TEACHERS' ORIENTATION TO TEACHING AND THEIR PERCEIVED READINESS FOR 21ST CENTURY LEARNERS

BY

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ABSTRACT

TEACHERS' ORIENTATION TO TEACHING AND THEIR PERCEIVED READINESS FOR THE 21ST CENTURY LEARNER

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In a 21st century world where students will need mastery of both core subjects and applied skills, the purpose of this qualitative study was to explore the congruence of teachers' orientations to education and the 21st century learning needs of students. The educational orientation of participants/teachers was measured by the Educational Orientation Questionnaire (Quam, 1998) with follow-up interviews and classroom observations focused on exploring their perceived readiness for 21stcentury learning in the classroom and congruence of their orientation to learning and the development of 21st century skills. Study

findings will raise awareness of where teachers are on the continuum of pedagogy to andragogy and the ways in which their educational orientation influences their perceived readiness for the classroom and 21st century student learning. Study findings will also aid teacher educators and school leaders in recognizing the need to provide teacher training, either pre-service or professional development, to ensure our teachers can meet the needs of 21st century learners in the K-12 educational arena.

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CHAPTER ONE

DESIGN OF THE STUDY

Our current educational system has not kept up with the rapid global changes in business, communication, and industry and is struggling to prepare all students for the opportunities and demands of the 21st century (Schrum & Levin, 2009; Trilling & Fadel, 2009; Darling-Hammond, 2006; Wagner, 2008). Doing well in school is no longer considered a guarantee of a life-long job and the promise of a career as it did for previous generations (Bellanca & Brandt, 2010). Today, core competencies that were once considered "nice to have" in schools are now essential tools necessary to provide economic security. Developing skills such as critical thinking, reasoning and problem solving, creativity, and collaboration in our students is now considered essential by employers and postsecondary educators for "real-world performance and advanced learning" (Bellanca & Brandt, 2010, p. xx) as well as maintaining the global competitiveness of the United States (Taylor & Fratto, 2012; Trilling & Fadel, 2009; Stewart, 2012; Wagner, 2008; Zhao, 2009). "As never before, the United States must prepare students for a world where the opportunities for success require the ability to compete and cooperate on a global scale" (Stewart, 2012, p. 1).

Many students today are not engaged or motivated in school classrooms with learning that seems outdated and unrelated to their futures (Good & Kalmon, 2008; Kay, 2010; Taylor & Fratto, 2012; Zmuda, 2010). As a likely result, the nation's dropout rate has reached crisis proportions, with 70 percent of students, and only 50 percent of minorities, graduating from high school on time (Bellanca & Brandt, 2010; Good & Kalmon, 2008; Zhao, 2009). Zhao (2009) goes on to report America's graduation rate ranks 19th in the world; 40 years ago the United States was first. Internationally, our US students score lower than average in math and average in reading and science on the Programme for International Student Assessment (PISA), the benchmark assessment in reading, math, and science for developed countries (Herbert, 2011). Even more telling is that PISA assessments measure applied skills or 21st century skills of critical thinking and problem solving (Kay, 2010; Partnership for 21st Century Skills, 2007). Clearly our students are not learning what they need to learn while in school.

Proponents of 21st century skills argue that all students today—not just a select few—need to master both core subjects (e.g., reading, math and science) and applied skills (e.g., critical thinking, problem solving, creativity, and collaboration), particularly relevant in our competitive global economy (Stewart, 2012; Trilling & Fadel, 2009; Wagner, 2008). To better prepare our students for the 21st century, educators today shoulder greater responsibilities beyond a methodology with the emphasis on basic skills as measured by multiple choice

and short-answer test items. According to Darling-Hammond (2010), what is needed today is an "effort to correct from the extreme back-to-basics approach represented by the No Child Left Behind Act of 2001 and instead put cognitive skills into the context of what learners need to know for the work world of the 21st century" (p. 34).

Skills that support critical thinking and reasoning, innovation and creative problem-solving, collaboration and communication are in great demand yet employers report an alarming lack in these and other applied skills among college-educated applicants entering the labor force (Bellanca & Brandt, 2010; Trilling & Fadel, 2009; Wagner, 2012). Research has led to the development of frameworks of skills that high school and college graduates should develop during their years of schooling (Bellanca & Brandt, 2010; Lemke, Coughlin, Thadani & Martin, 2003; Trilling & Fadel, 2009; Wagner, 2008) and subsequent changes needed in curriculum and instructional design capable of fostering such development (Bean, 2010; Beers, 2011; Jacobs, 2010; Taylor & Fratto, 2012). However, few if any recognize the role of ideology or teaching orientation in the successful instruction for student achievement in the 21st century.

There exist two distinct instructional ideologies in American education today: the practice of pedagogy (the theory of teaching children; Knowles, 1980; Knowles, Holton, & Swanson, 1998; Ozuah, 2005) and the practice of andragogy (the theory of adult learning or life-long learning; Knowles, 1980; Knowles et al.,

1998). Traditionally, the pedagogical model of education has been reserved to the art and science of teaching children and currently, much of the formal educational process from preschool through graduate school, has been locked into this model. The term andragogy was popularized in the United States by Malcolm Knowles, a professor of adult education, during the 1970s and 1980s. This learning model was established upon two principle, defining attributes: the adult learner as self-directed and autonomous, and role of the teacher as a facilitator of learning rather than deliver of content (Knowles, 1978; Knowles, et al., 1998; Pratt, 1998).

The pedagogical model of instruction was initially developed in the seventh century with the introduction of organized education at European monastic schools preparing young boys entering the schools for the priesthood. The model of pedagogy was founded upon certain assumptions about the teacher and the learner that would eventually have a profound bearing on the design of this educational model (Henschke, 2009; Hiemstra & Sisco, 1990; Ozuah, 2005). Pedagogical assumptions include: dependency of the learner on the teacher for direction with learning needs; learner needs that are subject-centered; extrinsic motivation as the driving force of learning; and the irrelevancy of the learner's prior experience (Knowles et al, 1998; Ozuah, 2005). This educational model is fundamentally teacher-centric where the teacher determines the curriculum goals, the content delivery, and the assessments to evaluate what has been learned. From these origins, this traditional method of education has become the dominant form

of instruction applied to the teaching of children and in many educational institutions, the teaching of adults as well (Hiemstra & Sisco, 1990; Knowles et al., 1998; Ozuah, 2005).

Widespread attention was given to andragogy when the term was introduced in a journal article by Knowles (Knowles, 1975; Merriam, 2001). The development and expansion of andragogy as an alternate instructional model was based on a series of suppositions about adult learners, all of which have some connection to the concept of a learner's initiative and desire to take responsibility for their learning. Andragogic assumptions include: the need to know the usefulness and value of the material to be learned; a self-concept as autonomous and self-directing; readiness to learn that is dependent on the relevancy of the topic; prior experiences that provide rich resources for learning; an intrinsic motivation to learn; and an orientation to learning that is problem- or task-centered (Hiemstra & Sisco, 1990; Knowles, 1980; Knowles et al., 1998). This student-centric model assumes that the learning needs of adults are very different from those of children. The curriculum goals, content delivery, and assessments for learning should be designed with this distinction in mind and responsibility for planning learning experiences should be shared with the learners (Knowles, 1990; Knowles et al., 1998).

Early writings by Knowles (1975; 1978) indicated a dichotomous distinction between andragogy and pedagogy. However, his later writings

(Knowles, 1980) suggested the two models of instruction are "probably most useful when seen not as dichotomous but rather as two ends of a spectrum, with realistic assumptions (about learners) in a given situation falling in between the two ends" (p. 43). Other studies have since expanded this continuum representation of differences between pedagogy and andragogy to more relational representations between the two educational orientations (Delahaye, Limerick, & Hearn, 1994; Grow, 1991; Henschke, 2009; Pratt, 1988). At some point, it is the teacher that needs to determine where on the continuum to focus his or her instructional design, conceivably beginning with pedagogy, where instruction is subject-oriented and teacher-driven, and moving toward andragogy where instructional design is more student-centric and promotes 21st century skills development by the students (Darling-Hammond, 2010; Grow, 1991; Henschke, 2009; Trilling & Fadel, 2009; Wagner, 2008; Zmuda, 2010).

Statement of the Problem

Today, the academic success of students across the continuum of education depends upon their ability to translate curriculum content and the skills of critical thinking and reasoning, creativity and invention, technology and research information literacy, and communication and collaboration into career success in our competitive global economy. No longer are total teacher-centric learning environments considered optimal (Bellanca & Brandt, 2010; Darling-Hammond, 2010; Schrum & Levin, 2009; Wagner, 2008; Zmuda, 2010). In fact,

research indicates today's secondary school learners prefer a student-centric environment with adult learning principles associated with andragogy (Choy & Delahaye, 2003; Wellenreiter, Lucey, & Hatch, 2010; Wagner, 2012; Zmuda, 2010).

But, traditionally, students have been expected to be academically successful in teacher-centric classrooms where teachers designed and delivered instruction. These learning environments are products of educational programs and methodologies entrenched with 20th century pedagogical orientations to education (Bellanca & Brandt, 2010; Darling-Hammond, 2005; Trilling & Fadel, 2009; Zmuda, 2010). Research indicates that although teachers regard student-centric classrooms as highly desirable and acknowledge preferences for innovative methodology, secondary schools continue to engage in teacher-centric practices and express reluctance in shifting from these methods(Korthagen, Loughran, & Lunenburg, , 2005; Meuwissen, 2005; Taylor &Fratto, 2012; Wellenreiter et al., 2010; Wiggins & McTighe, 2005).

Knowles (1980) would explain this anomaly of educators desiring student-centric learning environments but engaging in teacher-centered practices as the incongruence of educators' instructional orientations to student learning. Teaching strategies and learning needs are not always compatible. Congruence occurs when students' learning needs and educators' teaching strategies are compatible – 21st century, digital-aged learners engage with student-centric

teachers (Collins & Halverson, 2009; Fink, 2003; Grow, 1990; Taylor &Fratto, 2012; Vermunt, 1999). Incongruence often leads to friction and frustration for both the instructor and the student (Grow, 1991; Pew, 2007; Vermunt, 1999; Wagner, 2008; Zmuda, 2010) and ultimately a lack of student academic success for the learner in acquiring 21st century skills.

Purpose of the Study

Through the lenses of the andragogy/pedagogy continuum of teaching (Knowles, 1978, 1980; Pratt, 1988) and 21st century skills (Bellanca & Brandt, 2010; Lemke, Coughlin, Thadani, & Martin, 2003; Trilling & Fadel, 2009; Wagner, 2008), the purpose of this study was to explore the congruence of educators' orientations to teaching and 21st century needs. The following research questions guided this study:

1. What are teachers' educational orientations to teaching?
2. What are teachers' essential descriptors of their orientation to teaching?
    a. How do teachers describe classroom organization?
    b. How do teachers describe course content delivery?
    c. How do teachers explain their orientations to teaching?
    d. Why do they teach the ways that they describe?
3. In what ways do these teachers desired classroom behaviors support the 21st century learning needs of students? How do they promote:

a. Collaboration and communication

b. Research and information fluency

c. Creativity and invention

d. Critical thinking and problem solving

e. Self-directed learning

4. In what ways are teacher orientations to teaching and 21st century needs congruent?

5. What other realities are revealed about teachers' orientations to teaching and 21st century learning needs?

6. How useful are the frames of the continuum of andragogy/pedagogy (Knowles, 1978, 1980; Pratt, 1988) and 21st century learning needs (Bellanca & Brandt, 2010; Lemke et al., 2003; Trilling & Fadel, 2009; Wagner, 2008) for understanding the phenomenon under review?

Orienting Theoretical Frameworks

Theoretically, the educational principles of the andragogy/pedagogy continuum and the skills needed for 21st century learning provide frameworks that best support the purpose of this study in understanding the importance of teachers' educational orientation to learning and students' acquisition of 21st century college and career skills. A side by side comparison of the frameworks (CDE 21st Century Skills and Abilities, 2009; Knowles, et al 1990; Partnership for 21st Century Skills, 2007; Trilling & Fadel, 2009) reveals overlapping skills and

common characteristics (see Table 1.1). For the purposes of this study, the 21st Century Skills and Abilities, adopted by the Colorado Department of Education (CDE) in their desire to promote life-long learning among their students, was used.

Table 1.1TheAndragogy/Pedagogy Continuum and 21st Century Skills

Principles of Andragogy/Pedagogy Continuum	**21st Century Skills**
Self-Concept—moving from dependency to independence, autonomous, and self-directed	**Self-direction**—for example, but not limited to: adaptability, initiative, personal responsibility, work ethics, self-advocacy, and autonomy
Role of Experience—moving from devalued to valuable as a rich source of information; connecting knowledge to experience	**Collaboration and Communication—**for example, but not limited to: synergy, team resourcing, social skills, leadership; building experiences
Readiness to Learn—moving from teacher dictated to connecting what one needs to know to for real life situations	**Research and Information literacy**—for example but not limited to accessing and evaluating multiple sources of information for immediate application to identified problems and real-world situations; source discernment, systems management, and technology
Orientation to Learning—relevancy, immediacy of application; more problem-centered than subject- oriented	**Critical Thinking and Reasoning**—for example, but not limited to: problem solving, analysis, logic, and cause /effect
Motivation to Learn—moving from extrinsic to intrinsic	**Creativity and Invention**—for example, but not limited to: resourcefulness, innovation, integration of ideas; building intrinsic motivation
Need to Know—moving from teacher-determined toward relevancy of the concepts being learned	

The six assumptions of the pedagogy/andragogy continuum are linked to the acquisition of essential skills for 21st century learning developed in student-centric classrooms in the following ways:

- self-concept is key to andragogical learning and moving toward self-directedness;
- experiences serve as an increasing resource for learning when students are provided opportunities for creative problem solving, innovation, and collaboration with real-world problems and situations;
- readiness to learn becomes more developed as learners link relevancy of core subjects with real life situations and 21st century themes of global awareness;
- orientation to learning becomes less subject-centered and shifts to immediate application of learning with the development of information literacy and technology skills;
- motivation to learn becomes internal as a person matures and makes learning connections to real-world experiences and college and career readiness; and
- need to know why something should be learned and justification for being learned as opposed to accepting without question what teachers impart, is the basis for the “age old question” from

students of all ages “why do I need to learn this?” Also provides a basis for 21st century learning opportunities and knowledge application (Knowles, 1987; Knowles et al., 1990; Trilling & Fadel, 2009; Wagner, 2008).

Methodology

To answer the research questions, specific data was needed from select individuals. The following sections detail data needs, sources, collection and analysis.

The Researcher

As a school administrator, it is my vision that all students graduating from our school are equipped with 21st century skills for college and career readiness. Based on that vision, it is important that teachers I hire for positions in our school possess an orientation to learning that reflects the 21st century classroom. It is equally important to understand my existing teachers’ orientation to learning to help overcome potential resistance to change when new student-centric programs are introduced to the curriculum.

My professional administrative and educational interests have helped me focus this study. I have been a member on many K-12 accreditation teams over the past 15 years through the Association of Christian Schools International (ACSI) and the Southern Association for Schools and Colleges (SACS). Part of the REACH (**R**eaching for **E**xcellence through **A**ccreditation and **C**ontinuous

improvement for **H**igher achievement) accreditation process, Standard Five: the Instructional Program, requires schools and their educators to implement more active learning, student-centric methodologies in their programming (ACSI, 2008). However, through my experiences serving on these teams, I have observed the predominance of teacher-centric programs in ACSI member schools.

Meanwhile during my doctoral coursework, I was introduced to the concept of the andragogy, the adult learning theory, and the teaching concepts associated with the theory that I believe need to be supported in secondary education for our students to be successful in the 21st century. Because of my administrative position, I have access to teacher populations in ACSI member schools, essential to data collection. Additionally, as the research instrument for interviews and observations, my history of curriculum design facilitated follow-up questions and analysis of participant responses.

Data Needs

The data needed to conduct this study are threefold. First, I needed to know the andragogic/pedagogic educational orientation of the study sample. Second, I needed to know how these educators proposed or desired to support the 21st century learning needs of students through their understanding of 21st century skills, how they view their role as the teacher, and how they design their curriculum, assessments, and classrooms to support their teaching methodologies.

Finally I observed teachers in their classrooms to determine congruence between their interview responses and actual classroom activity.

Data Sources

Given the focus in this study on evidence from educators in support of 21st century learning, data sources, or educators, need to be those clearly challenged to teach in ways that support 21st century learning environments. To this end, data was collected from teachers currently employed in member schools of the Association of Christian Schools International (ACSI) in the same region as the ACSI member school where I am employed as a secondary school administrator. Teachers from these schools represent a convenience sampling due to the accessibility and availability of these teachers to me. In many research studies, researchers take advantage of populations that are expedient and readily accessible, as well as a sample population that is believed to be a representation of a given population (Gall, Gall, & Borg, 2007; Gay, Mills &Airasian, 2006).

Data Collection

Data were collected in three phases. In Phase One, I administered the Educational Orientation Questionnaire (EQO), a survey used as an indicator of the andragogic/pedagogic orientation of teachers. After receiving permission from ACSI school administrators in area schools, I contacted teachers by email and asked for participation in the study by completing the online survey. In Phase Two, I contacted select individuals who scored positively andragogic, neutral, and

positively pedagogic on the survey and requested permission to interview them about their work to teach essential skills for 21st century learning and observe their classroom teaching. Phase Three consisted of classroom observations with the participants.

Phase One. The Educational Orientation Questionnaire (EOQ) developed by Hadley (1975) and revised by Quam in 1998, is consistent with tools used by Knowles (1990) to assess an adult's readiness to learn, was used to measure respondents' andragogic/pedagogic educational orientation. The EOQ contains statements that relate to six dimensions of educators' educational orientations: 1) the purpose of education, 2) the nature of learners, 3) characteristics of learning experiences, 4) management of learning experiences, 5) assessments, and 6) the relationships between educator and learner as well as among learners. Hadley (1975) believed that most educators have both andragogical and pedagogical attitudes, therefore their orientations would fall along a numerical continuum. Higher scores would indicate an andragogical educational orientation while lower scores would indicate a pedagogical educational orientation (see Appendix A).

According to Holton, Wilson, and Bates (2009), a major gap in andragogy research centers on the lack of a measurement instrument that adequately measures the principles of andragogy and the fundamental elements of the process design. A recent study by Holton et al., (2009) indicated a weakness in the ability of the EOQ to "fully isolate and measure andragogical constructs" (p. 189).

However, for the purposes of this study, the EOQ was used for screening purposes to provide a baseline for determining the educational orientation of teacher candidates prior to the follow-up interview and classroom observations.

