the room to redirect off-task students and answer questions for anyone that may not feel comfortable going to the teacher desk.

Another room dimly lit with lamps and windows had every wall and open space covered in bookshelves with novels of every shape, size and topic. In this lesson, Jessica took the unusual approach to allow the students to select an article. The class had been working on a research paper and the teacher asked them to use the system's search feature to find a related

article. When a couple students had a difficult time finding anything on their topics, the teacher helped them to generalize their topics to a theme that could be searched. Jessica explained to the whole class that if they couldn't find a directly related article, they were welcome to "zoom out" to find a broader topic that included their own. Students were actively engaged in the article between 15 and 30 minutes and were directed to continue their research if they were done with the Achieve 3000 activity.

The second time I observed Jessica's class students were all doing the same article. The teacher began pulling students in with the poll question that asked if you did not have to pay for lunch, would you? The students debated intensely and were encouraged to use good listening skills and justification for their arguments. After engaging students with the initial hook, the teacher reviewed some of the program's annotation features and encouraged students to use those annotation devices during the reading. Students engaged actively with the program in a quiet setting. Students who completed the article before the class switched gears and worked on their research paper; they were still working quietly while the teacher checked-in with students individually on their progress.

While the observations validated (and in some cases triangulated) information gathered by other collection means, phenomenological interviews became the predominate means of developing themes shared after reintroducing the investigation questions. Perhaps due to the support structure of the Transdisciplinary Phenomenology Research Group (TPRG) out of University of Tennessee at Knoxville, the information garnered from the interviews took center stage for the study's findings. I will provide a brief description of the setting for those interviews next but will save the data processing and findings in line with the restated research questions.

Phenomenological Interviews. A total of five phenomenological interviews were conducted with teachers from Creative High. All but one interview was conducted in the teacher's room during their planning period on a regular school day. The fifth interview was completed before school in the researcher's office. In each interview, the researcher first asked for permission to record and then began with a single statement along the lines of "I am really interested in hearing about your experiences with Achieve 3000." After actively listening for the duration of the interviewee's initial statement, the researcher asked only for deeper explanations or more information on what the person being interviewed had said. All subsequent statements or questions from the researcher were related to topics or lines of thought initiated by the interviewee. The interviews lasted between 17 and 42 minutes and always ended with the researcher explaining that if the interviewee thought of anything they would like to add or share for the research; the interview could be reconvened at any time.

When coding the interviews, first I color coded every mention of a program impediment, a support to overcoming impediments or a teacher attitude. I copied all color-coded references verbatim into an Excel worksheet. I then sought to identify a single-word category for the phenomenon expressed. In the case of "too many pans on the stove," the single-word categories that kept surfacing were mentions of "time" and being overwhelmingly "busy." When categories were mentioned across interviews, they were brought into consideration as candidates for being a theme. Only if most (or all) participants discussed the category and no participants counter-indicated the category did it meet the criteria to rise to the level of theme. All themes the investigator considered were presented with direct quotes supporting the them to the TPRG at UTK. After finding themes across the interviews, coded observation field notes and the coded PLC transcript were used to attempt to further explain the themes.

The researcher read the transcripts repeatedly looking for themes that were present across all interviews. After collecting and validating themes with direct quotes, the researcher met via teleconference with the TPRG group at UTK. Two themes were adjusted, and one dismissed after meeting with team, the remaining four were validated as written and incorporated into the findings.

Having described the three data collection techniques, I will now re-introduce the three research questions and describe the major themes that emerged from the phenomenological interviews.

Research Questions

1: What impediments (anticipated and unanticipated) to fidelity are experienced during a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents?

Two major themes emerged regarding the impediments to implementation for Achieve 3000 at this school. The first centered around the multitude of competing requirements for teacher time and attention. The second focused on student reactions to executing the program with enough consistency. Both phenomenological themes were supported through observations and the PLC.

Too many "pans on the stove." With huge curriculum requirements, student needs, professional demands, parent requests, peer inquiries, additional duties and more, today's secondary educator is often stretched to their capacity. And yet, there's always one more program or requirement to consider. The teachers interviewed expressed their concerns about adding Achieve 3000 onto their overladen plates in all but one interview. Jessica compared the

requirements she encounters to "drinking from a fire hose most days." Adam lamented that he "probably could figure it out, but that's where the time constraint came in. I've got other things to do." He expressed wanting to do the program right, but also wanting to teach each of his courses right. Edward shared that the attention he can devote to training dedicated to improving implementation "depend[ed] on what [was] on the stove cooking" when he walked into the room. Adam agreed, that, to his chagrin, the Achieve 3000 initiative got relegated to "the back burner." Jennifer believed that if teachers would make time for an initial investment in learning the program, they could get a lot more out of it in their classrooms.

The conflicting demands for teacher attention and time were also illustrated in the classroom observations. Even during the protected instructional time while teachers were expected to provide full attention to their students, multiple interruptions were noted by the overhead speaker, the phone, the computer and at the door. Teachers were observed sneaking in one quick email response to a hot issue while finishing their attendance and starting class. They repeatedly multi-tasked, getting a couple of papers graded in the quiet hush of students working at their desks.