Phase Two. In phase two of the study, I conducted interviews with six subjects, two who scored positively andragogic, two who scored close to neutral, and two who scored positively pedagogic, comparing their orientation to education with their instructional focus on the acquisition of essential skills for 21st century learning. According to Creswell (2007), the use of the interview is an accepted way to best capture the experiences of participants in their own words. Broad-based or "grand tour" questions were utilized to help direct the interview and allow me to explore participants' answers in further depth (Rubin & Rubin, 2005). The following grand tour questions guided the interviews:

1) How would you describe your approach to teaching?
2) What would you describe as the essential skills our students need for the 21st century?
3) How would you design your classroom to promote students' proficiency in 21st century skills?
4) How would you design instruction and assessments to promote students' proficiency in 21st century skills?
5) How did you learn about 21st century skills development?

As needed, follow-up questions allowed me to probe for evidence of teaching orientation and application of that orientation to instruction (Appendix B, the Interview Protocol).

Phase Three. Following the interviews, I observed two classes taught by each teacher. Field notes were taken using an observation rubric that addressed each of the following 21st century skills: critical thinking and reasoning; creativity and invention; collaboration and communication; research and information literacy; and self-direction (see Appendix C). The purpose of the observations was to collect data to compare with the interview statements to confirm congruence of teachers' perceived orientations to teaching with their actual practice in the classroom.

Data Analysis

To understand the subjects' orientation to education, in the first phase of this study I analyzed scores of the EOQ using descriptive statistics. According to Hadley (1975) and reported by Quam(1998), subjects with standardized scores greater than zero (positive scores) are considered positively andragogic and those with standardized scores less than zero(negative scores) are considered positively pedagogic. A mean score of zero is considered neutral on the andragogic-pedagogic continuum. An andragogic orientation implies the use of more student-centric methodologies by the teacher whereas a pedagogic orientation implies the use of more teacher-centric methodologies (Grow, 1991; Knowles, 1980;

Knowles et al., (1998); Quam, 1998). Subjects with standardized scores in the positive range, close to neutral, and in the negative range were contacted for interviews.

Data collected through the interviews in Phase 2 were transcribed verbatim and statements were highlighted that were important to understand the teachers' orientation to teaching. These statements were examined for common themes (Boyatzis, 1998; Creswell, 2005) through the lens of the andragogy/pedagogy continuum that would support 21st century essential skills development. Data collected in Phase 3 were also viewed through the same orienting framework to help support the findings in the interview process. Additional coding helped me develop themes that supported other realities about the teachers' orientation to teaching and acquisition of 21st century skills. Overall, I was looking for information that appeared important to understanding the congruence/incongruence between the teachers' orientation to teaching and their promotion of 21st century skills development (Merriam, 1998; Yin, 2003).

Significance of the Study

"Learning is a lifelong journey and, as on most journeys, it is important to have a destination in mind and a reliable means to get there" (Trilling & Fadel, 2009, p. 95). The destination for students in the 21st century is to be prepared for and competitive in this global economy and to be life-long learners. Whether they are bound for college or destined toward a career, all students need certain skills

and their skill sets to be competitive are the same (Bellanca & Brandt, 2010; Trilling & Fadel, 2009; Wagner, 2008; 2012). Although andragogy promotes principles of the adult learning theory (Knowles, 1978), the underlying premise of this study is that concepts of andragogy and related teaching principles are critical to promoting development of needed skills for student success in the 21st century (Brockett & Hiemstra, 1991; Conner, 2004; Holton & Swanson, 2011; Serim, 2007;Wagner, 2008; 2012).

Today it is essential that our teachers are prepared to teach students in the 21st century, either through pre-service training or professional development. According to Darling-Hammond (2006), teachers clearly affect student learning but how we prepare teachers effectively is a matter of debate. While it is essential that teacher training programs equip our teachers to prepare students for college and career readiness, for the most part our pre-service training programs and professional development activities are designed to promote a pedagogical methodology and traditional views of schooling (Darling-Hammond, 2006; Glickman, Gordon & Gordon, 2013; Pew, 2007; Tate & Strickland, 2010). As a result, even if their educational orientation is andragogic, many of our teachers lack the educational training in andragogic principles and resist the paradigm shifts in learning proposed by researchers and educators intending to move students toward student-centric learning and 21st century skills development

(Grow, 1991; Caskey, 2010; Meuwissen, 2005;Taylor&Fratto, 2012; Wagner, 2008).

Theory

Any research study should inform theory, practice, and research. The purpose of this study is to expand knowledge about the theory of the pedagogy/andragogy continuum as related to the development of 21st century skills in the K-16 arena. To accomplish this, the educational orientation of current ACSI member school teachers was assessed using Hadley's Educational Orientation Questionnaire (EOQ) and revised by Quam (1998). Follow-up interviews with participants was used to determine those scoring higher on the andragogic/pedagogic continuum understand the essentials of andragogy and believe they are better prepared for student-centric teaching and 21st century skill development. Additionally, classroom observations were made to collect observational data that could help confirm the congruence of the teachers' perceived orientation to teaching and their actual practices in the classrooms.

Theoretically there are teachers today that may have a more andragogic orientation to teaching as indicated by their score on the EOQ. However their ability to translate this orientation into classroom experience to promote 21st century skills development in our students may prove to be difficult given the pedagogic methodology so entrenched in our educational system.

As indicated in the earlier research, Knowles himself eventually determined that younger learners could also benefit from the principles of andragogy, even though their life experiences may be limited (Conner, 2004). Perhaps an implication for the development of this aspect of the theory would be to provide more authentic learning experiences through problem-based and project-based learning for students in the K-12 arena that will enhance andragogic concepts and 21st century skills development, thus better preparing them for college and career readiness (Darling-Hammond, 2010; Trilling & Fadel, 2009; Wagner, 2012; Zmuda, 2010). However, this would imply that teachers would also need training with more emphasis on certain principles of andragogy to help them create an academic program aligned with and leading to college and career readiness.

Practice

There are many benefits to be gained from expanding andragogic principles in our K-16 educational system to promote acquisition of 21st century skills for college and career readiness. Education that is accomplished through student-centric learning has many benefits for the learner. It is more likely to promote skills of critical thinking and problem solving, collaboration and communication, technology and information literacy, creativity and innovation, self-directedness, and provide greater relevance to the needs of the learner

(Gibbons, 2002; Trilling & Fadel, 2009; Robinson, 2011; Wagner, 2008, 2012; Zmuda, 2010).

In practice, moving teachers and students toward the principles of andragogy means that teachers will need to adjust their instructional methodology according to the needs of the students. Developing a culture that allows for shared responsibility in the planning and operating of the learning experiences may entail a major alteration of expectations and interactions for all involved (Fink, 2003; Fisher & Frey, 2010; Gibbon, 2002; Pew, 2007; Wagner, 2012). It is the underlying orientations of the teachers, the educational designers, that can shape the types of experiences students will encounter in the classroom to develop 21st century skills (Fink, 2003; Grow, 1991; Pew, 2007; Wagner, 2012).

Research

Further research on teachers' educational orientations should include extended observations of the teachers' classroom culture and their instructional activities. Although this study explored the educational orientation and readiness for 21st century teaching among educators in Private Christian schools, additional research, which would support or disprove the findings, is desirable. Implications for additional investigations are necessary in other venues of education, including public schools, charter schools, and higher education, in light of the demands for 21st century learning and skill-sets necessary for college and career readiness.

The overall significance of this study, based on the educational orientation among teachers and their perceived efficacy in developing classrooms that promote 21st century skill acquisition, will be to raise an awareness of where teachers are on the continuum of pedagogy and andragogy and allow educational leaders and teacher training programs to facilitate better preparation and training for meeting the learning needs of 21st century learners.

Reporting

Chapter One has been designed to set the stage for this study--background, problem, research questions, methods and significance. Chapter Two presents an extensive review of the literature to include the history of pedagogy; the development of andragogy; andragogy today; criticism of andragogy; the andragogy/pedagogy continuum; and 21stcentury skills and skills development. Chapter Three describes in detail the research methods including justification for the research design, a description of the population and sample, and the procedures for data collection and analysis. In Chapter Four, the data are presented through the voices of the participants. In Chapter Five, the results of the data analysis are presented. Finally, Chapter Six provides a summary of the findings and conclusion, implications with regards to the theoretical framework with recommendation for practice and future research, and closes with final thoughts about the study.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this chapter is to discuss the theoretical roots, research findings and the significance of popular theories of adult learning, and the development of current 21st century learning skills as related to this study. More specifically, this chapter focuses on the history of pedagogy, the development of andragogy (Knowles, 1975, 1978, 1980), the andragogy/pedagogy continuum, criticisms of andragogy, and concludes with an investigation of the current expected learning outcomes of 21st century skills.

History of Pedagogy

The pedagogical model of education was developed between the seventh and twelfth centuries as a philosophy based on certain assumptions about instruction and learning. The concept of organized education was first introduced by the Church during the middle ages with the establishment of monastic schools to prepare young men to become priests (Knowles, et al., 1998; Ozuah, 2005). A curriculum based exclusively on religious documents and doctrine was taught, however a prescribed instructional methodology had not yet been developed. Based on the observations by monks of how children learned simple skills in these monastic schools and taking into account the known basic characteristics of

children, a common teaching methodology was devised based on certain assumptions (Knowles, et al., 1998; Forrest & Peterson, 2006; Ozuah, 2005).

The first assumption was that children entering the monastic schools were believed to be reliant on the monks for their learning needs, implying that children could not know their own learning needs. The second assumption was the religious curriculum was viewed as the main focus of learning, not the student, placing the importance of the subject-oriented preparation for priesthood over the abilities of the learner. The third assumption was based on the observation that the driving force for learning by children was influenced by extrinsic motivators (rewards and punishment) rather than intrinsic motivators. The last foundational assumption was the monks regarded any prior experiences of the children entering the monastic school as inconsequential to the learning process, thus promoting the concept of tabula rasa or the blank slate (Conaway, 2009; Forrest & Peterson, 2006; Knowles et al., 1998; Ozuah, 2005).

These four assumptions had a profound influence on the design of the instructional model for education. With the focus of teaching predominately on children, the instructional model developed became known as *pedagogy,* taken from two Greek words *paid* and *agogus,* translated to mean “child” and “leader of” or “education of children” (Forrest & Peterson, 2006; Knowles, 1980; Ozuah, 2005). The pedagogic model is fundamentally a teacher-centric model that assigns

full responsibility to the teacher all decision making for learning content, method, timing, and evaluation (Holton & Swanson, 2011).

The central provider of formalized education remained in European religious institutions through the Middle Ages and into the Renaissance period when secular schools began to emerge (Knowles et al., 1998). It was the Puritans who brought to America the European concept of education with its deeply embedded theological principles. The Puritans believed the reading of the Bible offered salvation and established an educational system for children to teach the reading of the Bible and communal information (Conaway, 2009; Hiemstra & Sisco, 1990).

Later in the 18th and 19th centuries, the religious influence in education began to wane with the emergence of elementary public schools. However, the powerful influence exerted by the church on the instructional methodology for so long was difficult to overcome. The pedagogic methodology was adapted and reinforced for both the teaching of children and adults because it was the only existing educational model for teaching at that time (Conway, 2005; Hiemstra & Sisco, 1990; Ozuah, 2005). Ozuah (2005) writes, “Today many contend that the entire educational system has been frozen in the pedagogical approach, ever since the initial application of pedagogy in the eighteenth century” (p. 83). For educators, the persistent use of the pedagogic model in instruction has meant application of certain assumptions and principles that were formally established

for the child learner to also be applied to the adult learner(Conaway, 2009; Forrest & Peterson, 2006; Knowles, 1980;Ozuah, 2005).

Development of Andragogy

Even though the chief educational audience had been children, adult learners have existed for centuries. Andragogic concepts can be found in the teaching methods practiced by great teachers of ancient times, strategies that used an inquiry method and problem solving (Henschke, 1998; Henschke & Cooper, 2006). According to historians, Confucius in China and Jesus in biblical times, separately created the "case study" method where the leader of a group presents a situation (often in the form of a parable) and the group collaboratively explores possible solutions. Socrates, Aristotle, and Plato in ancient Greece practiced the Socratic method, similar to the "case study" and conducive to problem solving. Additionally, in Rabbinical schools, the use of "question and answer with more questions" to gain insight into the matter under investigation is considered a methodology that promotes problem solving and critical thinking (Henschke, 1998; Henschke & Cooper, 2006; Knowles, 1990; Knowles et al., 1998). Based on these instructional methods of inquiry and problem solving, "it is suggested they [ancient teachers] perceived learning as a process of active mental inquiry, not passive reception of transmitted content" (Henschke, 1998, p. 4) commonly associated with pedagogy, and they understood the need for adult learners to be

self-directed and autonomous in learning (Henschke, 1998; Knowles, 1980; Ozuah, 2005; Savicevic, 1991).

The institutional basis for adult learning was established in the late 18th and early 19th centuries when the need for a different model of instruction became evident, one that was oriented toward adult learners and their needs (Conaway, 2009; Savicevic, 1991). According to Savicevic (1991), Europe was faced with economic and political pressures for growth and teachers of adult learners found the customary pedagogical model failed to produce the needed results when applied to adult workforce. The subject-centered orientation of pedagogic teaching "looks to fill empty passive minds with the instructor's knowledge" (Forrest & Peterson, 2006, p. 114) and assumes that knowledge and learning is intended to for future application (Knowles, 1980). However, for change and needed productivity to occur in the workforce, educators began to realize the need for an orientation to teaching that facilitated immediate application of knowledge for adult workers to perform tasks or solve "real life" problems (Conway, 2009; Forrest & Peterson, 2006).

The idea of a world movement to improve adult education in the workforce and formalize a theory of adult learning "was born and took root" (Savicevic, 1991, p. 182) in Britain with the formation in 1919 of the World Association for Adult Education, based in London. Although other European countries were involved in developing a theory of adult learning, it was Germany

who played a crucial role in laying the foundations of andragogy and posing adult education as the only method for the Germans to regenerate themselves and their country following the devastating effects of World War I (Henschke, 1999; Savicevic, 1991). The nationwide implementation of andragogy, known as the Workers Education Movement, was based on premise of "historical thinking," an essential element of andragogy that analyzes historical events so that one learns from experiences and past failures are not repeated (Henschke, 1999).

It was Edward Lindeman, an American philosopher, who first introduced the term *andragogy* to America in 1927, following a trip to Germany where he became acquainted with the Workers Education Movement (Knowles, 1978, 1980; Henschke, 2009).Several significant events occurred to develop the field of adult education in America during the 1920s. The American Association for Adult Education was formed in 1926 with the first adult vocational-training programs offered in public schools (Savicevic, 1991). Soon after, Lindeman, with his publication *The Meaning of Adult Education,* proposed several assumptions of adult education, including an approach to adult learning that was oriented to real-life problem-solving rather than subject-oriented. He was a strong advocate of student-centric learning and the role of experience in providing meaning to life events. The development of the adult education principles would be based upon Lindeman's fundamental assumptions of adult learning (Conaway, 2009; Henschke, 2009; Knowles, 1978; 1980; Ozuah 2005; Pattison, 1999). It is

interesting to note that Lindeman did not "dichotomize adult versus youth education, but rather adult versus 'conventional' education" (Holton &Swanson, 2011, p. 39), implying that young learners might also learn better when student-centric practices are taken into account.

The interest in adult education waned for several decades as the focus turned to the events of World War II. Following the war and the passing of the GI Bill, the andragogic movement once again moved to the forefront of the political and economic situation. Two important movements in the 1950s that impacted education and schools of education, humanism and progressivism, set the stage for renewed interest in adult educational reform (Conaway, 2009; Sopher & Henschke, 2011; Zmeyov, 1998).

The humanistic movement, with its focus on the development of the individual, assumed that people have a natural propensity for learning given the right environment (Brockett, 1997; Ozuah, 2005; Sopher & Henschke, 2011). The underlying assumption of the humanist philosophy is that education should be learner-centered and adjust to the needs of the learner. Theoretical principles of the humanist philosophy implied that the individual is responsible for their own personal development in terms of taking control of one's own learning and that learning should be facilitated rather than taught. These principles not only supported certain andragogical assumptions of adult learners (Brockett, 1997; Sopher & Henschke, 2011; Zmeyov,1998), but Knowles himself indicated that his

theory of adult learning was influenced by humanist ideals(Conaway, 2009; Knowles, 1990; Knowles et al., 1998).

At the heart of the progressive movement was educational reform that also had a great impact on the development of the adult learning theory (Labaree, 2005; Sopher & Henschke, 2011; Weiss, Defalco, & Weiss, 2005). Educational theorist and foremost progressive advocate John Dewey provided support for andragogical principles through the promotion of child-centered instruction, the teacher as a guide or resource, and shared decision-making of the learning experiences with the student. Other proponents of progressivism advocated the application of learning to social action on real world, and sometimes controversial, issues and problems (Labaree, 2005; Weiss et al., 2005). This focus to bring about social change through education paralleled the original drive of the adult learning theory introduced in the early 1900s. Progressive principles are firmly embedded in the development of the adult learning theory in terms of student-centric learning, teacher as facilitator, shared learning goals, and education as an instrument of social change (Conaway, 2009; Knowles, 1980; Labaree, 2005; Ozuah, 2005).

Andragogy Today

"The central question behind the study of how adults learn has been the focus of researchers and educators since the formation of adult education as a professional field of practice in the 1920s" (Merriam, 2001, p. 3). Although the

process of understanding how adults learn and the accompanying teaching methodologies have long been a concern (as previously written), it was the work of Malcolm Knowles and his theory of andragogy that brought this concept and approach to adult learning to the attention of American scholars (Knowles, 1975; 1978; 1980). In the 1970s, Knowles and other educators began promoting the idea that the process of education needed to move away from a teacher-centered, direct instructional learning approach to one more learner-centered, providing students with more autonomy in their learning, especially in the area of adult education (Knowles, 1978).

Assumptions

In 1968, Knowles introduced the term andragogy as "a new label and a new technology" that has become associated with a particular approach to adult education (Bedi, 2004). Knowles defines the term andragogy as "the art and science of helping adults learn" (Knowles, 1980, p.43) in contrast to the term pedagogy, the art and science of helping children learn. Pedagogy is based on the assumption that for learners to progress through the educational process, they only need to know what their teachers impart and that there is a summative quality to learning (Bedi, 2004; Holton & Swanson, 2011). According to educational theorists, pedagogy is teacher-centric and subject-oriented and suggests five assumptions about learners (Knowles, 1978, 1980; Hiemstra & Sisco, 1990):

1) Learners have a dependent personality, relying on the teacher/trainer to take responsibility for making decisions about what is learned, how and when it should be learned and whether it has been learned.
2) Learners enter into an educational activity with little experience that can be used in the learning process.
3) Learners are ready to learn when they are told what they have to learn in order to advance to the next grade level or achieve the next salary or job level.
4) Learners enter into an educational activity with a subject-centered orientation.
5) Learners are motivated to learn primarily by external pressures from parents, teachers/trainers, employees, the consequences of failure, grades, certificates, etc.

Using the foundations of modern adult learning theory as developed by Lindeman, Knowles conceived his original andragogic model based on four crucial assumptions about the characteristics of adult learners as they relate to the learner's dependency, life experiences, readiness to learn, and orientation to learning (Knowles, 1978; 1980). Knowles would later added two more assumptions to complete his model as seen today; internal motivation for learning

and the need to know why something must be learned (Knowles et al.,1998). For Knowles, as a person matures:

1) his self-concept moves from one of being a dependent personality toward one of being a self-directed human being;
2) he accumulates a growing reservoir of experience that becomes an increasing resource for learning;
3) his readiness to learn becomes oriented increasingly to the developmental tasks of coping with real life situations and problems;
4) his time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly his orientation toward learning shifts from one of subject-centeredness to one of problem-centeredness;
5) his motivation to learn increasingly moves from extrinsic to intrinsic; and
6) his need to know and/or justification for learning becomes increasingly important.

Principles

Based on the six assumptions of adult learners, Knowles further developed his theory to differentiate what educators must do to successfully teach these learners. These six principles of adult learners serve as the “core principles that

strengthen the theory by their applicability to all adult learning situations" Knowles et al., 1998, p.2). For the educator, the focus of the learning needs analysis, curriculum design, delivery, and assessment must shift from a subject-driven, teacher-centric approach traditionally identified with pedagogy to a learner-centric approach where students share in the planning and operating of the learning experience (Knowles, 1980).

Self-Directed Learning**.** The first and basic principle of andragogy, self-directed learning, assumes the adult learner "can and do[es] engage in taking control of their learning, assume ownership for their learning, are capable of weighing different learning strategies they feel are best for their particular learning needs, and can motivate themselves to engage and complete a learning task" (Knowles et al., 1998, p. 135-136). The role of the teacher would be to engage in the learners in a process of mutual inquiry rather than the transmission of knowledge with assessment of the learners' conformity to the prescribed learning.

Firmly entrenched in contemporary thinking about adult education (Henschke, 1998; Henschke & Cooper, 2006; Merriam, Caffarella & Baumgartner, 2007), the concept of self-directed learning has received the most attention and debate in terms of adherence to andragogic principles while producing some of the most important developments in the area of andragogical study (Merriam et al., 2007). Although conflicting data exists regarding the "one

size fits all" aspect of self-directed learning for adults, this principle remains central to the concept of adult learning (Merriam, 2001).

Experience**.** The second core principle of andragogy is that "an adult accumulates a growing reservoir of experience which is a rich resource for learning" (Merriam & Caffarella, 1999, p. 272) and can shape the learning outcomes. It is this accumulation of valuable life experiences that separates the adult learner from the child learner and augments what is presented in the classroom, serving as a point of reference to relate all new learning (Knowles et al., 1998). For the instructor, the core methodology should employ experiential techniques that include problem-solving activities, case studies, hands-on laboratory methods, and large and small group discussions (Holton & Swanson, 2011; Ozuah, 2005).

However, as expressed by Cranton (2002), experiences can also hinder learning based on pre-determined expectations because adults may be more comfortable with traditional methods of teaching and learning or their past educational experiences may not have been optimal. Based on past experiences, these expectations of the learner can negatively affect learning process and influence their attitudes about learning (Grow, 1991; Knowles et al., 1998). However, the adult education professional can learn to effectively draw upon these experiences to enable students to actively participate in the educational

process and move them toward more positive learning experiences and self-directed learning (Cranton, 2002; Pew, 2007).

Readiness to Learn**.** The third core principle of readiness to learn assumes the adult becomes ready to engage in a learning activity "when their life situation creates a need to know" (Knowles et al., 1998, p. 144) in order for them to effectively cope with the situation. This principle is also dependent on an appreciation of the relevancy of the topic (Ozuah, 2005). An important aspect of readiness to learn is the developmental task linked with moving from one phase in life to another. Several studies have indicated life transitions, in particular career transitions, readiness to improve professional growth, immediate and long-range economic security, and improved social status and prestige, serve as sources for this principle. In addition, proponents of andragogy have found readiness to learn is influenced by freedom of choice in regard to what is learned and how that learning assists in performing the roles and tasks required by adulthood (Holton & Swanson, 2011; Knowles, 1980; Merriam & Caffarella, 1999).

According to Knowles et al. (1998), it is not necessary for the educator to wait passively for this aspect of andragogy to development naturally. But rather, readiness to learn can be cultivated through the use of career counseling, simulation activities, role playing, and other techniques that apply learning to real life situations.

Orientation to Learning**.** After years of a pedagogical approach to learning that promised future application to concepts learned, Knowles et al. (1998) described orientation to learning, or problem solving, as the immediate need for adults to apply learning to life or task-centered problems. The assumption of this premise is that adult learners generally prefer a problem-solving approach to learning rather than a subject-oriented approach. For the educator, this indicates that more effective learning will occur when the adult learner can transfer the new knowledge to actual problems or situations they might encounter (Henschke,1998, 2009; Knowles, 1980; Knowles et al., 1998). In addition, research indicates that adults are more prone to engage in education that will improve occupational performance or enhance competence or satisfaction in their current roles (Merriam & Caffarella, 1999).

Motivation to Learn**.** The fifth core principle of andragogy is motivation to learn and is determined by the degree to which adult learning results in a solution to a "problem in life or its payoff" (Knowles et al., 1998, p. 149). Although there is no one absolute motivational factor for adults, research has found that adult learners' motivation to participate in a learning activity is directly related to internal pressures that include the desire for self-esteem and goal attainment, quality of life, and the extent of the connection of learning to life and work (Holton & Swanson, 2011; Knowles et al., 1998; Ozuah, 2005). Knowles et al. (1998) suggests that "the andragogical model predicates that the more potent

motivators are internal including self-esteem, recognition, better quality of life, greater self-confidence, and self-actualization" (p. 12). Adult learner motivation has been described as complex and subject to change (Merriam & Cafarella, 1999). However more recent research indicates four essential conditions that learners and teachers can create to enhance motivation to learn in students of all ages and support andragogic principles:

1. establishing inclusion: creating a learning atmosphere in which learners and teachers feel respected and connected to one another;
2. developing attitude: creating a favorable disposition toward the learning experience through personal relevance and volition;
3. enhancing meaning: creating challenging and engaging learning experiences that include learners' perspectives and values; and
4. engendering competence: creating an understanding that learners are effective in learning something they value (Wlodkowski, 2008, p. 114).

Need to Know**.** The last principle of andragogy and most recently adopted by Knowles, need to know and/or justification for learning, has been examined on three levels or dimensions (Knowles et al., 1998). The first level encompasses the adult learners' need to know how learning is conducted, followed by the need to know what learning will occur, and finally, knowing why learning is important at all. Adults will devote considerable energy in weighing the benefits they will gain

from the learning with the negative consequences of not learning it. The role of the facilitator is to bring about an awareness of the need to know and provide real or simulated experiences where learners discover for themselves the gaps between where they are and where they want to be (Holton & Swanson, 2011). According to Knowles et al. (1998), fulfilling the need to understand the purpose behind the learning experience can result in more effective mutual planning of the learning experience, increase motivation to learn, and more positive post-training results.

The table below provides a comparison of the properties of pedagogy and andragogy as developed by Jarvis (1991, pp. 176-177) and based on Knowles' assumptions of adult learning (Holton & Swanson, 2011, pp. 63-67):

Table 2.1 Comparison of Pedagogy and Andragogy Assumptions

Regarding	Pedagogy	Andragogy
The concept of the learner	The learner is a dependent one. The teacher is expected by society to determine what is to be learned, when it is learned, how it is to be learned, and if it has been learned.	The learner should move from dependency toward increasing self-directedness as a normal process of maturation. Teachers should encourage and nurture this movement. Adults have a psychological need to be generally self-directed, though they may temporarily be dependent under certain situations.

Table 2.1 Continued		
The role of learner experience	The experience that learners bring with them is of little worth. Though it is used, as a starting point, but the experience, which he or she gains from most, is that of the teacher, textbook writer, audio-visual aids producer, and other experts. Accordingly, the main techniques in education are transmittal techniques: lecture, assigned reading, and audio-visual presentations.	As people grow and develop, they accumulate an increasing reservoir of experience that becomes an increasing source of learning; for themselves and others. Adults attach a lot of meaning to learning they gain from experience rather than those they acquire passively. Accordingly the main techniques used in their education are experiential for example laboratory experiments, discussions, problem solving cases, simulation exercises, etc.
Readiness to learn	People are ready to learn what society and especially schools determine what is learned, provided the pressures on them to learn are great enough. Learners of the same age have to learn more or less the same standardized curriculum with a uniform step-by-step progression for all learners.	People become ready to learn something when they experience a need to learn it to cope more satisfyingly with real life tasks or problems. The educator has the responsibility to create conditions and provide tools and procedures for helping learners discover their “need to know”. Programs therefore should be organized around life application categories and sequenced according to the learner readiness to learn.

Table 2.1 Continued		
Orientation to learning	Learners see education as a process of acquiring subject matter content which most understand will be useful only at a later time in life. Accordingly the subject matter should be organized into subject matter units, which follow the logic of the subject. Students are subject centered in their orientation to learning.	Learners see education as a process of developing increased competence to achieve their full potential in life They want to be able to apply whatever knowledge and skill they gain today to living more effectively tomorrow. Learning experiences should be organized around competency–developed categories. Adults are performance centered in their orientation to learning.
Need to Know	Learners only need to know that they must learn what the teacher teaches if they want to pass and get promoted; they do not need to know how what they learn applies to their lives.	Adults need to know why they need to learn something before undertaking the learning. Adults will invest considerable energy in weighing benefits they will gain from the learning and the negative consequences of not learning it. The role of the facilitator is to bring about an awareness of the need to know and provide experiences where learners discover for themselves the gaps between where they are and where they want to be.

Table 2.1 Continued		
Motivation	Learners are motivated to learn by external motivators: grades, the teacher's approval or disapproval, parental pressures.	For the adult learner, the most potent motivators are internal pressures: the desire for increased job satisfaction, self-esteem, quality of life, etc. When adults experience the need to enhance or change their situation, motivation to learn propels them toward a task or problem-centered orientation to learning.

Research supports the use of andragogic teaching approaches in developing autonomous learning and promoting student innovation and creativity. According to proponents of andragogy (Merriam, 2001; Merriam & Caffarella, 1999; Henschke, 2009; Henschke & Cooper, 2006) andragogic-oriented teaching methodologies are more learner-centered in nature and often include opportunities for group collaboration, projects that examine real-world problems and extend beyond one discipline, opportunities for peer-to-peer and outside-of-school communication and presentation, and experiential learning. According to Knowles (1980, pp. 57-58), learning conditions and teaching principles that lead to optimal student learning are presented below:

Table 2.2 Knowles' Teaching Principles and Learning Conditions

Conditions for learning	Principles of teaching
The learners' need to learn	1. The teacher exposes learners to new possibilities for self-fulfillment. 2. The teacher helps learners to clarify their own aspirations for improved behavior. 3. The teacher helps learners to diagnose the gap between their aspirations and their present level of performance. 4. The teacher helps learners to identify life problems they experience because of the gaps in their personal equipment.
The learners' environment is characterized by physical comfort, mutual trust and helpfulness, freedom of expression and acceptance of differences,	5. The teacher provides physical conditions that are comfortable and conducive to interaction. 6. The teacher accepts and treats learners as persons of worth and respects their feelings and ideas. 7. The teacher seeks to build relationships of mutual trust among learners by encouraging cooperative activities, helpfulness and refraining from inducing competitiveness and judgmental. 8. The teacher exposes his or her own feelings and contributes resources as a co-learner in the spirit of mutual inquiry.
The learners perceive the goals of learning experience to be their own.	9. Involves learners in a mutual process of formulating learning objectives in which the learner, institution, teacher, subject matter and society are taken into account. The learners perceive the goals of learning experience to their goals.
The learners accept a share of the responsibility for planning and operating a learning experience and therefore have a feeling of commitment toward it.	10. The teacher shares his or her thinking about options available in designing of learning experiences and the selection of materials and methods; involves the learners in deciding among these options jointly.

Table 2.2 Continued	
The learner participates actively in the learning process.	11. The teacher helps learners to organize themselves (learning teams, independent study) to share responsibility in the process of mutual inquiry.
The learning process is related to and makes use of the experience of learners.	12. The teacher helps learners use their experiences as resources for learning through the use of such as techniques as discussions, role play, case method etc. 13. The teacher gears presentation of her/his own resources to the levels of experience of particular learners. 14. The teacher helps learners to apply new learning to their experience, and thus make the learning more meaningful and integrated.
The learners have a sense of progress towards their goals.	15. The teacher involves learners in devising criteria and methods to measure progress. 16. The teacher helps learners to develop and apply procedures for self-evaluation according to these criteria.

Criticism of Andragogy

The 1970s and 1980s saw a rise in the popularity of andragogy as it quickly became "the best known 'theory' of adult learning" according to Merriam and Caffarella (1999, p. 249). However, the theory also caused "more controversy, philosophical debate, and critical analysis than any other concept/theory/model proposed thus far" (1999, p. 250) and "few studies have attempted" empirical investigation (p. 251). Much confusion and resulting debates have been situated around not only the use of the word *science* and its' intended empirical efficacy in Knowles' definition of andragogy, but also in the

philosophical underpinnings of the concept (Savicevic, 1999). If Knowles had intended that his theory was scientific, then "subsequent researchers should be expected and indeed have the obligation to examine the validity of a theory that has had such a pervasive influence in the field of adult education" (Rachal, 2002, p. 211). However, according to Rachal, the extensive writing on the subject of andragogy has tended to obscure experiential investigations, and "most of the latter have been dissertations which rarely reach a wide audience" (2002, p. 211).

Empirical investigations have been further impeded by the lack of clear meaning as to what processes actually constitute andragogical practice. Knowles implemented andragogic practices through the use of learning contracts where responsibility for learning goals and objectives, evidence and criteria for learning, and other educational processes were all shared by the teacher and the learner. However, educational effectiveness is generally determined by learner achievement resulting in the acquisition of new knowledge that is largely measured by tests and grades. It is this type of measurement that becomes the "catch-22" embedded in the concepts of andragogy because for Knowles, "tests and grades are anathema to the very idea of andragogy" (Rachal, 2002, p. 211).

Added to this debate is whether or not andragogy can be considered a theory when one considers that an operational, researchable definition of andragogy eludes researchers (Rachal, 2002). Merriam (2001) reports that, given the lack of an operational definition, some researchers question whether

andragogy can even be considered a theory or perhaps it is just principles of good practice of what adult learning should be like. For others, the problem with an operational definition tends to be that the art of andragogy may be dominant over the science.

Even Knowles himself called attention to “two streams of inquiry” (Holton & Swanson, 2011, p. 35) that were discernable during the founding of the American Association for Adult Education in 1926. One stream was based on the scientific perspective of Edward Thorndike and the other stream on the artistic perspective of Edward Lindeman. In an article published in 1978, Knowles described the difference between the scientific stream, which seeks to discover new knowledge through rigorous and often experimental investigation, and the artistic stream, which seeks to discover new knowledge through insight and the reflections on experience (Holton & Swanson, 2011, p. 35). It is possible that one can conclude from this article that the key assumptions of the adult learning theory developed by Knowles were more largely based on the artistic stream as proposed by Lindeman (Knowles et al., 1998).

Whatever the controversy surrounding the “theory,” andragogy’s impact on the educational philosophy and instructional methodology for adult education cannot be underestimated. And evidence is emerging that andragogy’s principles are making an impact on the educational theory and practice in elementary, secondary, and collegiate education both in the United States and abroad (Fink,

2003; Gibbons, 2002; Holton & Swanson, 2011; Knowles et al., 1998; Merriam, 2001).

Pedagogy and Andragogy Continuum

Based on the history and development of andragogy from an educator's perspective, it is not difficult to determine why students enter secondary education with a teacher-centric and teacher-dependency mindset. Research indicates that principles of both andragogy and pedagogy should serve as foundational theory for student-centric learning and motivation in secondary and higher education (Grow, 1991; Pew, 2007; Serim, 2010; Wlodkowski, 2008). According to Pew (2007), however educators approach student-centric motivation for learning, be it intrinsic or extrinsic, their approach is determined in part by the andragogical or pedagogical orientations of the professor's teaching practices and the students' readiness for student-centric learning. Difficulty arises when pedagogic methods are applied wholly or partially to situations that necessitate andragogic principles.

Earlier journal writings and books by Knowles (1975; 1978) indicated a dichotomous distinction between andragogy and pedagogy. However, after conversations with teachers experimenting with the concepts of andragogy in elementary and secondary schools and "achieving superior learning" (Knowles, 1980, p. 42), the later edition of his book suggested his thinking had changed to the point that he wrote

> …andragogy is simply another model of assumptions about adult learners to be used alongside the pedagogical model of assumptions, thereby providing two alternative models for testing out the assumptions as to their "fit" with particular situations. Furthermore, the models are probably most useful when seen not as dichotomous but rather as two ends of a spectrum, with a realistic assumption (about learners) in a given situation falling in between the two ends (p. 42).

The results of this acknowledgement by Knowles resulted in andragogy becoming more defined by the specific learning situation than by the learner and therefore not unique to adults (Merriam & Caffarella, 1999; Grow, 1991; Pratt, 1998).

However, for some such a relationship between pedagogy and andragogy depicted as being on a continuum appears to some as somewhat simplistic. Based on the paradigm shift of thought for leadership and management theories, from opposing dichotomies to acceptance of a continuum and finally leading to an orthogonal relationship, Delahaye et al., (1994) posed the possibility of a more complex relationship between pedagogy and andragogy than one of a continuum. Using Hersey and Blanchard's Situational Leadership model, the finding of the Delahaye et al., study was the relationship between an andragogical orientation and a pedagogical orientation is not always based on a continuum but can also be considered orthogonal. This indicates that an individual can be located within a two-dimensional space that is bounded by andragogy on one side and by

pedagogy on the adjoining side, while reflecting learner maturity (high to low) across the bottom. Therefore, a learner can be considered high andragogy and low pedagogy in stage 3 (with the opposite holding true in stage 1) but can also be considered high pedagogy, high andragogy (stage 2) as well as low pedagogy, low andragogy (stage 4) similar to the Hershey and Blanchard's orthogonal relationship with the four leadership styles (Delahaye et al., 1994).