The PLC also illustrated the pressure teachers feel to do more than they believe can be accomplished. Before the PLC began, 9 of the 14 members present were actively engaged in something on their computer the seconds before they transitioned focus to the meeting at hand. The remaining members were actively talking with their peers (at least one of the conversations pertained to ongoing student issues). The three sources of data collection easily triangulated the theme that teacher experience the phenomenon of having "too many pans on the stove" to adequately attend to them all. Eventually something is going to boil over or not go as planned.

"Ugh, again?" Every teacher interviewed expressed that students repeatedly resisted engaging with the program in their classrooms. Several of the classroom observations corroborated that students had audible negative feedback upon learning that they would be undertaking Achieve 3000 activities. Despite their (sometimes loud) protests, students did complete the work assigned within the program.

Jessica shared during her interview that she was used to the students groaning at the announcement that they would be completing an Achieve 3000 article, but she shared, "That's hard as a teacher because I want to bring my kids valuable things that are relevant and worth doing. I want them to *feel* like it's relevant and worth doing. And so, when they don't feel that way, it's hard for me. There's some dissonance as an educator." She was not the only one that was tuned in to the discord when students complained about the work assigned.

Other teachers quoted students during their interviews as responding to an Achieve article assignment by saying "ugh, that was just really painful" or "ugh, why do we have to do this?" and "we're doing this AGAIN?" However, Adam noted that the complaints he heard from students were simply "token resistance." He shared that, though students grumbled about having to complete the assignment, they did settle in and quietly work for as long as it took to read and respond to the article. Adam's complaint was witnessed in every single class setting the researcher observed. Adam reflected that all that venting "…is token resistance 'cause they'll complain a little bit about it, but then they'll just march right through it."

Undoubtedly, token resistance or not, consistent student complaints about a program the teacher was required to implement could wear down the resolve of even the most dutiful educator. Jennifer suggested working for greater student buy-in on the front end. Victoria wondered what publicly celebrating student growth could do for perception of the program itself.

Certainly, this was a shared experience that deserved attention and support to facilitate resolution.

When teachers consistently feel pressed for time and don't believe they can do all that is asked of them well, it can be challenging to implement a program where students consistently complain about having to complete assignments. These impediments need to be addressed to support staff participation and increase program fidelity, especially when that fidelity is tied to consistent interaction with the program. Therefore, it is appropriate to look at what supports help overcome these and other impediments.

2: What mechanisms of support overcome impediments and increase fidelity during a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents?

Naming supports through a phenomenological interview was a challenge in this study. Since the interview was intentionally open-ended to allow the participant to fully express his or her personalized experience within the phenomenon, in this case through implementation, there could be areas of investigator interest that were not addressed by the participants. No single support rose to the level of phenomenological theme. However, there were two themes that pointed toward supports that were relevant to this study. Those themes were: meeting quota to support student growth; and hit or miss - searching for articles. Three direct supports – coaching, PLC, and celebrating growth - were mentioned repeatedly and worthy of discussion despite not having risen to the level of theme.

Meeting quota to support student growth. Each of the interview participants were duty-driven and determined to meet his or her assigned quota. As expressed at the PLC, science, history, language arts and wellness teachers were all required to assign students two articles per

month while other subject areas were expected to complete one each. Victoria expressed her compliance simply as "I'm told to do 2, so I'm going to do 2." She elaborated, "I always do what I'm told to do." Adam shared, "I want to make sure that I get it done, like meet my quota." Before assuming that a sense of requirement was the only driving factor in compliance, it was important to look at the other reasons participants cited for incorporating the program into their lesson plans.

All five of the interview participants expressed faith that the program had efficacy when fully implemented. While talking about his increased participation, Edward said, "And if that helps out for the school and students, which I think it does both, …that's why I did it." Adam expressed it for the group when he referred to the effects of Achieve 3000 by saying simply, "I believe in it, and so do other people." Perhaps what was most powerful was what was not said; throughout the entire transcript of the five interviews, there was not a single reference to doubt in the effectiveness of the program. There was a shared belief that if educators in the building could do their part to get students adequate exposure, student reading comprehension would improve.

With this shared belief in mind, educators interviewed had a drive to do their part in ensuring students contacted the program the assigned number of times for their class. Jessica shared, "I feel bad when I can't hit the number because I know that affects students." Adam expressed his motivation when he said:

> I don't want to be the subject area that falls back and makes us not reach. You know the way I think about it is, if you need 10, then you should get 10. If you get 9 you're not going to get all the bang for your buck and that doesn't seem right.

There was a shared experience through the group that they were a part of the whole effort and that the team was counting on everyone doing his or her part.

The support this shared belief pointed to was that implementing schools need to get buy-in from the teachers that 1) the program will work and 2) their part is critical to the whole success. Creative High school learned from other implementations in their district and assigned distinct manageable pieces to every teacher involved and then reviewed that compliance. Despite her belief in the system, Jessica admitted, "I don't know if I would do it if it weren't required. That's the other end of the stick. You know what I mean? Like, would I do this if I weren't required to do it? And the sweet spot is buying into something so much that you would do it even if you weren't required to. That's hard to find." At this point in Creative High School's implementation, it was obvious the accountable requirement was still a necessary component of the support to the program.