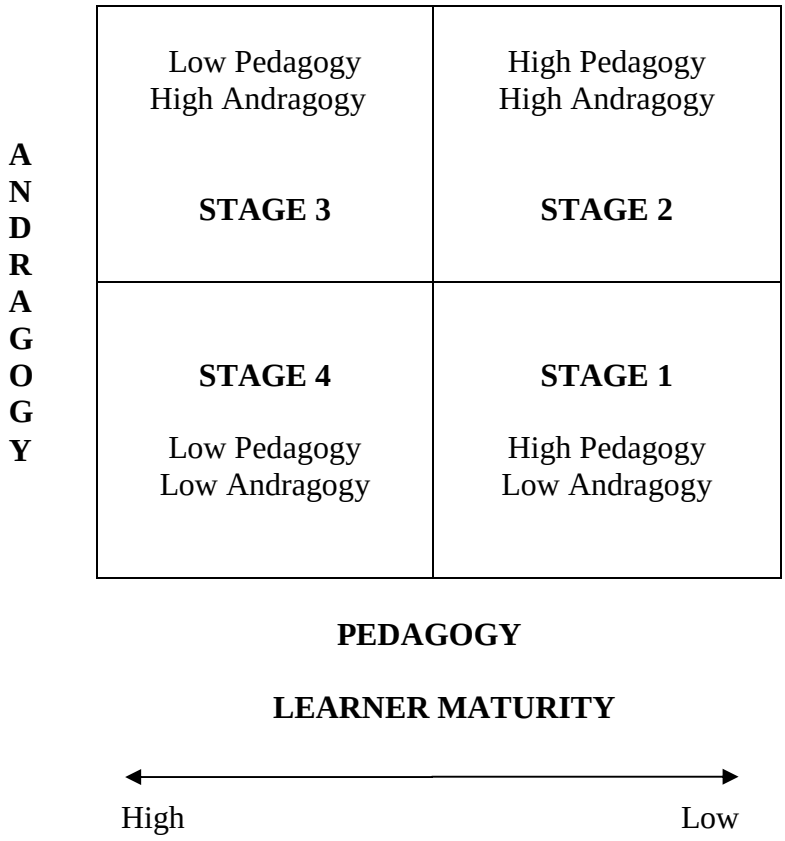

Figure 2.1 Four Stages of Learning (Delahaye et al., 1994)

Similar studies have also used key concepts from the situational model developed by Hersey and Blanchard (Pratt, 1988; Grow, 1991). Pratt (1988) explored andragogy as a relational construct and the roles teachers should take with students with differing needs of support and direction. Pratt viewed the comparison between andragogy and pedagogy as one with variations in learner dependency with respect to specific situations as well as the relationship between the teacher and learner. The results were reported using an orthogonal relationship that reflected the variations in learner dependency (low to high) across the bottom and using the two dimensional space with support (low to high) on the vertical axis and direction (low to high) on the horizontal axis. According to Pratt (1988), pedagogical relationships, quadrants one and two, are appropriate when learners are dependent on the teacher for direction. Andragogical relationships, quadrants three and four, are appropriate when learners can be more self-directed and may or may not need instructor direction. The following figure depicts the pedagogical and andragogical relationships described by Pratt (1988):

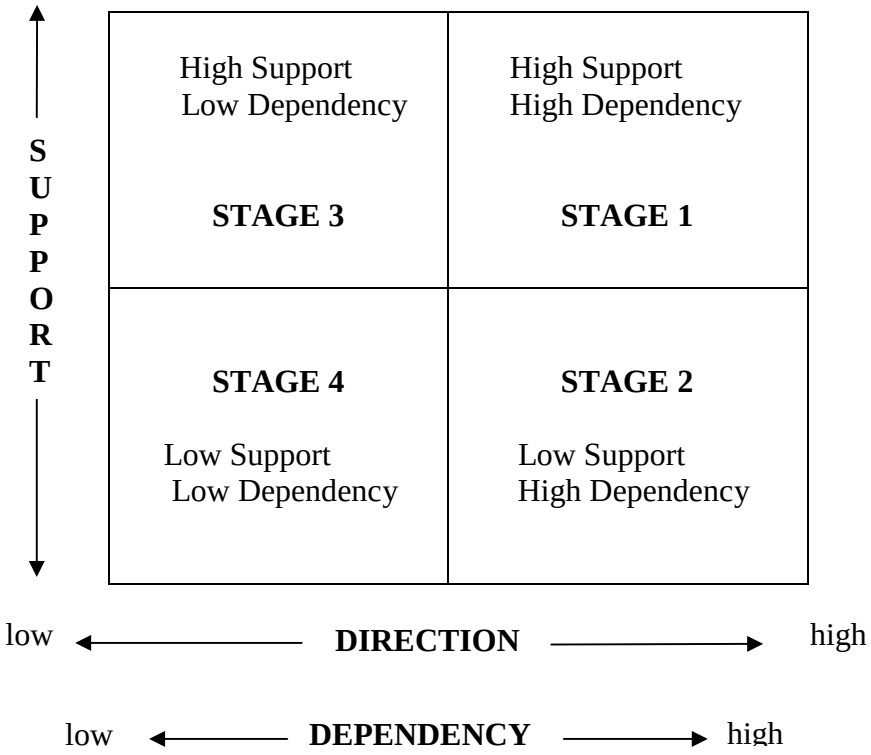

Figure 2.2 Pedagogical and Andragogical Relationships (Pratt, 1988)

Grow (1991) developed his model, the Staged Self-Directed Learning Model (SSDL), to suggest how teachers can actively equip students to become less dependent on the teacher and more independent and self-directed in their learning. Just as Hershey and Blanchard argued that management style should be situational and matched to the employee's "readiness," by extension, according to Grow, so should teaching styles. The SSDL model (see Table 2.5) assigns stages to the learner (1-4 with varying degrees of dependency on the teacher) and roles to the teacher that match the stage of the learner (authority, motivator, facilitator and consultant).

Table 2.3 Grow's Staged Self-Directed Learning Model (1991)

	Student	**Teacher**	**Examples**
Stage 1	Dependent	Authority, Coach	Coaching with immediate feedback. Drill. Informational lecture. Overcoming deficiencies and resistance.
Stage 2	Interested	Motivator, guide	Inspiring lecture plus guided discussion. Goal-setting and learning strategies.
Stage 3	Involved	Facilitator	Discussion facilitated by teacher who participates as equal. Seminar. Group projects.
Stage 4	Self-directed	Consultant, delegator	Internship, dissertation, individual work or self-directed study-group

For Grow (1991) "the goal of the educational process is to produce self-directed, lifelong learners" (p.127), one of the chief principles of andragogy (Knowles, 1975). However, many current educational practices in schools and universities do more to perpetuate student dependency on the instructor than to promote self-direction and concepts associated with student-centric learning. Added to these educational practices are the problems that arise when instructor's teaching style is not congruent with the learner's degree of instructor dependence/independence (Grow, 1991; Pew, 2007). According to Grow (1991), teaching styles should be governed by more than just the subject matter, to

include a balance between teacher directedness and student control, usually set by the student's ability to participate as a self-directed, self-motivated, responsible learner.

For the purposes of the study, the use of the andragogy/pedagogy continuum was used with the belief that experienced teachers are able to recognize their orientation to teaching, identify 21st century student needs, and apply the relational construct of students' needs to the teacher's orientation to teaching.

21st Century Skills

Changes in recent decades have brought about global foundational shifts—widespread advances in technology and communications, booming economic developments and increased competition, and the escalation of global challenges. The call continues today for improvement and school reform by leaders to better prepare our students to meet the higher educational demands of life and work in the 21st century (Tilling & Fadel, 2009; Wagner, 2008; Zhao, 2009). Among the call for change is the demand for schools to revise instructional methodology and the focus of curriculum to meet the demands of a 21st century, information-based society (Schoen & Fusarelli, 2008; Partnership for 21st Century Skills, 2009; Trilling & Fadel, 2009) while remaining accountable to the public for student performance through standardized testing (Schoen & Fusarelli, 2008).

A study conducted in 2006 asked executives of major corporations if college graduates are ready for the workplace and the overwhelming response was "not really." Executives reported that students graduating from secondary schools, technical colleges, and universities are lacking in some basic skills and a large number of applied skills: oral and written communication; critical thinking and creative problem solving; professional and work ethic; teamwork and collaboration; working in diverse teams; applying technology; and leadership and project management (Trilling & Fadel, 2009). Michael Dell, CEO of Dell, Inc. reports

> Reading, math and science are the foundations of student achievement. But to compete and win in the global economy, today's students and tomorrow's leaders need another set of knowledge and skills. These 21st century skills include the development of global awareness and the ability to collaborate and communicate and analyze and address problems. And they need to rely on critical thinking and problem solving to create innovative solutions to the issues facing our world. Every child should have the opportunity to acquire and master these skills and our schools play a vital role in making this happen. (Partnership for 21st Century Skills, 2007,p. 4)

According to Trilling and Fadel (2009), the role and purpose of education in an evolving society is to empower for contribution to work and society;

exercise and develop personal talents; fulfill civic responsibilities; and forward traditions and values. The challenge is how to meet these universal needs as our society has moved from an Agrarian Age, through the Industrial age, to the recently arrived Knowledge Age (Trilling & Fadel, 2009). The basic skills, once in high demand for workers, are no longer what matter most. There are fewer tasks required in the workforce today using routine skills and those tasks are often done by computers (Silva, 2008). Wagner (2008) states it in this way,

> …work, learning, and citizenship in the 21st century demand that we all know how to *think*—to reason, analyze, weigh evidence, problem-solve—and to *communicate effectively.* These are no longer skills only the elite in a society must master; these are essential survival skills for all of us (p. xxiii).

Over the past decade, state and government agencies have paid considerable attention to the standards or benchmarks students need to master without addressing the more complex thinking and technical skills that will govern our 21st century world. Today's standards cover core subjects only, cover too many topics superficially, focus on lower levels of Bloom's taxonomy, and compartmentalize knowledge into subject-specific disciplines—all of which can be measure by current standardized high-stakes testing (Darling-Hammond, 2002; Jacobs, 2010; Marzano & Kendall, 2007; Partnership for 21st Century Skills, 2007).

Much of the issue revolves around the sheer volume of material that most standards documents deem essential. Researchers at the Mid-Regional Educational Research Lab have determined it could take as much as 22 years of school to adequately cover content identified in typical standards (Marzano & Kendall, 2007). These "mile-wide, inch-deep standards" do not promote student learning (Darling-Hammond, 2002) and teachers are challenged to know what to focus on or where to direct their students' efforts (Collins & Halverson, 2009; Partnership for 21st Century Skills, 2007; Taylor & Fratto, 2012).

Despite increased accountability and growth of standards-based reform, there continues to be ample evidence American students need better preparation for competing in the new global economy (Collins & Halverson, 2009; Stewart, 2012; Wagner, 2008; Zmuda, 2010). Recent reports issued by American College Testing (ACT, 2008, 2010) identified adopted state standards as a major contributor to the gap between what high schools are teaching and what colleges want incoming freshman to know. In response to their studies, ACT has developed the *ACT's College Readiness System; Meeting the Challenge of a Changing World* (2007), a system that stresses the responsibility of K-12 education to graduate students ready for the demands of postsecondary education and provides benchmarks and assessments (EXPLORE, PLAN, and the ACT) that allow states to monitor students' college readiness beginning in eighth grade.

It is interesting to note an additional ACT report, *Ready for College and Ready for Work: Same or Different?*(2006), provides empirical evidence that today's high school students need to be educated in comparable levels of readiness for reading and math whether they are planning to enter college or the workforce. From the perspective of ACT, our students today need these 21st century skills to succeed in postsecondary education and training, leading to better jobs and greater career options.

President Obama has addressed the demand for preparing our students for the 21st century global society in his newly released *Blueprint for Reform: The Reauthorization of the Elementary and Secondary Education Act* (U.S. Department of Education, 2010). This education blueprint would replace the No Child Left Behind Act requirement that every American child reach proficiency in reading and math by 2014 with a new national target that could prove just as intangible, that all US students graduate from high school prepared for college and/or a career by 2020. The administration's plan helps facilitate programs such as "expanded learning time schools" by redesigning the 21st Century Community Learning Centers program, a program that provides academic enrichment opportunities during non-school hours to students attending low-performing schools, and ensures these schools receive the needed support services to make their schools successful (Brown, 2010).

The President's blueprint calls for all states to adopt state-developed standards that build toward college-and career-readiness. Building on these statewide standards and better assessments to measure student progress,

> every state will ensure that its statewide system of accountability rewards schools and districts for progress and success, requires rigorous interventions in the lowest-performing schools and districts, and allows local flexibility to determine the appropriate improvement and support strategies for most schools. (U.S. Department of Education, 2010, p. 8)

While this push toward college and career readiness to meet the demands of our 21st century society is encouraging, according to Brown (2010), the Obama administration appears to be taking a much more targeted approach than NCLB to holding low-performing schools and districts accountable for student achievement.

Although there are several prominent 21st century skills frameworks that share commonalities related to the identified skill-sets our students need for success in the global market (Lemke et al., 2003; Partnership for 21st Century Skills, 2007; Wagner, 2008), for purposes of this study the 21st century skills and abilities identified and adopted by Colorado Department of Education (CDE, 2009) in their desire to develop students as life-long learners, with be used: critical thinking and reasoning, research and information fluency, collaboration and communication, creativity and invention, and self-directed learning.

Critical Thinking and Reasoning

According to Trilling and Fadel (2009), "critical thinking and problem solving are considered by many to be the new basics of 21st century learning" (p. 50). Studies indicate a combination of basic skills combined with higher-order thinking skills provide students the necessary tools they will need to adjust to future trends (Collins & Halverson, 2009; Partnership for 21st Century Skills, 2009; Trilling & Fadel, 2009; Wagner, 2008). Research in cognitive processes has challenged a conventional principle of teaching, that students must master specific content before they can make application of the content. The research provides evidence that using knowledge as it is being learned, applying skills like critical thinking and reasoning, and creative problem solving to content knowledge, increases motivation and improves learning outcomes (Partnership for 21st Century Skills, 2009; Trilling & Fadel, 2009;Wagner, 2008; Zmuda, 2010).

Critical thinking not only requires students to evaluate, weigh ideas and claims, and assess the validity of the ideas presented, but it also requires the ability to challenge the rationality of one's own thinking. The ability to ask significant questions and solve different types of problems using both conventional and nonconventional methods is a crucial skill in the workforce today (Kay, 2010; Partnership for 21st Century Skills, 2009; Wagner, 2012). Although an essential skill for students, business leaders today report that recent

high school graduates are deficient in both critical thinking and problem solving abilities (Kay, 2010; Trilling & Fadel, 2009; Wagner 2008).

The ideas of critical thinking and reasoning are not new to the educational process; however the ability to teach and model higher-order thinking remains an enigma for many educators teaching in 21st century schools using 20th century methods (Darling-Hammond, 2010; Taylor & Fratto, 2012). While teachers aspire to teach critical thinking, reasoning, and problem solving, a continued emphasis on high stakes testing and the resulting "teach to the test" instructional strategy continues to distance a teacher's ability to develop 21st Century skills. According to Barell (2010), these skills "are more crucial now than ever before" (p. 176) and along with others, recommends curricula designs that include student-driven, teacher facilitated problem-based/project-based learning to facilitate the development of critical thinking, reasoning, and problem solving skills (Barell, 2010; Bell, 2010; Jacobs, 2010; Trilling & Fadel, 2009).

Communication and Collaboration

"It is possible that collaboration is one of the most important 21st century skills. We need to prepare students how to manage their own work within a team setting and how to organize and manage global communications" (November, 2010, p. 281). Communication and collaboration have moved beyond our educational basics of good communication—articulating thoughts and ideas clearly through speaking and writing. The development of Web 2.0 and the

demands of our times "call for [a] much wider and deeper personal portfolio of communication and collaboration skills to promote learning" (Trilling & Fadel, 2009, p. 54). Today's graduates can no longer depend on a degree in a particular area of study as a guarantee of employment. Essential requirements for the 21st century workforce include demonstrating the ability to work effectively in diverse groups; exercising flexibility and willingness to make necessary compromises to achieve a common goal; and assuming shared responsibility for collaborative work, all with less supervision (Kay, 2010; Partnership for 21st Century Skills, 2009; Trilling & Fadel, 2009; Wagner, 2008).

Traditional education, with a focus on individual's tests, quizzes, and worksheets, has a difficult time promoting the critical skills of effective communication and collaboration for the 21st century. These skills can be learned through a variety of methods but are best learned socially—by directly communicating and collaborating with others, either physically, face-to-face, or virtually through technology (November, 2010; Wagner, 2008; 2012). Team learning projects that involve such as problem-based/project-based learning promote social learning skills of communication and collaboration that students practice and become proficient. According to Darling-Hammond (2008), learning environments that support collaborative learning practices have a more significant impact on student performance than any other variable. Other research indicates that teaching students through collaborative small-group learning and problem-

based/project based learning exceed traditional teaching methods in developing 21st century skills (Barell, 2010; Darling-Hammond, 2006, 2008; Trilling & Fadel, 2009).

Creativity and Invention

The research on 21st century skills overwhelmingly recommends the development of students' creativity and innovation skills. With rapid societal and economic changes, it is difficult to predict skills that will be needed in the future workforce. The development of creative thinking can assist students in preparing for challenges they have not yet encountered (Robinson, 2011; Wagner, 2008; 2012). Creative inventors are described as those who have the ability to think on their own, identify problems, take risks, experiment, and develop solutions to problems. Jobs of the 21st century require workers who are flexible, adaptable, imaginative, innovative, and highly creative (Johnson & Johnson, 2010; Robinson, 2011; Wagner 2012). According to Johnson and Johnson (2010), "The economic future of societies depends on their capability to grow, attract, and support talented, innovative and creative entrepreneurs" (p. 211).

Not only is creativity vital to the economic viability of our workforce, "it is important in extending our learners' capacity to wonder, to explore the unknown, to think of entrenched problems from a new perspective, and to experience the joy of producing original thought" (Zmuda, 2010, p. 39). Unfortunately, according to Robinson (2009), we do not grow into creativity, we

grow out of it—or rather we are educated out of it. Our 20th century, industrial model of education in the United States, with the focus on facts, memorization, basic skills, and test taking, limits opportunities for students to develop needed skills of creativity and invention. However, this standardized approach to education is changing in countries around the world, like Finland, India, China, and Singapore, as they are transforming their education systems to include creativity and invention as a high priority in their desired outcomes for student learning (Robinson, 2009; Wagner, 2008; Zhao, 2009). In the United States, schools that are using the problem-based/project-based approach to teaching are seeing increased development of creativity and innovation in their students as well as other coveted 21stcentury skills (Barell, 2010; Bell, 2010).

Creativity is "frequently dismissed, misunderstood, and marginalized in the school curricula" (Zmuda, 2010, p. 38) and teaching students to be creative in not something many schools achieved in the past. Creativity requires time to think and the ability to take risks but schools have generally discouraged students from taking risks (Robinson, 2011; Wagner, 2008, 2012; Zmuda, 2010). Schools tend to promote and reward convergent thinking that results in finding a single solution to a problem rather than encouraging divergent thinking with creative brainstorming that generates new fresh ideas and possible solutions. Students learn at a very young age to discern what their teachers want and how to provide the "right" kinds of answers that will ensure a good grade. However, our real

world demands multiple ways to do something well (Jacobs, 2010). The question remains, how can the established educational institutions with their focus on content coverage and the one correct answer encourage the trial and error and intellectual risk-taking that are the hallmarks of creators and innovators (Robinson, 2009; Wagner, 2012)?

Research and Information Literacy

Students in the 21st century live in a technology and media-suffused environment, marked by various characteristics, including: 1) access to an abundance of information, 2) rapid changes in technology tools, and 3) the ability to collaborate and make individual contributions on an unprecedented scale (Baker, 2011). To be effective in the 21st century, employees in the workforce must be able to exhibit a range of functional and critical thinking skills related to information, media and technology.

The Web has become the dominant media of our society yet we are not teaching students critical thinking skills in this media. Most educators agree that we need to prepare students for this information economy but remain unclear as to what does this really means and what are the essential questions and planning processes need to prepare our student to have global work ethic (November, 2010). Assessing information effectively, evaluating information critically, and using the information sources appropriately and effectively, are a few of the skills that define 21st century research literacy (Collins & Halverson, 2009; November,

2010; Trilling & Fadel, 2009). Given the immediate access to an over-abundance of information and essentially free global communications, it is essential that students in the 21st century learn how to make meaning of the overwhelming amounts of information and "apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information (Trilling & Fadel, 2009, p. 67).

Self-Directed Learning

As expressed by Grow (1991), "the goal of the educational process is to produce self-directed, lifelong learners" (p. 127). The ability to be a self-directed learner is an important achievement in 21st century, rapidly changing, and complex society. The amount of time managers in the workforce have for mentoring and guiding employees is diminishing. Self-management and self-directedness are high demand commodities in the workforce today for employees (Trilling & Fadel, 2009). Gibbons (2002) defines self-directed learning as "any increase in knowledge, skill, accomplishment, or personal development that an individual selects and brings about by his or her own efforts using any method in any circumstances at any time" (p. 2).

Becoming a self-directed learner implies students go beyond the basic mastery of curriculum concepts to explore and expand their own learning and opportunities to gain expertise. Students take initiative to advance skill levels toward a professional level and demonstrate a commitment to life-long learning.

As part of the assessment process, self-directed learners develop the ability to reflect critically on past experiences to inform future progress (Fisher & Frey, 2010; Gibbons, 2002; Partnership for 21st Century Skills, 2007; Trilling &Fadel, 2009). The importance of self-directed learning is that it enables students to customize their approach to learning tasks, deepens their understanding of concepts with application and extension of new knowledge, and prepares them for life-long learning (Fisher & Frey, 2010; Gibbons, 2002).

The development of the skill of self-directed learning requires a different approach by the teacher and demands new skills from the students. With the use of guided instructional events, strategically planned by the teacher, students gradually take over most of the traditional teaching operations until they can design and execute their own learning activities (Fisher & Frey, 2010; Gibbons, 2002; Grow, 1991). The role of the teacher is transformed and becomes more important and more demanding. According to Gibbons (2002), "teaching SDL requires a full professional repertoire of instruction, including training, coaching, guiding, and counseling skills. It [SDL] represents a paradigm shift in thinking about teaching and learning" (p. 3).

However, the choice is not simply between teacher-centric and student-centric learning environments. Much like Grow's (1991) SSDL model and Pratt's (1988) orthogonal teacher/learner dependency model, there are many stages between the two poles. Students need to be taught how to think critically for

themselves, learn in their own way, choose their own goals, and design their own programs to develop the self-efficacy needed to adapt to rapidly changing circumstances in the 21st century. It should be the role of the teacher to assess where students are on the continuum of teacher dependency and self-directed learning and develop a program that supports this necessary skill development (Fisher & Frey, 2010; Gibbons, 2002; Pratt, 1998; Trilling & Fadel, 2009).

It is interesting to note the similarities between 21st century learning needs and the principles of andragogy. Although andragogy is typically cited as the way adults learn, even Knowles recognized that four of the initial five key principles apply equally to adults and children. The only varying factor is that children have fewer life experiences than adults to contribute to the learning experience (Conner, 2004). However, Dewey, as far back as the early 1900's, was an influential supporter of the use of experience for learning; believing that experiencing something is a linking process between action and thought and believing in the unity of theory and practice (Dewey, 1938). Dewey wrote

> It is a great mistake to suppose, even tacitly, that the traditional schoolroom was not a place in which pupils had experiences. Yet this is tacitly assumed when progressive education as a plan of learning by experience is placed in sharp opposition to the old (p. 26).

Today, the inclusion of problem-based and project-based learning often provide students with authentic learning and real world experiences the theory of

andragogy assumes pre-adults are lacking (Barell, 2010; Beers, 2011; Jacobs, 2010; Synder, Acker-Hocevar, & Snyder, 2008;Wagner, 2008; Zmuda, 2010). It is essential that we unlearn our teacher-reliance methodology and move from the pedagogical model of "sage on the stage" to "guide on the side" to more fully assist our students in acquiring 21st century skills. Regardless of one's orientation to teaching, tremendous benefit exists in providing instruction based on a number of andragogical approaches that value individual growth and view education as a life-long process.

Summary

The unifying theme of the literature review is the connections of the principles of andragogy and the 21st century learning needs. The review began with the history of pedagogy and the resulting predominate teaching methodology for both children and adults, based on certain assumptions of the learner: the learner is dependent on the teacher to take responsibility for making decisions about what is learned, how and when it is learned, and whether it has been learned; the learner enters into the into an educational activity with little experience that can be used in the learning process; learners are ready when they are told what they have to learn to advance to the next educational level or job level; learners enter into an educational activity with a subject-centered orientation; and learners are motivated by external pressures from parents, teachers/trainers, employees, and/ or the consequences of failure, grades, etc.

The review continued with the development of andragogy, the adult learning theory, and provided a historical background on adult learning. Following the historical background, a description of andragogy today was presented with the development of Knowles' theory of andragogy (Knowles, 1975; 1978; 1980) based on six assumptions drawn from the learning differences between children and adults. As a person matures, his self-concept moves from one of being a dependent personality toward one of being a self-directed human being; he accumulates a growing reservoir of experience that becomes an increasing resource for learning; his readiness to learn becomes oriented increasingly to the development tasks of dealing with real life situations and problems; his time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly, his orientation toward learning shifts from one of subject-centeredness to one of problem-centeredness; the motivation to learn moves from extrinsic to intrinsic; and his need to know becomes increasingly important.

Next, the review followed the growing trend of moving from viewing pedagogy and andragogy as "either or" to one of two ends of a continuum. Based on the learner's needs and teacher's orientation, at any given time the learner and teacher can be at either end of the spectrum or somewhere in between. This perspective was further developed as an orthogonal relationship, indicating students can be in differing quadrants based on their need for support and/or

direction from the teacher. An additional model, (Grow,1991) provides teachers with four situational roles, from authority to consultant, depending on the learning stages of the students.

A clear understanding of the principles of andragogy is vital to the educator and the practices they employ in the classroom. For the educator, the focus of the learning needs analysis, curriculum design, delivery, and assessment must shift from a subject-driven, teacher-centric approach traditionally identified with pedagogy to a learner-centric approach where students share in the planning and operating of the learning experience (Knowles, 1980). This review provides research that supports the use of andragogic-oriented teaching approaches in developing autonomous learning and promoting student innovation and creativity, skills that are critical for students' success in the 21st century.

The review concludes with the developing need for students to possess certain skills to be successful in the 21st century. Today's students require this same type of learner-centric learning environment, normally identified with andragogy, to help develop the much needed skills of critical thinking and reasoning, communication and collaboration, technology and information literacy, creativity and invention, and self-directed learning, as described in the literature review. The use of problem-based/project-based learning, a core principle of andragogy (orientation to learning), can provide students with life experiences they can apply in future learning.

For teachers, knowing their orientation to teaching, whether pedagogic, andragogic, or somewhere in between, is vital to preparing students with skills for college and career readiness in the 21st century. The next chapter will describe the methodology used to identify teachers' orientation to teaching and the congruence of their teaching orientation to the classrooms.

CHAPTER THREE

METHODOLOGY

The purpose of this study was to identify the congruence of teachers' educational orientation to teaching and students' acquisition of 21st century college and career skills. A qualitative design was selected because the purpose of a qualitative study often reflects a more phenomenological approach to research. It uses an inductive process in which themes appear through the collected data analysis and samples are usually small and often purposefully selected. This type of study also seeks to understand peoples' interpretation of the phenomenon under review and the researcher is an integral part of the investigation. Interviews and observations are important and detailed data can be gathered through open-ended questions as well as the observational process (Gall, Gall & Borg, 2007; Lincoln &Guba, 1985; Merriam, 1998). The following questions were used to guide this study:

1. What are teachers' educational orientations to teaching?
2. What are teachers' essential descriptors of their orientation to teaching?
    a. How do teachers' describe classroom organization?
    b. How do teachers' describe course content delivery?
    c. How do teacher explain their orientation to teaching?

    d. Why do they teach the ways they describe?

3. In what ways do these teachers' desired classroom behaviors support the 21st century learning needs of students? How do they promote:
    a. Collaboration and communication
    b. Research and information fluency
    c. Creativity and innovation
    d. Critical thinking and problem solving
    e. Self-directed learning
4. In what ways are teacher orientations to teaching and 21st century needs congruent?
5. What other realities are revealed about teachers' orientation to teaching and 21st century learning needs?
6. How useful are the frames of the andragogy/pedagogy continuum (Knowles, 1980; Pratt, 1988) and 21st century learning needs (Bellanca & Brandt, 2010; Lemke et al., 2003; Trilling & Fadel, 2009; Wagner, 2008) for understanding the phenomenon under review?

The following sections detail me as researcher, the data needs for the study, data sources that were identified and used, collection of the data, methods for analyzing the data, research criteria, and timeline.

The Researcher

As a school administrator, it is my vision that all students graduating from our school are equipped with 21st century skills for college and career readiness. Based on that vision, it is important that teachers I hire for positions in our school possess an orientation to learning that reflects the needs of the 21st century classroom. It is equally important to understand my existing teachers' orientation to learning to help overcome potential resistance to change when new student-centric programs are introduced to the curriculum.

My professional administrative interests have helped me focus this study. I have been a member on many accreditation teams through the Association of Christian Schools International (ACSI) and Southern Association of Colleges and Schools (SACS) accrediting boards over the past 15 years. One aspect of the REACH (**R**eaching for **E**xcellence through **A**ccreditation and **C**ontinuous improvement for **H**igher **A**chievement) accreditation process, Standard Five: the *Instructional Program*, requires schools and their educators to implement more active learning, student-centric methodologies in their programming (ACSI, 2008).

However, through my experiences serving on these teams, I have observed the predominance of teacher-centric programs in ACSI member schools. The 2011 *Cardus Education Survey* (CSE) examined the correlation between Christian education motivations and student outcomes. The report revealed, among other

things, that Catholic schools and private schools were far more academically rigorous that Protestant Christian schools and students graduating from private Christian schools are not prepared for top tier "Ivy League" schools. This is important because world changers, people in high-visibility positions of politics and policy-making, tend to be graduates of these institutes of higher learning. ASCI's response is that clearly, school improvement and the instructional programming of schools must be a focus to prepare our students in the 21st century (ACSI, 2012).

More recently, I have been selected as a delegate to the Vancouver Symposium Christian School Consortium for 21st Century Education, a global community of Christian educators that meet annually. Our mission is to prepare Christian schools for 2025 by focusing on educational pedagogy in the digital world using online and blended learning (21st Century Educators, 2011) as well as other methodologies that support student-centric schools and learning environments to help students develop 21st century skills. This annual event is sponsored by Christian leaders in the world of education and supported by ACSI for Christian school leaders with the intent of shaping the future of Christian schools for 21st century educational needs. This strong move by ACSI indicates to me as a delegate to the consortium and a Christian school leader, the objective of ACSI to support Christian school leaders in the shaping of the future of Christian schools for 21st century educational needs.

My administrative position in a Christian school allows me access to teacher populations in ACSI member schools, essential to data collection. Additionally, as the research instrument for interviews and observations, my background as a classroom science teacher for 15 years and as a student of the history of curriculum and instructional design will facilitate follow-up questions and analysis of participant responses and classroom observations.

Data Needs

The data needed to conduct this study were threefold. First, I needed to know the andragogic/pedagogic educational orientation of the study sample. Second, I needed to know how these educators propose or desire to support the 21st century learning needs of students through their understanding of 21st century skills, how they view their role as the teacher, and how they design their curriculum, assessments, and classrooms to support their teaching methodologies. Finally, I needed to be able to document actual classroom activity of these same teachers to determine congruence between their interview responses and actual classroom activity.

Data Sources

Given the focus in this study on evidence from educators in support of 21stcentury learning, data sources, or educators, needed to be those clearly challenged to teach in ways that support 21st century learning environments. To this end, teachers currently employed in member schools of the Association of

Christian Schools International (ACSI) served as the population or data source from which the sample of study participants was chosen. Schools were selected from the same ACSI region as the school where I currently serve. Teachers from other ACSI schools in my same region represent a convenience sampling due to the accessibility and availability of these teachers to me. In many research studies, researchers take advantage of populations that are most available and convenient to access, as well as a sample population that is believed to be a representation of a given population (Gall et al., 2007; Gay, Mills &Airasian, 2006).

To narrow the focus of the study, teachers currently teaching high school science classes in these schools were targeted at potential participants. The use of science teachers is supported in the introduction of the study with the reference to average scores by students in the United States on the science portion of the PISA in comparison to other developed nations (Herbert, 2011) and based on my background and experiences as a science teacher.

Data Collection

Data was collected in three phases. Phase One was the survey whose responses would indicate andragogic/pedagogic orientation of teachers. Phase Two was teacher interviews. Phase Three was classroom observations.

Phase One

In Phase One, I administered the Educational Orientation Questionnaire (EQO).The EOQ, developed by Hadley (1975) and revised by Quam (1998), is

consistent with tools used by Knowles (1990) to assess adult teaching and learning and used to measure survey respondents' andragogic/pedagogic educational orientation. The EOQ contains statements that relate to six dimensions of educators' educational orientations: 1) the purpose of education, 2) the nature of learners, 3) characteristics of learning experiences, 4) management of learning experiences, 5) assessments, and 6) the relationships between educator and learner as well as among learners. These six dimensions or subscales represent those elements of educational theory and practice which focus on differences between andragogy and pedagogy. Hadley (1975) believed that most educators have both andragogical and pedagogical attitudes, therefore their orientations would fall along a numerical continuum. The continuum extends from consistently andragogical at one end to consistently pedagogical at the other. According to Hadley (1975) subjects with standardized scores greater than zero (positive scores) are considered positively andragogic and those with standardized scores less than zero (negative scores) are considered positively pedagogic (see Appendix A).

Hadley's (1975) EOQ was developed from a review of the literature that produced "over 600 statements illustrating pedagogical or andragogical attitudes and beliefs about education, teaching practices, and learning" (p. 72). These statements were reviewed against several criteria and a preliminary questionnaire was prepared with 100 items. This was later reduced to the current questionnaire

of 60 items, 30 andragogical and 30 pedagogical. Hadley (1975) reported a test-retest reliability of 0.89 after administering the questionnaire twice to 254 respondents with an average time of two weeks between administrations. Internal consistency reliability was determined by the average inter-correlation of item scores (0.21) which yielded a coefficient alpha of 0.94.

The EOQ is self-paced and can be administered in small or large groups on an untimed basis, allowing respondents as much time as needed to complete the survey. It consists of 60 Likert-scale items ranging from strongly agree, agree, uncertain to the statements, disagree to strongly disagree. One half (30) of the statements measure andragogic characteristics indicating an educational orientation analogous to responders using educational principles aligned with Knowles' adult learning theory. The other 30 items on the EOQ measure pedagogical characteristics indicating an educational orientation analogous to the responders using pedagogic education principles, or those principles more aligned with child learning theory.

There is a major gap in the andragogic research that centers on the lack of an instrument that adequately measures both the andragogical principles and the process design elements (Holton, Wilson, & Bates, 2009; Merriam, 2002). A recent study by Holton et al. (2009) indicated a weakness in the ability of the EOQ to "fully isolate and measure andragogical constructs" (p. 189). However, for the purposes of this study, the EOQ was used solely for screening and

providing a baseline for determining the educational orientation of teacher candidates prior to the follow-up interview and classroom observations.

Prior to receiving IRB approval, I contacted seven school administrators in regional ACSI schools and explained the nature of the study and my data needs. Six of the administrators responded favorably with willingness to participate in the study and one did not respond. This information was given to the IRB and approval for the study was granted. I received a list of 27 high school science teachers from the six school administrators and contacted these science teachers by email, requesting their participation in the study by completing the online survey through "Survey Monkey." The survey began with a voluntary participation consent statement on the first page so teachers could opt out if they did not want to participate in the survey. Out of 27 teachers contacted, 14 teachers completed and returned the survey. The final page of the survey included a statement asking for permission to contact the individual via email for a follow-up interview and classroom observations and 12 teachers responded positively.

Six teachers were selected for interviews and classroom observations based on their EOQ scoring. Although no participant scored in the high andragogic range, two participants selected for the study scored in the low-to-mid andragogic range. Four other teachers were selected for the study: two teachers scoring low pedagogic (close to the neutral mid-point) and two other teachers scoring in the mid-to-high pedagogic range. A table of the scores and the

participants' placement on the andragogy/pedagogy continuum is found in chapter five. The identity of the teachers is protected throughout the study through the use of pseudonyms with names starting with "S" designating science teachers.

Phase Two

In phase two of the study, I conducted interviews with selected teachers who scored positively andragogic, neutral, and positively pedagogic, two from each category. According to Creswell (2007), the use of the interview is "a way to capture best the experiences of participants in their own words" (p. 405). Broad-based or "grand tour" questions were used to help direct the interview and allow me to explore participants' answers in further depth (Rubin & Rubin, 2005). The following grand tour questions guided the interviews:

1) How would describe your approach to teaching?
2) What would you describe as the essential skills our students need for the 21st century?
3) How would you design your classroom to promote students' proficiency in 21st century skills?
4) How would you design instruction and assessments to promote students' proficiency in 21st century skills?
5) How did you learn about 21st century skills development?

As needed, follow-up questions allowed me to probe further for evidence of teaching orientation and application of that orientation to instruction (see Appendix B).

Teachers were interviewed in their classrooms during their planning period. Four of the interviews lasted approximately 30 minutes; one interview was closer to 45 minutes in length and one interview was 20 minutes. Two of the participants teach in a small Christian school located in a rural area outside of a major metroplex with a K-12 enrollment of 400 students. The other four participants teach in Christian schools with K-12 enrollments of 800 and 1000 students, and these schools are located in suburban areas of their respected cities.