Hit or miss - searching for articles. Searching for articles was another essential experience for the professional educators I interviewed during this study. Some found the library of articles offered by Achieve to be a rich resource full of related materials; others expressed frustration for a lack of content-specific support; several felt they could find articles on the fringe of their content but felt that they were stretching the relevancy. They wondered how the stretch to content relevancy affected student engagement and performance. This subject was also addressed during the PLC when Jennifer told the staff that the district language arts support staff had developed a resource that linked curriculum pacing guides to articles in the Achieve database. A follow-up discussion determined there were similar resources in science and algebra. Whether the articles' topics were plentiful or lacking, the search for articles was an essential part of the experience for teachers using Achieve 3000 in their classrooms.

The most common concern brought forward by teachers was the lack of directly related content articles. Jessica shared:

> It's frustrating because then I feel like I have to stretch more to find the relevancy. And the kids know that you're stretching. They know that you're reaching, and they see right through it. And so, it just makes that buy-in even more difficult when they feel like I'm stretching. Because when *they* feel like I'm just checking a box, then it just it all feels like I'm checking a box.

Adam says:

> In Geometry, it's hard to find an article that specifically addresses a standard, really, that we're covering. I can find articles that have some of the content that we teach about, like spheres or like I did one on moons. Well, a moon is not really in the geometry curriculum, but they're certainly spheres and … something I can loosely tie to.

Victoria added that she found it very discouraging when she couldn't find articles directly related to her curriculum. While they all found ways to make it work in their classrooms, several teachers lamented the program's limited capacity for content aligned materials.

Educators also addressed how much of their most precious resource – time - they spent looking for appropriate articles. Victoria shared that most of the time she invested related to Achieve 3000 implementation was looking for articles that directly related to her content. Adam felt that he "really should probably spend more time finding an ideal article." He went on to say, "I do spend time finding articles, but I don't spend a ton of time, and maybe with so many articles out there, I could find the perfect one. I don't really do that. I find one that works."

Not everyone found the program's library lacking. Edward said, "There's a lot of articles about Wellness in the menu. So, there's plenty to choose from and we can always find

something about what we're studying at the time." Adam found that there were plenty of personal finance articles he could use. Jennifer noted that some subjects probably had an easier time than others but did not have any issues finding articles for her language arts program.

The relevancy to the classroom for any given lesson using Achieve 3000 rested heavily upon the selection of an article that conveyed that curriculum so that the lesson could be used in lieu of rather than on top of the lesson the teacher normally completed about that topic. As Victoria siad, "It's really kind of hit or miss with the articles." Teachers appreciated places where their curriculum was paired with appropriate articles from the Achieve library that supported content alignment.

Coaching, PLCs and celebrating growth. In addition to the two themes that emerged pertaining to supports through implementation, three supports did not rise to the level of theme but were present in at least two separate data sources. The supports prevalent in the data were coaching, the PLC meeting and celebrating growth.

In this study, the investigator also served as the implementation coach. I facilitated the PLC meeting, worked with individuals to overcome technical issues, brainstormed lesson plans with colleagues and tracked fidelity. Jennifer recognized the importance of having a coach to her own classroom implementation. She shared that she worked with a co-teacher that felt strongly about the program; in fact, the excitement from the coach was contagious. She also shared that having a coach in the room improved her strategies for opening and engaging students in lessons. Edward also discussed in his interview needing a point person to go to when having challenges with the technology or not knowing where to find specific features of the program. While the coaching role was never formalized, it played an ongoing pivotal role in the implementation process.

The study had intended to incorporate three PLC meetings. As was often the case in educational program implementation, the professional development time devoted to this initiative was less than budgeted due to extenuating circumstances (the school missed an entire week due to snow, the study approval process took longer than expected and disallowed for the initial implementation meeting) and competing demands (a more time sensitive topic bumped the final meeting beyond the calendar scope feasible for this study). This study was only able to fully include a single PLC. That meeting, which was described in detail at the beginning of the chapter, was rich with educator participation and professional discussions. The meeting was referenced again in several interviews. Victoria reflected how the PLC changed her practice with the program when she said, "But you know how Jessica had found something that was completely different than what she was studying but made that connection? Um, I like that idea as well, so I'm going to try to do that when I'm struggling to find things." She went on to say about the PLC meeting, "I thought it was great to show us ways to get the students motivated and ways to encourage conversation among the students. So, I appreciate it."   Despite being cut from three meetings to one within this study, the PLC had a positive effect in the commitment and support of the educators who participated.

In large and small ways, the staff of Creative High School celebrated the victories accomplished in their use of Achieve 3000. In the PLC, teachers were recognized for their accomplishments related to the program and students were recognized for their progress as a group and individually. Classroom teachers were observed during Achieve lessons providing feedback to students celebrating a variety of successes from most points in the day to most growth in the month. Victoria reflected during her interview that:

If we tell them [students] why they're doing it, which I don't think has been done, and if

they can see their increases and their gains, I think that students would have more of a

buy-in as well and maybe you wouldn't get that pushback.