The interviews were recorded digitally and played back to the participants to ensure the recordings accurately reflected the experiences of the teachers. According to Creswell (2007), this type of member check is critical to verifying qualitative research. All participants supported the interview recordings and verified the recordings accurately portrayed their experiences. One participant did clarify a statement she made in the interview, believing this was important to my understanding her response to one of the questions. This change was noted with an additional comment added to the end of her interview recording.

Phase Three

In the final phase of data collection, I conducted classroom observations of the teacher-participants I interviewed. In this way I could collect classroom

realities that would be compared to the answers given by the teachers during the interviews. The purpose of the observations was to collect observational data that could help confirm the congruence of the teachers' perceived orientation to teaching and their actual practices in the classrooms that support 21st century skills development.

Two concurrent classroom observations were conducted with each teacher. All observations were conducted following the teacher/participant interview. Only one second observation for one teacher was conducted on a following day, due to the teacher's schedule of classes. Observations for three teachers were during their morning classes; the other classroom observations were split by the lunch schedule, with one observation before lunch and one after lunch.I was positioned in the back of the classrooms to make my presence as least disruptive to the learning environment as possible. In one school, the teacher explained before the observation that students were accustomed to visitors and this was evident in the students' response (or lack of response) to my presence.

Detail notes were taken during the observations using a rubric that helped me focus on specific methods teachers use for 21st century skills development. The rubric was developed with specific teacher behaviors that would help me identify varying degrees of teacher expertise in developing 21st century skills: critical thinking and reasoning; communication and collaboration; creativity and invention; research and information literacy; and self-directed learning (see

Appendix C).The observations also provided an additional form of data to enhance the thick, rich description of the teachers' orientation to teaching and their readiness for 21st century learners' needs.

Data Analysis

Data collected through the interviews in Phase 2 were transcribed verbatim and examined through the lens of the andragogy/pedagogy continuum (Knowles, 1980; Pratt, 1988) for common themes (Boyatzis, 1998; Creswell, 2007) to support the andragogic/pedagogic orientation to teaching and 21st century skills development (Bellanca & Brandt, 2010; Lemke et al., 2003; Trilling & Fadel, 2009; Wagner, 2008). I employed the constant comparative method of data analysis, a strategy according to Merriam (1998) that allows the researcher to compare interview notes within the same set of data, leading to "tentative categories that are then compared to each other and to other instances" (p. 159). Finally, additional coding of information was used to help support other realities about teachers' orientation to teaching and 21st century learning needs. Overall, I was looking for information that appeared important to understanding the congruence between the teaching orientation and 21st century skills development (Merriam, 1998; Yin, 2003).

Data collected in the Phase 3, the observations, were compiled as "field notes" from the observational rubric tool, describing as accurately and comprehensively as possible to aid in the description and understanding of the

research setting and participants (Gay et al., 2006). The rubric was developed with specific teacher behaviors that would help me identify varying degrees of teacher expertise in developing 21st century skills: critical thinking and reasoning; communication and collaboration; creativity and invention; research and information literacy; and self-directed learning (see Appendix C).The data were then viewed through the lenses of the andragogy/pedagogy continuum and acquisition of 21st century skills to help support the findings in the interview process of the participants and enable me to "tell their story" in their desire to teach and prepare students for the 21st century.

Research Criteria

Validity and reliability were critical considerations in this qualitative study. Several steps were taken to check for validity. Surveys and interview questions were pre-tested with teachers at a school not included in the research to ensure the chosen data collection methods would provide the data I needed for the study. The collection of data from multiple sources provided corroborating evidence, which enhanced the validity of the study's conclusions. The use of multiple forms of data and triangulation (to view the data from several vantage points), were used to assist in identifying themes related to the study framework and validate the results of the study (Creswell, 2007). The use of surveys, interviews, and observations provided "thick, rich" data that is desired in a study of this nature (Gall et al., 2007; Lincoln & Guba, 1985).

Efforts were made to establish further trustworthiness in the study through the following credibility criteria: initial establishment of the authority of the researcher (background, qualifications, and experience); the use of well-established research methods; the interview protocol that was followed for each participant; the triangulation of multiple forms of data described previously; and the use of member checking (Creswell, 2007; Gall et al., 2007; Lincoln &Guba 1985; Yin, 2003). According to Lincoln and Guba (1985), the use of member checking is considered the single most important provision that can be made to enhance the study's credibility. In this study, member checks were made immediately following the interview with the playback of recorded interviews for data accuracy and to ensure the teachers' responses were what they had intended.

Efforts were also made to establish dependability through the use of triangulation and the dense description of the research methods (Creswell, 2007; Merriam, 1998). Finally, attempts were made to enhance transferability by a thorough description of the research context and the assumptions that were central to this study. However, as stated by Lincoln and Guba (1985), in the end "the person who wishes to 'transfer' the results to a different context is then responsible for making the judgment of how sensible the transfer is" (p. 298).

Timeline

Data collection was conducted May 2012-June 2012. Online surveys were first administered in May 2012 to teachers from schools that had agreed to

participate in the study. Then, individual interviews were conducted in late May/early June 2012 with selected individuals. Finally, follow-up observations were conducted during classroom instructional times with selected teachers/interviewees. All interviews and observations were conducted at the volunteers' school sites during school hours.

Summary

This chapter has provided a thorough description of the methods used in the study. The chapter begins with the positioning of the researcher and my background and interest that qualifies me for this particular study. Next I detailed the data needs, the data sources, and the collection of the data in three phases. Finally, I described, how the data would be analyzed, including steps taken to ensure validity and reliability of the study, and I closed the chapter with the study timeline. The voices of the teachers as heard through the interviews and their classroom activities will be presented in Chapter Four.

CHAPTER FOUR

TEACHERS' VOICES

In this chapter I will present the voices I heard from teachers interviewed for this study. After listening to and reviewing the teachers' interview transcripts multiple times, I wanted to conceptualize their "voice" as an integral part of understanding the phenomenon under review. According to Elliot (2005), the use of "voice," or narrative, can be used in qualitative studies as a means to validate and give meaning to experience and raise an awareness of particular issues. For this particular study, using teachers' voices was important to provide and awareness of their orientation to teaching as related to promoting 21st century skills in their classrooms.

The teachers interviewed are all teaching high school science courses in K-12 private Christian schools that are accredited through the Association of Christian Schools International (ACSI) and two schools have dual accreditation through ACSI and SACS (Southern Association of Colleges and Schools). Both of these accrediting entities have a required standard that provides for the inclusion of "active learning" activities for students, activities that promote 21st century skills of collaboration, critical thinking, creativity, research fluency, and technology integration (AdvancedED, 2008; ACSI, 2008). All schools are

promoted as “college preparatory” schools and provide information to their constituents and prospective families that support graduates’ college and career success. The six teachers are serving in Christian schools with various enrollments and demographics.

Each interview began with a description of my study and the significance of the study. I also explained the sampling process and how each teacher was selected for the study. Each teacher was asked the same open-ended questions to facilitate the analysis and comparison of answers. The interviews were each allotted the same amount of time, however, as indicated by the stories presented, some teachers provide richer data than others. The organization of this chapter is according to the participants’ scoring on Quam’s (1998) EOQ. From the lowest score to the highest score, teachers with more pedagogic oriented scores are presented first, followed by teachers with more andragogic oriented scores. Pseudonyms have been used to protect the teachers’ identity and I have applied names beginning with “S” to represent “science” teachers. Each story opens with a brief description of the teacher’s school, including the school’s demographics. As much as possible, the order of the narratives is based on the following open-ended questions that were asked to all participants.

1) How would you describe your approach to teaching?
2) What would you describe as the essential skills our students need for the 21st century?

3) How would you design your classroom to promote students' proficiency in 21st century skills?
4) How would you design instruction and assessments to promote students' proficiency in 21st century skills?
5) How did you learn about 21st century skills development?

Quotes used in this chapter were from the personal interviews that were conducted in the teacher's classroom.

The following table provides a portrait of the teachers involved in this study, including their score on the EOQ (Quam, 1998).

Table 4.1 Teacher Portraits

Name	**Degree**	**Years Experience**	**Subject(s) Taught**	**School Location**	**School Enrollment**	**EOQ Score**
Steve	Masters	30	Chemistry; Creation Science	Rural area	425	-3.0
Susan	BS	12	Physical Science	Rural area	425	-2.2
Sam	BS	8	Physical Science	Suburban area	1000	-1.5
Syd	BS	20	Chemistry; AP Biology	Suburban area	800	-1.4
Sarge	Masters	20	Biology; Environmental Science	Suburban area	800	+0.8
Sarah	Doctorate	22	Chemistry	Suburban area	1000	+1.7

Steve's Story

Steve teaches at a small private Christian school located in a rural area of the county, with approximately 400 students. The school is a "mission" of a local church and the school and church share space for weekday school classrooms and Sunday School rooms. Like most teachers at the school, he has approximately 15-18 students in his classes. His long and narrow classroom is set up in with three long rows, seven desks in a row, lined up side by side. Science posters cover the walls with information covering several different science disciplines, but no student work was evident. Steve, a 30-year teaching veteran, seemed eager and excited to participate in the interview, but was surprised to find his score on the survey placed him in the high "pedagogic" range on the andragogy/pedagogy continuum. He commented that with his background in science education and number of years teaching, he would be more toward the middle or in the andragogy range.

Steve views his teaching philosophy as a response to God's call on his life "…to equip the church, equip the saints, especially in the area of creation science." His expressed desire is to "help students discover truth," a product of what he believes is discrimination because of his views regarding a young earth and the flood. The outcome of his personal experiences gave him a passion to mentor and disciple students, to instill in them why they believe what they believe

because after they leave high school, “we are sending them off into a culture war, and I am just trying to equip them.”

Steve views his teacher role as directing his students toward truth, sharing information, and instilling in them the principles of Deuteronomy 6:7, “to teach them [commandments] diligently to your sons [students].” His underlying word for “teach” is the Hebrew for “Shinar” which is translates from the Greek as “to pierce or penetrate, to provide repetition.” He does not consider his role as a facilitator to help students discover or explore, rather he believes many of our students “don’t know what’s going on out there really behind the scenes in science; many do not know how to utilize a commentary, or find journal articles. “He believes his role is to help his students get the whole truth and then build upon that the scientific knowledge, what evolutionists have to say; then go back and compare that to scripture because “we believe the scriptures to be true.” He sees his role as a teacher to direct students toward truth by taking scientific truth and making comparisons to what the Bible teaches. Steve’s foundation for teaching is “built on the truth of scripture, not on scientific models that are up for interpretation.”

Steve describes his approach to teaching as one that is teacher-centered and teacher driven, using a lecture type format with many handouts and “audio visuals.” He laughed that the “power point projectors working now…all we need is a computer that works fast enough to keep up!” There are many different types

of media to communicate the message he wants his students exposed to, scientific writings, journals, and videos, and because of his creation research background, he has connections his students do not have. School-wide, the textbooks used at his school are Christian-based, rather than using secular textbooks used in public schools, and this same philosophy is evident in Steve's science classrooms.

Steve believes schools should be geared to be a 21st century school, as much as they can, perhaps giving all students smart tablets in the future so they can access videos, DVDs, internet sites, and power points. At his school teachers are still using "20th century" transparencies with an overhead projector. He would like to upgrade by scanning his transparencies "but [we're] not there yet!" According to Steve, there is so much content to cover in his classes that he rarely assigns research papers or research projects, leaving those types of research assignments to other teachers in other classes. His desire is to challenge students to think critically in class, to be able to pull together all the research he gives them over the course of the school year (students are given a four-inch think notebook referred to as the "master notebook" they can take to college with them as a reference). He delights in hearing back from students who tell him "this article" or "that article" provided them with information they could use to refute what a certain professor said in class.

For Steve, the essential skills students need are to be able "think on their feet, "to discern and analyze information and primary sources, to be able to

separate science from philosophy, and to make interpretation from actual scientific data. “We think just because it comes from an authority, it must be objective, but not always; all scientific knowledge has to be interpreted through the[ir] worldview.” His goal is to teach students to ask key questions so they can determine for themselves the worldview of the author and the information. This means his classes spend a lot of time going through the different worldviews and understanding there are all different “camps” in all disciplines of science.

To teach his students how to know what key questions to ask, Steve begins the school year teaching students how to ask questions and the types of questions to ask, spending up to six weeks in each class. Students look at questions such as what is the age of the universe or the Earth. Did God speak it into existence or did God use the “big bang” theory? By what authority does the author speak from? Who was the first man? Was their death before the first sin? Was it animal death or human death? Steve also teaches students to explore and determine the author’s worldview based on the answers to their questions. In his Creation Science class, students spend an additional six weeks on biblical interpretation and compromising positions of the flood, creation, and other science topics related to theories of evolution. Steve uses the analogy of “only one truth, many types of error . . . just like bills, there are many types of counterfeit bills but only one federal bill.”

Although certain assignments allow for small group collaborations, the majority of Steve's methodology uses whole class discussions. Occasionally Steve provides short essay questions (in which he plays "devils' advocate"), looking at current events in the news through the lens of different worldviews . . . not just from a scientist's perspective but what does society or current culture say about these things? Included are current "hot topics" such as abortion, stem cell research, and other political issues. With these issues, he takes students to what the Bible says first, then to what science says, and then to what students hear through the culture/society. As the department head, Steve strives to have this same strong emphasis throughout the whole science department; strong in the secondary school and moving down to the elementary school. He cautions the use of "story" when talking about the biblical story in the elementary classrooms because children see stories as nursery rhymes, fairy tales, and Dr. Seuss, when Noah and the ark is a true story with real history, eye witnesses, and with real documentation.

Steve's school shares space with the supporting church so many of the classrooms were originally designed as Sunday school rooms, rather than educational classrooms. Steve looks around the room in describing his classroom design and points out his use of posters and visuals, using different walls for different science classes. He tries to keep the visuals current to the topics his students are studying. The primary focus is on the front of the classroom where

the dry erase boards are located and rows of desks face the front for the projecting of overheads/transparencies and power points. As Steve indicated, there are a limited number of ways to arrange the room due to the design and space so he stands in the center where he can interact with students and keep them on task.

In describing his instructional/lesson design, Steve indicates there are a certain set of objectives his school wants to meet. Many of the objectives are aligned with state standards but the school tries to go above that to be a "second mile" type of school that focuses on the instructional objectives with critical biblical integration, not just the adding of a verse "here and there," but purposeful Bible study. Steve plans certain activities that are research-based using instructional based questions or essays. He requires reading from the school-required textbook and journal articles he provides that students keep in their "master notebooks." His goal is to ensure the students' notebook is a useable item, a reference they can turn to when they leave the school. Also he believes the notebook is the student's direct line back to the teachers, and he gives his email to his students so they can keep in touch even after they graduate and ask questions they cannot answer.

For assessments, Steve does not rely on student projects so much as he does demonstrations, science labs, and "hands-on" instruction for teacher-directed activities. Next year he wants to incorporate debate into his courses, especially in the junior and senior level courses. Most of the tests are text-book generated from

the provided supplemental materials. Steve usually goes through these tests to pick out main points which he has covered in class and students have the information in note-form. He then chooses a variety of true/false, multiple choice, and essay type questions from the textbook generated questions. He occasionally uses assessments from secular textbooks which he has access to online samples of the book evaluations, especially in the area of earth science and geology so his students are not "blind-sided" when they get to "secular" colleges and take a geology course.

Steve indicated he had not officially heard the term "21st century skills" and skills development used in education. However, he thinks it means education that is more critical thinking based, more hands-on, more collaboration or working together rather than alone. Also it probably means more student-driven rather than teacher-driven or a balance between the two; but as he indicated before, "until we have a series of years where schools are made that way, exposing students the information they don't normally get, at this point I will remain more teacher-driven in my classroom to make sure students get the information they need."

In closing, knowing I would be observing his classes, Steve wanted to stress that his students are sometimes intimidated by visitors . . . [they]

> are still getting their feet wet so they may not be as open when you're in the classroom. If we went back to previous lessons, they might feel more

> comfortable but not with new information. I tell them they will never really know what they believe until they are challenged on it and that test will come after they graduate.

My follow-up classroom observations supported Steve's interview responses.

Susan's Story

Susan teaches at a small private Christian school located in a rural area of the county, with approximately 400 students. The school was established in 1992 as a "mission" of a local church with nine students in K-5th grade. Currently the school and the church share space for educational classrooms during the week and Sunday School rooms on Sundays. Like most teachers at her school, Susan has approximately 18 students in her classes. Her long and narrow classroom is set up with desks intwo long rows, two desks in each row, and facing the front of the classroom. Science posters cover the walls with information covering several different science disciplines, but no student work was evident.

Susan considers her approach to teaching as "a pretty direct approach!" She likes to use the curriculum the school has provided and the textbooks students are reading. "We do a lot of reading together at the secondary level, but I also like to ask a lot of questions." She considers note-taking an important skill for students and indicated "we [students] do take a lot of notes but I like to interject stories and break down concepts into smaller processes so they can understand." Susan likes to tell stories from either her lifetime or the parents' lifetime that are related to

what her students are currently studying. She feels this method helps to make the concepts more applicable to where students are in their lives.

Susan believes that the teacher has a very important role in student's learning. Teachers "need to set the tone, lead the discussion, get things started and keep things on track, [and] bring kids back to the topic." She believes it is essential for students to have a teacher that is a "take-charge sort of person" who can control the atmosphere but at the same time provide a climate that would allow students to express themselves in their learning, ask questions, and participate in classroom discussions.

Critical thinking is "high up there" as an essential skill that students need for the 21st century. Susan indicated she believes his skill is being developed in many of the school's upper level classes.

> My son comes home and tells me about the discussions they've had in Bible or Health class and we'll watch the news and have discussions. He is a thinker and a "reasoner" and I think it's important they ask questions and analyze situations and that they don't just accept what's taught to them; that they think things through and come up with their own truth, what's important to them, but still truth . . . it's important they come up with this through their own thinking.

Susan also believes that initiative and responsibility are two other essential skills for students. She points out that "at some point in this 21st century we've got to

have kids that are motivated and want to get things done and not be held by the hand all the time . . . and help kids find answers without always being told what the answer is."

Susan indicated that she tries to provide a variety of opportunities for students to develop these skills but the number of activities is dependent on the personalities of the classes. "I do have one class that we can have more group activities, discussions, things like that, but not so much in others [classes]." She tries to schedule times in the [science] lab "occasionally" and when some students get the concepts earlier than others and "if they have learned it [the concept] and learned it well," she encourages those students to help other students. "I do believe many students learn better from their peers than from their teacher so I allow that kind of collaboration." Susan clarified that this type of collaboration would only be used for daily work assignments and not for assignments that carry more weight in grading. Her students are not assigned many research projects, because many of the other classes already do a lot of projects. Susan believes the labs her students participate in provide the "hands-on" experiences her students need.

According to Susan it is difficult to design her classroom or make many changes that would enhance her teaching. However she believes the classroom setup facilitates her style of teaching. "The classroom setting is pretty much set because our rooms are long and narrow." She pointed out that she uses an

overhead and the two, long rows of desks face the front of the classroom so students can see her overhead notes on the screen. A projector has been mounted on the ceiling but it is not working yet. According to Susan all the teachers are getting projectors but she "will need to have a steep learning curve on how to use that because I am still in the old-fashioned, overhead mode." She indicated that the desks placement also allows her to focus on students that need the extra attention, whether it is academic or behavior. These students "sit closer to me so I can keep them controlled." Susan "definitely" believes in having a seating chart because students will sit where they want "so from day one they need to know who's in charge. "Overall she believes this has worked out well for her and makes changes as she needs to, stating that "it's not an automatic thing for each quarter." She likes to use a lot of visuals on the walls, pointing out that some of the posters are for math as well as science since she also teaches a math class. There are character posters as well on the walls because Susan "like[s] to emphasize the character building . . . I like to take advantage of that."

Susan designs her instructional methodology around the concepts she wants students to learn and the skills she wants students to develop. To make sure her students are learning the concepts out of the textbook, Susan reads the chapters aloud or has students take turns reading aloud. "I don't just say 'read chapter four' and hope that they do that, I make sure they are reading because we do it together." As she previously indicated, Susan wants her students to take a lot

of notes but she also tries to provide for group discussions and occasional class activities and labs "and things like that." Students are assigned section reviews and other types of written assignments which they do at home independently. "So it's pretty much direct instruction… [I] don't have many projects but I do ask questions and students respond…they seem to like to respond, but I have to guide them and make sure there is not too much dialogue…I want to get the back on track!"

For assessments, Susan uses the ancillary supplements provided with the science curriculum. "I pretty much use the curriculum…tests and quizzes that are already there for us. Sometimes I have to make up my own assessments but for the most part I use what comes with the books. "The lab books provide lab activities for students that are also graded, but they are also a part of the provided curriculum. Occasionally Susan designs assessments that include small presentations, "group work with presentations" but for the most part the assessments are what the curriculum provides.

When asked about the term "21st century skills development," Susan indicated that she had not really heard that term used before this interview. "I know about collaboration and group projects but never really heard it put that way or using those terms. I think it's very important that we know what that term means because this is where our kids are . . . I mean we're in the 21st century!"

Susan concluded that this interview has “made me think about where I am and things I might need to work on for my kids!”

My follow-up classroom observations confirmed the statements made by Susan during the interview. Students read aloud from the book and took notes from the overhead. Susan interjected questions throughout the reading that sparked some discussions and provided for understanding of the concepts. Although the same amount of time was allotted for this interview, Susan’s interview did not provide elaboration or depth of answers I experienced with the other interviews.

Sam’s Story

Sam is young teacher at a Christian school with over 1000 students enrolled and located in a suburban area. Although once associated with a church denomination, the school is now independently run by a school board made up of school parents and community members at large. The school has two separate campuses, the main campus housing 7th through 12th grades and the elementary (Pre-K through 5th grade) campus located several miles north of the main campus. The classrooms are designed to facilitate “science” instruction, with science tables that can seat two to four students, depending on the instructional activity. Each classroom is equipped with a projector mounted on the ceiling to support technology integration.

During his eight years of experience, Sam has developed an approach to teaching as one that believes all students have the ability and are capable of learning. “I don’t think everyone is equal in how well they learn and in the way they learn but they all want to learn, nobody wants to stay where they are, just be stagnant in where they are.” Sam views his role in the classroom as basically giving students the “avenues” to learn the material in the best possible ways his students learn. This means that at times he has to be the “giver of the instruction. . . I have to give them [students] the information for them [students] to be able to think critically and solve problems for themselves, teaching them the problem solving skills that they need…teaching them the skills so they can solve problems on their own.” In this sense, Sam considers his approach to teaching as both teacher-centric and student-centric; he presents the topics of study then and gives the students opportunities to discover the information on their own through online research and through teacher-led or student-led group collaboration. Sam also provides many opportunities for group projects.

> We do a lot of projects…we’re finishing one called ‘Adopt a city’ with regards to weather maps; but I am trying to go back and reassess what the final point was of the project [because] I don’t know if I got the desired result I wanted. But we do a lot of projects and a lot of time online researching. So this means we spend a lot of time talking about reliable sources, where you can go, what you can trust or not, how to look at a

> source then go to another source to see if they collaborate. They're learning the hard way about going to sites of information without Wikipedia! So we do lots of projects . . . sometimes it seems like I am sitting around doing nothing but they're learning and they're fully engaged so I like it that way.

According to Sam, the number one essential skill for students is to be able to think critically and to be able to use discernment while reading or researching information.

> I think they need to be able to . . . they need to start using some discernment. I don't know if that's a skill with critical thinking but knowing there are a lot of things they can do but they shouldn't be doing all those things and I think they have a difficult time with discernment. But especially at a Christian school, this is something we need to be teaching them.

Sam believes teachers can give students all the information but if students cannot problem solve or think critically then all teachers are really doing is helping students memorize answers for the test that they will soon forget.

Collaboration is another essential skill Sam believes is important for his students in the 21st century. He provides opportunities for collaboration through team projects. Many of his projects are designed to include different team member responsibilities. Each student "plays the role" of a science expert in a

particular area and brings information to their group. The experts from the different groups meet together to determine the information they will bring back to their original groups. The groups then discuss the information given by each expert and decide how they will present their projects to the reset of the class. This way, students are "working not only within their groups but they have to work with the 'experts' from other groups to determine pertinent information." The conclusion of most projects is a presentation to the class but sometimes can be an audience of peers and teachers.

While projects provide opportunities for collaboration, they also help students develop a sense of responsibility, an important "trait or skill" Sam wants to develop in his students. He also provides other opportunities to develop student responsibility through the use of social contracts.

> I went to "Capturing Kids Hearts" last year and the social contracts start at the beginning of the year. They [students] write what they think are good qualities for students in the classroom, for their classroom. Then as a class we go through them and if some are mentioned more than once, we put a checkmark and students start to see what qualities are important in the classroom. So once they agree on it [the social contract], the students sign the social contract and students themselves are held to the contract. If someone says something not in keeping with the list, someone will say something so they hold each other accountable.

According to Sam, the social contracts work in many of his classes but in other, "students just aren't quite there yet." This classroom management system works well for Sam because students are operating under a system of accountability to each other as opposed to the teacher "handing out infractions and demerits."

Periodically throughout the school year Sam is able to arrange his desks differently, within certain boundaries, to accommodate activities and labs and to support how he teaches. Several of his units are ongoing which require learning centers to be accessible to students throughout the day for several weeks or even months at a time. One such unit is forensic science that involves learning about DNA and fingerprinting. Posters on the walls identify aspects of forensic science and a "crime scene" area is set up in the back on the room. This unit actually provides "a sort of background theme for the whole year." At the beginning of the school year, students learn about classification of living things and Sam brings in fingerprint classification. A police officer comes in and teaches the students how to collect fingerprints from surfaces and introduces other aspects of crime scene investigations. In the spring, the "actual crime takes place" and students are involved in several "CSI activities" to help them solve the case. One activity involves a chemistry lab where students identify a "mystery" substance using properties of mixtures and compounds. Students interview "suspects, staff members, and faculty members." Then they write up their reports and present their findings to the class. "There is a lot of time involved but they [students]

enjoy it and actually learn from it!" A few weeks leading up to the "crime," Sam rearranges the chairs so the class has "more of a group setting, so it's not like in rows."

Sam designs his instruction based on the size and personality of his classes. He understands that not all students learn alike and not all students learn the same way he learned and considers this with the curricular design and instruction.

> I have one class that is very, very talkative and it's not the kind of class where we can have a lot of lecture and then I ask questions so a lot of time I may give them small points and give them some group work so they can collaborate and then we come back together. Whereas another class I can put up a power point and we can discuss some things, I can show then a video clip to illustrate . . . I can do the same lesson plan but do it a little bit different for different classes. I mean there are some [students] that can't just hear it, they've got to see it, do it, and write something down. It's surprising that the class that talks a lot, almost bordering on disrespect, you can get a lot done with them. They do well on tests when you change it from just me talking and asking questions to me talking a little and letting them work in groups.

Although he understands the concept of differentiation, Sam expressed his weakness in this area of instruction. "I am still working on it. I'm kind of at the

beginning stages." He feels it is unfortunate that many times it takes him until spring to realize the different make-up of his classes and then make the adjustments needed for instructional design. "When you only see them for a year, you think, man . . . I wish I had known this at the beginning of the school year I could have totally fixed it early. But you're getting to know your kids then and they act differently in the fall than in the spring."

Sam designs assessments around the course content and instructional design. For the course projects, rubrics are used for grading. Students know what is expected of the group members in the mechanics of presentations and what information should be included. He also includes different types of assessments throughout the projects so that "a bad group grade doesn't hurt their [students'] overall average. But each one [student] has their own job so when they're presenting its easy to grade what they are doing or have done, and this can offset the final group grades." For Sam, the CSI unit presents some difficulty for him with assessments because it is "on-going, inter-related and part of the whole curriculum." The final grade for that project is a major grade in the final school quarter and he is already reflecting on the whole project to see what he can do differently next year.

> It's fun . . . they [students] enjoy it and they learn a lot. What they learn from the project seems to be less from the curriculum and more from interpersonal skills, learning how to talk with adults. They are learning

> how to sit down and ask well-thought out questions to adults, and based on answers, come up with follow-up questions. So it's challenging but they're also learning skills that you can't put a grade on.

Sam also uses assessments based on the chapter concepts that include the "traditional tests, quizzes, and essay type questions," but for the most part, he tries to make most of the assessments based on the outcomes from the projects.

Sam indicated he has never heard the term "21st century skills or skills development" but believes that if he is doing it, he is doing it naturally or through what he has learned through pre-service and professional development.

> I'm sure some of it comes from professional development and I mean, I've only been teaching in the 21st century. I started teaching in 2004, so we're in the 21st century and it's [21st skill development] been a focus but I don't know how different what we're being taught as teachers is different from teachers were taught in the 1980s or '90s so I really don't know what it was like in the 20th century . . . I haven't known anything different. And I don't remember how different it was when I was in school. It's sad but I don't remember how different the instruction was . . . I remember doing labs in science and a lot of lecture but I don't remember any group work but then I don't remember not doing group work. I don't remember taking notes but I know I did because I remember studying and getting good grades.

Sam's school provides professional development for teachers and staff several times a year. One such opportunity earlier in the school year was a presentation on "differentiated instruction and how each kid learns differently, teaching the students and not just teaching the curriculum." This has been a major focus for Sam this year and as he indicated earlier, "something he would like to be better at." Sam has also attended a forensics conference in San Jose because "they [the school administration] knew my students were enjoying that and that was something that I needed a firmer grasp on so I could integrate it with the other things we were working on."

Final reflections indicated that Sam is not always sure why he is in the teaching profession.

> It's one of those things that . . . I love Jesus Christ and I lead worship part time at my church and so for right now He's got me here. I love science, I love how the idea of God and what He made can be studied and we can attribute the things we are studying to Him and I don't know that He gets the credit very often for what He made. I like being in a place like this where you have kids you can share the gospel with them and you teach science at the same time. It's being able to share with them that it's not science and God, it's science because of God. So it's really cool to be able to have that kind of effect on kids because in public school you almost have to keep them at a distance, you have to worry about telling them the

truth. It's weird; I didn't grow up in a private school so I was a little leery of coming into a private school to teach because I didn't know anything about it. But I enjoy it and I love teaching kids and right now He's got me teaching kids. There could come a day when I'm teaching adults but right now I'm here and I love what I doing.

Classroom observations supported the instructional aspects and room design Sam indicated in the interview.

Syd's Story

Syd is a 25-year experienced high school science teacher currently teaching at a suburban Christian school with approximately 800 students. The school was originally established as a part of a non-denominational church with a school board made up of church officials. Fifteen years ago the school became an independent Christian school and is run by a school board consisting of current parents and community leaders. Many of the classrooms were originally designed to house both educational classes during the week and Sunday School classes on Sundays. Several of the classrooms have partitions that can open to accommodate larger classes. Syd's particular science lab is small compared to public school labs but does have gas jets for Bunsen burners and safety components, such as a "shower," eye wash station, and a vent hood, that are clearly visible. Syd teaches "on level" and advanced levels of Chemistry and advanced level Biology.

Syd describes her approach to teaching as one that begins with "a love of the subject, a love of kids, and a desire to teach them some of the basic parts of science. "She has developed her approach to teaching using an "inquiry" technique that helps her know where her students are in the learning process. "I think a lot of it comes from talking with them. If we're doing a lab, I walk around and ask 'what are you doing?' and try to find out if they know what's the purpose of why they're standing there with the Bunsen burner on and test tube in their hand . . . why is that happening?" Syd believes this approach to teaching will be of value as she trains and prepares for future advanced placement science courses that College Board has designed to be more inquiry based.

> I see that helping me next year with the AP [Advanced Placement] Biology but I don't know . . . we've done the "cookie-cutter" [prescribed labs] for so long so in the lab book, it [lab book] uses basic ideas in the lab like osmosis. But now we're going to add a little 'mystery' with what are you going to end up with and why' rather than them telling the student what to do step by step and what you [students] should end up with . . . what the results will be. This starts next year along with the new syllabus.

For Syd, assessments are a part of what she does as a teacher, but it is the ongoing discussion with students that tells her whether or not she is "getting across to this kid or not." She understands that not all students do well on tests so that type of assessment is not always the best barometer of the learning that is

taking place in her classroom. “For the brighter kids that do well on tests that’s okay, that’s a good assessment. But when some students are testing their stomachs knot up and their brains turn off and they’re dead meat! So discussion really tells me a lot.” She tries to “pay attention” along the way, asking what students learned, so she can reassess and re-direct her questions and instruction as needed. Syd also believes that involving her students in the learning process allows her to assess student learning.

> We’re working on math and I put it up on the board and ask ‘who thinks they can work this problem?’ and then maybe pick on the child that maybe doesn’t have it just yet. Often times up at the board a student will all of a sudden say “Oh . . . that’s how it works!” and when your nose is right up there at the board you [students] can see and it’s ‘oh . . . now I’ve got it!If you don’t involve them . . . they’re gone! Sometimes you just need to stop and do something different. Quick . . . change seats to activate something different.

Syd uses other instructional techniques and activities to assess learning and involve students in the learning process. One activity her students particularly enjoy is “appointments” routinely used for reviews. Students set up “appointments” with three or four other students and beginning with their first appointment, students ask and answer several questions. Students then move to their second and additional appointments. “Some kids won’t get up, they make

students come to 'their house,' but others love to get up and move around." According to Syd, this type of activity also promotes social interaction because she can "take that kid that wouldn't volunteer to work with that kid or Joe because he doesn't necessarily get along with Joe but for right now, at least for a couple of questions, he has to! "At the end of this activity, students come back together to talk about what they have learned and to ensure they have the correct answers.

Assessments for Syd's classes also include the traditional tests and quizzes. "I do quizzes, short 10 questions, almost always it's [the quiz] advertised . . . you going to have a quiz over 'such and such' or whatever, sometimes pop quizzes but not too often, I'm not too fond of pop quizzes because I know when I got them I would panic so I don't do that too often. Syd also believes labs are a good assessment to determine if students understand the concepts presented. She also uses labs to help students discover concepts and ideas not yet discussed. "I love the whole discovery process to look at what's coming up next because they [students] are totally out there in the dark. Why are we doing this or let's see what happens." One such "discovery lab" Syd described involves the concepts of acids and bases. On the first day of the lab Syd teaches students what acids are and the importance of being "gowned and dressed" with goggles, gloves, and aprons. Students identify the pieces of equipment they will be working with and they identify the different litmus papers and acid/base indicators. Then she "just sets them loose and lets them see what will happen." Equipped with the

understanding of identifying acids but not bases, the second part of the lab requires students to identify whether a substance is an acid or base by the colors they see on the litmus paper.

> This type of activity is fun because we're studying acids and bases but they [students] had no idea at first what they were doing. Students don't often make the connections between what we've taught and what we're [students] doing. We think they've made the connections but they might not have learned the "what and why." It's something I learned last summer at the AP training . . . "cookie cutter labs." I like cookie cutter labs because you've got to learn the equipment so let's do a little something with it . . . get the right color of flame, add the glassware with it and all that, so cookie cutters are okay.

Syd occasionally provides opportunities for student projects. A recent project involved students researching the different atomic models and the scientists who developed the models. Post-project reflection revealed changes Syd would make the next time students do this particular project.

> I would change it next time because each group had one particular guy and model and so they knew that guy really well . . . months later we came back and pulled that information back in and the groups that worked on that particular scientist, knew that but didn't necessarily know the others [scientist] so I think if I do it next time, somehow they [students] have to

> get in contact with each one of those scientists that have developed the scientific models.

As with other projects, Syd gave students a grading rubric but students were on their own to design the project and how they would present the information. She assigned the scientist to each group and she chose the team leader, but the leaders chose their group members. “But that can potentially be dangerous because ‘Joe’ is still over there in the corner and eventually he gets picked up on a team. But you know what you can do with that, you can make Joe one of the team leaders and then he’s set up to pick out who he might want to be ‘buds’ with.”

In the Advanced Placement Biology class, students do more projects than in Syd’s other classes. Much of the material is “self-taught” and they collaborate with other students to help understand the concepts. Students in the AP class are assigned parts of the chapters and they design the instruction. Usually this involves the development of PowerPoints that are sent to other classmates. Syd takes the information from the student-developed PowerPoints to make the assessments. Meanwhile she will be lecturing on other material or the class is working on the required labs but all the student-driven work is done outside of the class time.

> They [students] don’t have time to work on their PowerPoints; there is too much to cover for the exam. They [students] have to become more self-directed [and] I would say in the end, they learn more this way and they

> learn the material really well. They had to learn it in order to teach it and you can tell if a student has put in the proper amount of time . . . if not they stumble over the PowerPoint. One student took a difficult equation the other students were uncomfortable with it. She went up to the board and she went through several problems. It was awesome . . . I sat there and took notes, it was such an awesome presentation. Of course, its algebra, its candy to this student and another student is asking "What? Can you repeat that?" and the student would go right back and explain it the second time and the third time and the fourth time, and finally the other student went "Ohhh!" An excellent teacher!