She further recommended ways to acknowledge student growth and achievement in the

program at the school-wide level to support and encourage further student buy-in to the program.

While individual efforts have been made in this implementation to recognize growth, a sustained

school-wide recognition may be warranted.

3: What are teacher experiences during a three-grade-level (9-11) implementation of

a program intended to promote literacy growth for adolescents?

Perhaps the most rewarding selection of phenomenological interview as a methodology

for this study was the richness of the open-ended phenomenological interview, which allowed

teacher experiences and perceptions to be thoroughly explored. Two major themes emerged

from the five interviews: "See, it's working – following the numbers"; and "It's kind of helpful"

because "sometimes you hit the jackpot." Both themes were echoed in the PLC transcription and

again in the classroom observations and triangulated the depth of these two essential

understandings to the experience of teachers implementing Achieve 3000 for the first time.

"See, it's working" – following the numbers. In the titled quote, Jennifer informed me

that she's "called a couple people [students] over and said 'look at your score from where it was

to where it is now' that kind of thing. And when they realize 'Oh, Wow.' And I'm like 'see, it's

working.'" She aptly named this process "a celebration of growth." Victoria recounted that "it

was nice seeing those increases in the Lexile levels you showed us. I think that's huge." Adam

shared, "I've looked at my own students' growth and progress. And the numbers are increasing,

which is great. So, I do believe it is working." In the PLC teachers celebrated loudly when

seeing the list of students who reportedly grew over 100 Lexile points in a single semester.

They cheered over the class average increases, which pointed toward more than a year's

expected growth in a single semester. During classroom observations, teachers noted to students

their individual growth and applauded increasing Lexile levels. In every source of data

collection, there was evidence of looking to the numbers (all generated from the originating

program) as proof of the implementation and growth of the student.

The teachers interviewed expressed a complete faith that the program-generated Lexile

measurement that showed growth was indisputable proof that the program was working to

increase reading comprehension. Despite this heavy reliance in quantitative criteria, there were

two teachers that alluded in their interview to a more wholistic approach to assessing program

success. Victoria shared, "I think comprehension is better this year.   I'm seeing more

comprehension of content. . . across the board." Jessica remarked that "at the end of the day it

comes back to – are the students getting what they need? Are the students growing? And if I

can answer yes to that question, then the numbers and all of that other stuff doesn't really matter

as much to me." Victoria mentioned that her students illustrated stronger comprehension skills

this year than previous years at the same school, but this was the only time anyone involved in

the study looked at criteria beyond what was presented from the program to evaluate the progress

of students in their reading capacity.

"It's kind of helpful, and sometimes you hit the jackpot." While the professional

educators on this team had varying levels of regard for Achieve 3000, they all agreed that, at

least on some level, the program supported learning in their classroom. Elements of the program

that were lauded included: the imbedded differentiation, the ease of use, the instructional support

that includes testing and grading, a different point of view, and, sometimes, increased student engagement.

The feature of the program most highly regarded by the educators interviewed was the embedded differentiation that it offered. Students all read the same article, but at varying degrees of difficulty based on their current reading levels. Jessica said that it lets her "know that students are getting things that they can be successful with. . . and I'm confident that the material is where they need to be." She elaborated that it "help[ed] students feel secure in my classroom. . . knowing that things are at your level means that we're rooting for you; that we want you to succeed." Adam agreed that his favorite part of the program was the way the articles adjust to student reading levels. Jessica also reported that differentiation was a feature she could not replicate with materials she found external to the program, which were at a fixed reading level. That differentiation was critical to the successful reading activities students were engaging in the classroom.

Another feature of the program highly regarded by the teachers I interviewed was that the articles provide a point of view that was outside the traditional classroom resources. Edward appreciated when his students got a point of view that did not come from the text or himself. Victoria believed that the program could sometimes provide a more meaningful connection for students and shared the time she used an article that tracked a Supreme Court eminent domain case. She said the students were more invested in the case because of the way it was personalized in the article. Jessica shared that her use of an article about car selection tied to what cars characters in *The Great Gatsby* would choose gave students a new way to look at socioeconomic status. She said the exercise "made those characters come alive in a different way," which was, for her, "the jackpot as an educator. [It] hits all that [is] relevant [and]

that…helps them remember those characters in a different way. Or to see class in a different way, even more in depth." Across the board, educators found it refreshing to have another source on hand to provide students informational text.

Summary

For each of the three research questions, two major themes emerged from the interviews and three additional supports were considered from the triangulation of data points. Impediments to fidelity experienced during a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents included "**too many pans on the stove**," a visual reminder of the competing demands for time and attention every professional educator faces; and "**ugh, again,**" which rephrased the student push back, possibly from limited buy-in, that teachers face while implementing the program. The mechanisms of support to overcome impediments and increase fidelity during a three-grade-level (9-11) implementation of a program intended to promote literacy growth for adolescents included: creating clear interconnected requirements to assist teachers in **meeting quota to support student growth** and providing curriculum aligned article suggestions to improve their experience in **hitting or missing while searching for articles**. Continued coaching, PLCs and celebration of growth were present in all three data sources as mechanisms of support meaningful to successful implementation. The teacher attitudes ranged as expected. However, all agreed "**see, it works**" was illustrated by the numerical growth to Lexile levels students exhibited within Achieve 3000 assessments. Additional anecdotes to teacher attitude ranged from the program "**it's kind of useful**" to **"hitting the jackpot"** of the lesson planning.

Chapter 5 – Discussion and Conclusion

The purpose of this study was to follow one school's implementation of Achieve 3000 and to determine the impediments to implementing that program across three grade levels, the necessary supports to overcome those impediments, and teacher experiences during the implementation. This was an action research case study where I served as an implementation coach and staff participant. In addition to observing lessons where the program was implemented and facilitating the professional learning community meeting about the program, I conducted phenomenological interviews of faculty members about their experiences implementing Achieve 3000 in their classrooms. Knowles andragogy was used to frame thinking throughout the research, but especially in the final analysis and conclusions. The literature review began with the broadest problem of improving reading outcomes, then narrowed to the implementation of computer assisted instruction in literacy, then narrowed further to CAI in the high school setting, and finally focused on the three existing published studies on Achieve 3000 use for secondary schools.

Based on the relevancy of the literature to the three research questions, two impediments rose to the level of theme in this study: competing demands for teacher time (too many "pans on the stove") and student irritation with the program ("ugh, again?"). Supports revealed during this work included a well-defined and interconnected support plan to meet contact minimums to support student growth, curriculum article alignment guides, coaching, professional learning communities (PLCs) and celebrating student growth. Teacher experiences included starting with a strong belief that the program was effective ("See, it's working" – following the numbers) and also ranged from a sense the program had some useful features to moments that the program

was very impactful in the educator's lesson ("It's kind of helpful," and sometimes you "hit the jackpot").

Chapter Organization

In this chapter, I will discuss each of the findings from Chapter 4 in the same order that they were presented there. I will then make recommendations for future studies that can continue to contribute to the current body of literature as branches and sequels to this study. Finally, I will make recommendations for practitioners undergoing implementation of a cross-content CAI reading program at the secondary level.

Discussion of Findings

I conducted five phenomenological interviews with teachers implementing Achieve 3000 in their classrooms, observed six whole classroom lessons utilizing Achieve 3000 and coached one PLC focused on the schoolwide implementation of the program. After compiling data from all three data sources, I coded the transcriptions and field notes to look for patterns. I categorized all codes that were repeated in more than three data collection sources then reviewed the categories to see if they were universal enough to rise to the level of theme. Two themes emerged pertaining to each of the three research questions. Additionally, there were two categories that were present in multiple data sources, though never rising to the level of theme. In this section I will briefly introduce each finding and then discuss the possible implications for those findings.

Impediments. The two impediments to implementation for Achieve 3000 at this school were how pressed for time teachers felt and how much students vocalized discontent at beginning the exercises.

"Too many pans on the stove." While "time constraints" was included as one of the nine major impediments to CAI implementation (Chiang & Jacobs, 2010; Ahmed & Khurshid, 2012; Howell, Lewis, & Johnson, 2012), none of the studies I reviewed provided an articulation of the enormity of that pressure and how it impacted teacher action (or inaction). Only three of the studies reviewed included any teacher input for consideration (Chiang & Jacobs, 2010; Shannon & Grant, 2015; Zorfass & Clay, 2008). Of those, one reported a Likert scale rating for teacher perceptions of the program (Shannon & Grant, 2015), another briefly stated that integrating traditional instruction with computer aided instruction was a time-consuming process (Zorfass & Clay, 2008). The third study that included teacher input shared that lack of resources, including time, contributed to teacher difficulty using the program (Chiang & Jacobs, 2010). Through this study, I found that the scarcity of time as a resource was the prevailing factor in teacher interaction with the program. Teachers described feeling like they are "drinking from a fire hose" most days. Several described in detail the conflicting demands on their attention at any given moment. The conscientiousness of the educators interviewed and their desire to do everything right, to give attention to all the competing requirements, led to dissatisfaction because they knew they couldn't possibly do everything they were asked to at the level they would like. This created a constant awareness of their limited time for planning and preparation and how their time was being utilized. These intense emotions regarding time and competing requirements was prevalent in the experience of the teachers throughout implementation.

In Knowles' andragogy an adult's need to know about a given topic (in this case classroom practices for implementing Achieve 3000) must be greater than the cost for not knowing (1990). In other words, for the focus of this study, the teachers needed to fully believe that Achieve would lead to better results for their students before they were able to invest more

of their time in learning how to implement it. Jessica and Victoria shared that they had to replace previously used resources with those available in the program. Doing so required additional effort on their part to make meaningful connections with the curriculum. For these teachers, believing that Achieve would lead to results for their students was a necessary predecessor to investing in making the program work. Zorfass and Clay (2008) also found that when integrating technology into more traditional classroom strategies, teachers found the large investment in time challenging. Therefore it is confirmed that educators are able to fully invest in learning how to implement a new program only after they understand how it will positively affect their students and their classrooms.

"Ugh, Again?" Today's educators are rightfully charged with providing students with work that is relevant and meaningful to them. The district where this study took place displayed the banner "rigor, relevance, relationships, relentlessness" across every public communication challenging the teachers to be constantly on the lookout for ways to build the "four r's" that were important to the district leaders. Therefore, it caused discomfort for the professional educator when a group of students expressed openly that they did not find meaning or value in their ongoing interactions with the newly implemented program. This was made more uncomfortable to teachers by the subsequent crescendo of student discord as more students joined in bemoaning the activity. Student perception was one of the ten most common impediments inhibiting major program reform (Schaffer, 1997). In this study, student perception was not directly gathered, but negative student response to interacting with the program was an essential element of the teacher experience. Student reaction to CAI was not considered in previous studies (Chiang & Jacobs, 2010; Ahmed & Khurshid, 2012; Howell, Lewis, & Johnson, 2012), which focused on impediments emanating from the system structures, teacher preparation and resource constraints.

In this study, student discord with the program rose to the level of a theme and was prevalent in every one of the five interviews and six observations as well as highlighted during the PLC meeting.

Knowles states the adult learner must perceive a benefit or need for the material to actively engage in learning (1990). The teacher experiences surrounding "ugh, again" provide the cost for not using best practices when implementing Achieve 3000 and support a need for learning better methods. Though all staff members went through initial training, it was the PLC that took place after they had tried the program a few times in their own rooms that they mentioned as helpful during their interviews. The later training was provided when teachers had a frame of reference and brought their own problems to the group for learning and resolution.

Other Impediments. The literature review also revealed nine common impediments to implementation of CAI into the classroom. They were lack of resources (hardware and software), *time constraints*, *misalignment to required curriculum*, technology malfunctions, classroom management challenges, *lack of familiarity with the technology, preference for previously used materials*, and extensive preparation for lessons involving the technology, *scheduling resources* are the top reasons teachers do not fully implement CAI programs (Chiang & Jacobs, 2010; Ahmed & Khurshid, 2012; Howell, Lewis, & Johnson, 2012). Of those, only time constraints rose to level of theme in this study; extensive preparation for lessons was also illustrated by the teacher's reiteration for time it took to find appropriate articles. Other expected impediments included misalignment of the program to required curriculum, and one teacher expressed a lack of familiarity with the technology.

Expected impediments that were not found in evidence during this study included lack of resources, technology malfunctions and scheduling resources. These were absent in part because

Achieve 3000 was accessible at any time for all students and teachers in the building. Additionally, the school where the study took place was a one-to-one technology center, meaning every student had a laptop (mostly chrome books) assigned to them for the entire school day that was returned to a docking station each night. This meant that Achieve 3000 was accessible at any time for all students and teachers in the building. This also contributed to the increased student comfort in accessing and interacting with technology throughout their school day. In a less technologically driven school, one might expect to see these impediments resurface.

Supports. The supports to implementation that emerged from this study included a well-defined plan to meet contact requirements, curriculum article alignment guides, coaching, PLC and celebrating growth.

A well-defined plan. One support that was not found in any of the studies I reviewed was the use of a well-defined plan to meet contact requirements. To implement with fidelity, Achieve 3000 required each student to make contact with the program eight times every month (Achieve, 2017). Most schools undergoing Achieve 3000 implementation fall short of that goal (Borman, Park & Min, 2015; Hill, Lenard & Page, 2016; Shannon & Grant, 2015). One element this study used was a plan that required nearly every teacher to participate and clearly outlined expectations by course.

The plan used by Creative High School was proposed by the administrator but adapted by the teachers as a team to incorporate meaningfully in their classrooms. To support achieving fidelity with contact opportunities each language arts, science and history class was required to use the program twice per month in their classrooms, have students complete the Thought Question, and provide meaningful teacher feedback once per month. All other courses (except

career technical education classes, which were exempted from the program) were expected to make contact one time per month. When it was observed that the plan was lacking in contact opportunities for the grade level where most students were not taking a science class, the wellness teacher from that grade level offered to implement three times a month to make up for the missing opportunities.

What may be unique to this small school environment was how dedicated teachers felt to making sure they were not the class that made students miss their contact goals for the month. Every educator interviewed expressed their desire to make sure they adhered to the plan. Each felt that their piece of the plan was critical and achievable. Through my review of the literature in implementing CAI in schools, only one referenced integrating teamwork into the structure. In that study, biology teachers worked with reading support to increasing reading comprehension through CAI in biology classrooms (Zorfass & Clay, 2008). No other study I found incorporated building-wide, cross-content support. Knowles' andragogy does not directly contribute importance to the social aspect of learning. The participants in this study repeatedly discussed their interactions with each other and their commitment to the group. Perhaps a constructivist social component could be considered for addition and contribute to the wholeness of Knowles' andragogy.

Curriculum article alignment guides. One frustration repeatedly expressed by educators participating in this study was the lack of content curriculum specific articles available in Achieve 3000. The professional educators in this study lamented the amount of time they spent looking for articles, the stretch needed to connect articles to content and the scarcity of content-specific articles for several classes. While these issues should be considered by the proprietor to maintain a market share in this industry, they could also be supported by curriculum experts.

The district curriculum teams in math, science and language arts added Achieve article suggestions for specific content pacing, which was extremely helpful for educators in those courses. I did not see any reference to curriculum alignment support in the literature reviewed. This overlooked support could save teachers time and facilitate increased use the program in their classrooms.

Coaching. Coaching was illustrated in the literature review as an effective method in supporting and growing educators (Powell & Diamond, 2013; Poglinco & Bach, 2004; Guiney, 2001; Herll & O'Drobinak, 2004; Gallacher, 1997). The investigator acted as an informal implementation coach for Achieve 3000. The finding that coaching supported progress was not at all surprising but contributed to the growing body of evidence to call for its use when working to help educators grow in their practice. From my perspective, a designated person to support peer teachers through a specific program was vital to the success of program use. To ensure success, program implementation coordinators should designate in-house experts to take ownership through guiding that program to success.

Professional learning community (PLC). The literature reviewed was clear that, when utilized effectively, PLCs are a valuable component to successful implementation (Akibaa & Liang, 2016; Cooper, Stanulis, Brondyk, Hamilton, Macaluso, & Meier, 2016; Horn & Little, 2010; Meirink, Imants, Meijer, & Verloop, 2010; Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010). This study also found that the PLC contributed to the implementation process in a positive and meaningful manner. The PLC was mentioned across several interviews and the methods demonstrated during the PLC were later observed in the classroom setting.

Using Knowles andragogy as a lens, it was clear why the PLC supported the educators. It allowed teachers to bring their own experiences to bear and allowed them to learn from each

other through their interactions. Additionally, the PLC oriented teachers to the learning in a way that they helped each other address problems brought forward at the meeting. It provided time and space for teachers to focus on the topic when they had a readiness to learn based on their own experiences in the classroom and their own needs to acquire new skills.

Celebrating growth. The need to publicly recognize success was not evident in the literature reviewed pertaining to CAI implementation for student growth. However, it was relevant to Kotter's model to support change. Within Kotter's model to implement change, there is a call to create short term wins to provide evidence that the change was worth the effort (Kotter, 1996). The public recognition of these gains undermines critics of the program and builds momentum toward implementing the program. Kotter called for consolidating these gains to produce further change to support ongoing growth. Intuitively, the teachers interviewed knew that publicly rewarding students who made progress in the system would create energy and quell some of the student discontent for utilizing Achieve 3000. Several teachers called for a more formalized and comprehensive mechanism to celebrate student growth.

Teacher experiences. The most rewarding element of this study was the richness and variety of response provided using phenomenological interviews. Teachers openly shared their experiences using a wide array of vocabulary and analogies. Teachers' experiences while implementing Achieve 3000 ranged from viewing the platform as a somewhat helpful, though sometimes inconvenient, tool in their kitbag to "hitting the jackpot" in a lesson plan. In my review of the literature, I did not come across any other studies regarding CAI that conducted one-on-one interviews to investigate the teacher experience. In one study, focus group interviews gathered some information on the collective experience (Chiang & Jacobs, 2010).

Teachers in the current study firmly expressed a faith in the program and its effect on student growth in reading comprehension. Multiple educators pointed back to the growth reported from the program's own assessments and used those numerical growths as evidence for how the program was working effectively with their students. There was a real sense of "show me the numbers" to validate program effectiveness. In another study regarding Achieve 3000, teachers completing a survey indicated that they believed the program was effective (Shannon & Grant, 2015). The belief teachers had in the effectiveness of the program was a necessary component of learning how to develop high quality lessons surrounding the program. According Knowles, if adults perceived a benefit or a need for the material, they were prepared to progress in their knowledge (1990). If teachers believed the program was working, then they perceived a benefit from learning how to implement the program effectively.

Only one teacher discussed reading comprehension growth from a qualitative perspective. Victoria said that she believed students were doing better at reading comprehension in her course external to the Achieve program. She, as a professional, had a sense that students in her classes were improving in this important skill. Everyone else observed or interviewed focused on the numerical Lexile gains provided by the system as evidence that the program was working. Though on the fringe of the interest of this study, this observation does speak to the bias toward quantitative measures of effectiveness. Teachers felt better about implementing the program when they had numerical evidence of progress which led to increased commitment to the implementation.

This study contributed to the body of knowledge regarding implementation of Achieve 3000. There are some elements of this information that can be considered for generalization to adapting CAI into the secondary setting. However, this study was limited in sampling and

timing. Therefore, the body of literature would be further enhanced with additional related research.

Recommendations for Future Research

Student Experience. This research focused on the experience of the adults implementing the program with little regard to the end user. It would be a valuable next step to delve into the experience of the students utilizing the program. A phenomenological interview sampling across students would provide a deeper understanding of what the essence of the student experience was within Achieve 3000. One study using CAI in an effort to improve reading comprehension found that students completing a survey preferred the CAI to traditional instruction (Stetter & Hughes, 2011). After using CAI in biology class to increase course content understanding through reading support, a group of interviewed students highlighted the elements of the program they found particular worthwhile (Chiang & Jacobs, 2010). It would be worthwhile to determine if student metacognition or confidence in his or her reading comprehension was affected by his or her use of Achieve 3000. Since the current study found an increase in verbal pushback as usage rates increased, a longitudinal study of how attitudes toward the program fluctuate over time would be worthwhile. The teacher experience was heavily influenced by the student reaction to program use.

Larger School Setting. Creative High School was used for this study in part because they were undergoing implementation, but also in part because the researcher was an integral part of that implementation. Some of the supports that were very effective at Creative High School may or may not transfer to a larger setting. Therefore, another iteration of this study in a larger setting would either support the findings or relegate them for use to small school settings.

Longitudinal. This study focused on the initial implementation of Achieve 3000 for three grade levels to support growth in student reading comprehension levels. The study was a

snapshot of a single quarter, the third quarter of implementation. The next step would be to

continue tracking past implementation through sustainment. Areas that did not need addressed

during implementation but need to be reviewed for sustainment included integrating new staff

members, maintaining momentum, and re-energizing commitment. While the deep study of

initial implementation was an excellent starting point, it would be important to look at sustaining

the initiative through a longer period of integration.

> **Quantitative Evaluation of Program Effectiveness.** The data was not yet conclusive

that Achieve 3000 consistently worked at increasing reading comprehension for adolescents. In

the three peer-reviewed studies available for consideration, two concluded the program was

effective and one concluded that it was not (Borman, Park & Min, 2015; Shannon & Grant,

2015; Hill, Lenard & Page, 2016). It would be beneficial to look at student gains using

alternative measures rather than the system's own internal assessments for growth. It would also

be valuable to determine if the reading comprehension growth measured by the Achieve 3000

program transfers to other areas requiring reading comprehension including standardized exams.

Teachers had faith that the program was working for their students, and districts indicated a

similar faith with the investment of their resources dedicated to the program. It would be

beneficial to have additional studies that measure and determine the effectiveness of Achieve

3000 and transferability of the skills acquired within the program.

> To recap, this study contributed to the body of knowledge for implementing CAI across

grades in a small secondary setting. To my knowledge, it was the only exclusively high school

oriented study for Achieve 3000 implementation. Future researchers considering contributing to

this body of knowledge should consider looking at student perspectives; recreating a similar

study in a larger setting; conducting a longitudinal study; or utilizing alternate metrics to objectively ascertain program effectiveness.

Recommendations for Practitioners.

Two major findings and one observation of this study that should be of interest to practitioners were the reality of time pressures felt by teachers across the profession, the supports that aided teachers in implementing programs in their classrooms, and the benefit of receiving training in multiple doses.

The biggest take away for educational leaders at all levels was a reminder of the intense the time pressure felt by classroom teachers. They wanted to do well at everything asked of them but could become overwhelmed by the enormity of the task. When considering adding a new program, it would be prudent to determine if anything could be taken off the plate of teachers to make room for the new requirement. Additionally, when asking teachers to take on learning a new program or system, Knowles' andragogy should be considered, and the teachers needed to understand what they were gaining by investing their time into the program.

The second finding that practitioners should heed were the supports that aided in CAI program implementation in a small high school setting. Teachers benefitted from having a clear understanding of their piece of the puzzle and how that piece fit into the school wide implementation effort. They were also helped with curriculum alignment guides that could be shared by subject areas. A peer coach assigned to support teachers through the implementation was also beneficial to classroom use. Celebration of short term wins allowed for more buy in from students and teachers alike and limited the strength of nay-sayers. A functional PLC provided a safe place for teachers to share strategies and troubleshoot problems together. These supports when integrated together ultimately increased new program use in the classroom.

The initial training for program implementation took place over the summer, nearly a month before teachers were able to first use the program in their classrooms. The four-hour session provided teachers with the functionality of the program and attempted to provide best practice ideas for implementation. However, when similar ideas were presented later (after teachers had the opportunity to practice with the program in their own classrooms) teachers better related to the material and incorporated it into their lesson plans. This speaks to using multiple trainings that evolve as educators get experience with the system rather than single whole-dose attempts with professional development.

Conclusion

The purpose of this study was to examine the implementation of Achieve 3000 with attention to what facilitated and impeded implementation along with understanding teacher experiences while using the program in their classrooms. When finding facilitation measures, this study sought to capture and categorize them for replication. While determining impediments, this study sought mechanisms of support to overcome obstacles to program adherence and attempted to increase fidelity in content teacher application of the program. The use of a coach, the PLC and celebrations of success supported this implementation. Teacher experiences were captured, categorized and shared to contribute to the body of knowledge.

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