Syd limits this type of learning in other classes that are considered required courses, such as Chemistry. She works off the premise that these students have to be in the class and they "just want to pass." For these classes an observer would see more direct instruction and traditional "teacher driven activities" such as worksheets, frequent quizzes, tests, and labs. Conversely, students are in the more rigorous, Pre-AP Chemistry course because "they love science or they want that grade, they want that top spot [in their class]." However, Syd understands the competitive nature of these students and even though students have excelled at the assigned projects, she limits the frequency of projects because these students want "those individual grades to boost their GPA."

According to Syd, an important skill for students in the 21st century is "how to read a book, the skill of opening a textbook . . . I know that sounds awful but it's true!" Students in her advanced science classes read the assigned chapters because Syd does not always go through the entire chapter yet students are still responsible for the content. However, her "on-level" students return their books at the end of the school year "still in pristine condition." Syd is convinced those students only open the book when she assigns problems from the chapters or end of chapter questions. "I know we can have it [the book] online and that's great, they've got to know their technology and I'm learning with them." Syd believes that many of her students are "technology ignorant" and considers this another skill students need to be successful in the 21st century. She described working with students who do not know how to email assignments and thinking "wow, I feel like an expert here! Teacher [referring to herself] is doing well here!"Syd indicated that although our students have been raised in this "digital age" and they have access to a lot of information and they can send text messages, the reality is they do not know how to complete "simple technology tasks like sending an email or saving a word document."

Another skill important for Syd's students in the 21st century is the ability to think critically and problem solve, especially with lab experiments. "Most science teachers really work on this [critical thinking], or they should . . . it's the 'what if' thing, or what do you think is going to happen?" Syd tries to incorporate

asking students “why” in many aspects of the curriculum and daily lessons. “Why did that happen? Yea, I know you got this data but why did this happen?” She does not allow students to change their data when their results do not match the expected outcomes because she wants students to learn the importance of research integrity. When students record data and work the problems, they sometimes see an error that is “off the charts.” This provides opportunities for Syd and the students to talk about what happened and investigate where the mistake occurred. “Why do you think you got this wrong? Because often the last question of the lab assessment is why? Why did you get this result? Why is your data so bad or why is your data so good? And I tell them it can never be ‘because of my partner,’ that’s never an excuse!”

Another important skill for students in this “digital, text-messaging” age according to Syd is the ability to write in complete sentences.

> It shouldn’t surprise me but it always does when students ask me if they have to write in complete sentences. It’s a requirement, unless on the assignment it’s a short line and it’s asking for yes or no in that line. But they [students] need to watch that because it may be a yes or no [answer] but then it will say “explain!” So now the explanation will be in complete sentences.

Students in Syd’s Advanced Placement classes are “awesome as far as expressing themselves” and come to her class armed with the necessary skills. She believes

this is because traditionally her AP students are the same students that are usually enrolled in the upper-level English classes. “They’re doing the writing in English and evidently they’re taught a lot there, more than other classes . . . they can write awesome!”Syd’s concern is that not all students in her school come to science classes with these needed communication skills, especially in the on level classes.

> I realize I will always have those gifted students who aspire but what can we do for our on-level students to help them see the importance, to have the enthusiasm for learning? How do we get them [students] to the point where they will open a textbook and read, or write in complete sentences. Does this go back to the middle school level to get even the on-level students where we need them to be?

Syd understands that building relationships is a major component of the issue she faces. She knows that from the relationship, she can “pull something out of somebody that another teacher can’t …they enjoy you . . . ‘hate your subject Syd, but love you.’ That is the teachable moments when as a teacher, she can “poke and prod and get something out of the students, or then be able to turn around and say, you’re not doing your best . . . I see an A out of you.” Syd expressed that she has tried this with a couple of students during this school year but understands the demands that extra-curricular activities place on her students, seemingly more prevalent in a private schools. Her reflection considers

> How do we get our students to be self-directed or self-motivated so that it doesn't matter what the subject is they will still put forth some effort into this? There seems to be so much "spoon feeding" that when they get to a class or teacher that requires them to think . . . they say "oh what, you're not going to tell me the answer?" Where do we start that process . . . maybe way back in elementary…I don't know.

Syd also tries to promote collaboration skills through the experimental labs. "I definitely try to promote that skill through the labs…I mean your partner is your partner!" Students are instructed to figure out who is going to get the materials, who is doing the measuring, who gets to light the Bunsen burner, ("that's always the big one"), but more importantly trying to teach students the whole "partnership thing." Syd prefers student teams of two because then students have to pull their own weight and smaller teams require more individual responsibility "like who's going to tell the teacher we just broke something over there?"

Syd's classroom is small compared to other classrooms in her school. Counters line the back and one side of the classroom with built-in cabinets above and below the counters for storage. Student work is displayed on the upper cabinet doors and a large Periodic Table hangs on a side wall. Tables built for two students are situated side-by-side in two long rows, all facing the front of the classroom. As with other teachers interviewed, Syd struggles with room design to

facilitate her style of teaching. She notes the Bunsen burners situated on the counters under the cabinets and realizes this "is probably not the best design but it is where the gas jets have been installed." Syd indicated that students always have their backs to her when they are working on labs at the counters and she would prefer a different set-up.

> I'd rather see their faces because then you can tell what's going on and you can catch a mistake or an accident coming. Because with their backs to you, with this complete line of backs to you and that's all you can see, sometimes maybe you can see this little flame from the Bunsen burner but mainly this line of backs, so the only way you can find out what's going on is to get in there among them or lean over them so I would design a lab where I can see faces.

Syd also pointed out the rows of tables and indicated this is not an ideal set-up as well. She believes that students need their "own space" so they are not as "tempted to lean over and copy from someone else's paper." She also pointed out that this type of arrangement limits the working space for many of the high school boys, especially her football players. However, Syd sometimes uses the table arrangement for a particular purpose. "I sometimes put two people together I know don't get along just so they have to get along because we often do 'table partners' and you have to work it out with your table partner." Ideally Syd would like a science lab that includes a teaching space with a teacher demonstration area

that is separate from the student work space. Currently she has to use the counters at the back of the classroom for her demonstrations, especially if she needs the Bunsen burner, and she feels this puts students at a disadvantage who are seated at the front of the classroom.

Syd's school uses a one-to-one laptop program in the high school so her instruction is designed around the learning management system downloaded in the laptops. Although Syd knows several teachers at her school struggle with the new technology, she is "a lover of the program" because it helps keep her organized. She explained that when she first started using the program two years ago "there was a lot of trial and error . . . mainly error." But she eventually worked through the problems and once she figured out what aspects of the program worked best for her teaching style, she "never looked back." One aspect of the program Syd uses is the "panels" that contain the concepts she is teaching, followed by the problems or definitions that students complete on their laptops and then electronically submit for grading. The student textbook is also downloaded on the laptop so students can follow along while Syd is teaching. There are also websites with additional student activities, enrichment games, or videos students watch during class or at home. "So we have a joke in the Chemistry classroom . . . we don't play games but we do lots of activities!" Syd also likes that students can bring up the panels at home while working on homework if they have questions about a concept or problem that was taught in

class. Syd realizes that technology is constantly changing but for right now "this program works well for [her] to present material and for students to learn."

Syd indicated she could not recall ever hearing the term "21st century skills" or "21st century skill development" but believes it is something that teachers normally talk about when they are in their grade-level meetings and discussing common problems with students that are struggling in school. "Well why aren't they being successful, what aren't they turning in homework, why do you suppose that? Maybe they're [students] involved in something else or maybe they can't get the material or maybe it's the way we're teaching. I wonder if we [teachers] ever just ask them [students]?"

For her final thoughts, Syd reiterated the calling on her life, her love for classroom teaching, and her love for students.

> I know others who have been in the classroom and they've gone up, but I have no desire to go up…God has not called me to go up into administration, out of the classroom. I look around in the classroom and think this is where I'm supposed to be. Small groups fine . . . I could be a leader in a small group but not in a big group. I don't talk in teachers' meetings, I have opinions . . . I talk when we're in department meetings but most of the time it's quite up here [pointing to her mouth]. But I love the classroom, I love the kids.

Syd sees her school moving toward different instructional methodologies with newer technology and project-based learning. For her, the learning will be slow, but as with the learning management system she described earlier, "it's just a matter of getting in there and get my feet wet, and yes, I will make mistakes and I know our IT [instructional technologist] says 'I'll get it in there for you' but I want to be independent, I don't want him to be doing all that for me when I can figure it out on my own. And you know, I also want to provide that kind of learning for my students."

Observations in Syd's classroom confirmed her responses in the interview.

Sarge's Story

Sarge teaches at a mid-size Christian school with over 800 students and located in a suburban area of Texas. The school was originally established as a part of a non-denominational church. Fifteen years ago the school became an independent, board-run school. Many of the classrooms were originally designed to house both educational classes during the week and Sunday School classes on weekends. Several of the classrooms have partitions that can open to accommodate larger classes. Sarge's particular science lab was originally the "teachers' lounge" and was retrofitted several years ago because it already had the required plumbing for sinks and had additional room for a full-sized refrigerator to store dissection specimens. Science tables arranged in a "u-shape"

accommodate typical class sizes of 18-22 students. Sarge teaches “on level” and advanced levels of Biology and Environmental Science.

Sarge describes his approach to teaching with this statement: “My philosophy has always been if the student hasn’t learned, the teacher hasn’t taught.” His approach to teaching is based on his understanding of what happens in the developmental process.

> We get “stuck” in one form of learning rather it be visual, tactile, auditory, or a mixture. So I try to bring in visual for the visuals, auditory (I’m auditory), and some movement for those who are kinesthetic and bring that into play. I think the student should be the center of the learning, so their needs, how they learn, should be the way I teach.

Sarge discovers how his students learn best in several ways. Some students are called on to teach a section of the material while others are called on to answer oral questions. Sarge frequently gives “several question quizzes” over the main topics or has students write a short paper over what they have learned or what knowledge they have gained. That way he knows what the students have learned and “what has just passed through the air!” He also referenced a tool developed by a speaker at the ACSI (Association of Christian Schools International) conferences that helps teachers determine students’ learning styles. He has not used this tool but would like to at some point so he could discuss with

students their learning styles and why it is important for students to know how they best learn.

Sarge believes self-discipline is a major skill students need to develop for the 21st century. "If they [students] don't have self-discipline then all they do is play video games." Along with self-discipline, Sarge would consider the ability to work together and communicate with one another vital skills. "They need to be able to work together in this world…it's all about being able to work together, to be able to explain yourself, and not just in a text message." He describes opportunities for students to develop collaboration and communication through the use of group projects and student oral presentations. He also allows for students to talk about concepts in small group discussions at the lab tables.

Another vital skill is for students to think critically and Sarge sees this skill as "a great shortfall in the students I have." For Sarge, our educational system did a great injustice to students when we did away with composition and rhetoric. "I hated comp and rhetoric but rhetoric was the critical thinking aspect of composition . . . today we just teach true composition but we don't teach rhetoric." Sarge further explains that when he was in English classes taking composition and rhetoric, students would read a passage and answer questions that contained inferences, making students "really think about the process." He remembers his military background revolved around critical thinking, "how do we solve this problem, how do get through this safely without loss of life?" Sarge

also sees critical thinking as a vital skill necessary in the business world. “My son is a store manager, he has to set and reach certain goals and so he sets goals for his employees. If they can’t meet their goals he gives them about 30-60 days and then lets them go if they can’t reach their goals because it means he can’t reach his goals.” For his Pre-AP classes, Sarge provides students with a worksheet that deals with analogies and has students relate the science concept with something that is non-scientific to help develop critical thinking skills.

Another skill Sarge views as “definitely” important for students in the 21st century is computer skills. Although his students are more proficient with computers than he is, Sarge believes students are still in the learning process with the necessary computer skills they need. “We’re all in this [computer] learning process together. I’m from that generation where computers didn’t come out until my 30’s and these students have always had computers so I need to be learning from my students. I enjoy that!” Sarge reiterates that the key skills for students in the 21st century are critical thinking, computer skills, working together with collaboration, and self-discipline.

Sarge describes himself as “a firm believer in self-study” and although not on his “original list” of skills needed in the 21st century, he thinks this type of learning is lacking in our educational system today. In the early 70’s, his freshman college biology class was designed to be a type of independent learning course. Students would sit at cubicles and watch reel-to-reel movies with the

lecture. At certain points the professor would say “stop the tape and go to this station” and then students would listen to a tape while they made observations or performed dissections. According to Sarge, students enrolled in this course met for one class period each week to discuss the material and took their tests on Thursday afternoons. On Friday mornings students would meet with the professor for 15-20 minutes to review the tests and asks questions.

> It was so enjoyable and you could come in at any time as long as you accomplished the material. I used to accomplish the assignments within the first day so I could get ready for the tests and just absorbed it. I think my lowest test grade was a 98! I think we have gone away from this type of teaching . . . except maybe now with online courses . . . but I don’t know many college courses [that] are set up that way . . . like the “flipped classroom.” I really learned so much from that [course] and this was ‘way back when’ but I still remember that. Of course it was a lot auditory and I’m auditory but also tactile learning with the dissections.

As with other science classrooms, Sarge is limited in the design of his classroom to help facilitate his teaching style and help students develop the important 21st century skills. At one point he had his lab tables pushed together with students seated side by side and facing the front of the classroom. However, “this seating arrangement provided more social interaction than was desired.” Currently the tables are placed in a “u-shape” so that students are more spread out

with students seated on both sides of the tables. “They [students] can look at each other and they can still interact, but they are not so close to each other as to block out the instruction but can still engage in some of the more social activities.” Sarge points out the visuals on the walls and comments “they [the posters] represent chapters in the anatomy class and they are in chapter order. And so we start in chapter 3 (the first 2 chapters are review) and each poster you see is a chapter.” Additional mounted posters on the front and back walls include other course concepts such as heredity, genetics, and DNA and one poster that comparestheories of evolution and creation science. “I tell the students, if you can read it and it’s on the test, you can use it because it [the poster] is not covered up . . . you just can’t get up out of your seat to read it!”

Sarge designs his instruction “through much prayer.” He believes that teaching is a “supernatural enablement from the Holy Spirit and that because God is the creator of all things and God is the scientist so I use prayer.” Included in the design of his instruction are the textbook chapters, however he does not necessarily follow the order of the chapters.

> I mix up the order of the textbook so I can accomplish certain items in a certain time frame. For instance I start out with macro-biology, so we can get into some dissections. If we can do dissections early, I feel I have the students’ attention for the rest of the year. They can’t wait to come to science to what else we’re going to do. Then when it turns cold, winter

> time, I move to microbiology and we use the microscopes. We study heredity and genetics and viruses and bacteria. Then after spring break, when everything turns green again we do botany so we can go outdoors and I teach botany outdoors. Even if we go outside for 10 minutes to look at different species of plants for comparison…say monocots and dicots, then they're excited and they learn from that.

Sarge uses some projects to facilitate his teaching but would like to use more "project-based learning" in his curriculum. He is scheduled to attend a workshop on project based learning during the summer and his plan is to use this method of teaching and student learning more in the next school year. "The more I learn about PBL (project-based learning), the more I like to use it. In the past I have used a lot of worksheets to help them [students] learn the material. But now I am look at using PBL." Sarge describes one project he used recently with his Pre-AP biology class:

> I had the [Pre-AP] class learn about the ecosystems through a project. Their group had to pick a biome, first come first served, so no two groups had the same biome. There were certain questions they had to answer, then there were choices for other questions, but they had to choose four, and how they presented was up to them. So I give them a lot of leeway in how they did the project. I had a contract for them so if there was a member of the group not working, the ultimate thing would be they would have to

> dothe whole project on their own . . . they were “fired” from the group just like in business. I enjoyed doing it . . . kids loved it. When it came to doing the grading, I had each student grade each other . . . they grade a lot harder than I would!

According to Sarge, the students found much success in this project and were highly engaged in the learning process. One group was so involved in the project that they went to a park on a Saturday and created an area that represented their biome, including one student walking a dog. “It was hilarious! I learned more through this project and I know students did through self-study . . . more than I could have taught them in the traditional classroom situation with lecture.”

For his course assessments, Sarge looks at what has been covered in his classes and many times uses the textbook publisher’s assessments “because it covers the reading.” These types of assessments are arranged so that he can pick and choose not only the questions, but the level of questions. For example, in the regular biology class Sarge tends to stay with the ‘level1/level 2” type questions. But for his Pre-AP biology classes, he chooses “level 2/level 3 type” questions because those students “should be able to handle them.” Sarge describes the difference in the levels of questions as “the level 1’s are real easy type questions taken directly from the textbook with the answer almost in the question . . . multiple choice types, real easy. Level 2 requires some background knowledge and then with level 3, it requires [students] making inferences.” Sarge also

provides a word bank for “fill in the blank” questions but he lists more words than students will use, “more than the number of blanks.” For true/false questions he may change all the answers to be “all true or all false to see if they really know the answers, how many times do they erase because they think this can’t be right!”

In the regular biology class, daily quizzes are given that are always “open note” but not “open book.” Students can take notes over the reading assignments and then use those notes for the quizzes. “I encourage students to take notes because I know at the college level, learning requires students to be able to take notes, your whole survival is based on your reading and being able to pull out the pertinent information.” Sarge does not spend time teaching students how to take notes, he relies on what students have been taught by their teachers in previous years and in other courses. However, “if I have a student who doesn’t know how to take notes, and this is real evident in the first few weeks of school, then I show them how to take notes. I explain you don’t have to write down everything, you can just write out an outline that helps you remember.”

Sarge explains that his understanding of “21st century skills” has developed over the past few years through professional development opportunities provided at his school as well as at CAST (Conference for the Advancement of Science Teaching) conferences. “We might not call them ‘21st century skills’ per say, but we do talk about the skills I mentioned earlier and we

talk about how we can get our students to learn them and master these skills." Sarge is looking forward to the training he will receive this summer in project-based learning because "it will help me teach my students those skills like collaboration, communication, critical thinking, and independent learning."

> For Sarge, a successful teacher is one that loves his or her students. You have to be transparent, and when you make a mistake, let them know you have made a mistake, apologize and go on. I believe, someone said, if you discipline without relationships you breed rebellion and so once you build the relationships . . . I work on building the relationships during the first few weeks of school . . . you don't have the discipline problems. And when there's no discipline issues, and it makes teaching fun. I can't believe I get paid to teach!

Observations in Sarge's classroom confirmed many of the statements made during the interview. Although the desire to teach 21st century skills is evident, much of the student work was question/answers from the textbook and worksheet generated.

Sarah's Story

Sarah teaches at a Christian school located on the outskirts of a major metropolitan area with a student enrollment of 1000 students. Although once associated with a church denomination, the school is now independently run by a school board made up of school parents and community members at large. The

school has two separate campuses, the main campus housing 7th through 12th grades and the elementary (Pre-K through 5th grade) campus located several miles north of the main campus. Sarah's large science lab is part of a new building addition to the school and is designed to facilitate "science" instruction in one area and labs and demonstrations, in another area of the room. The classroom is equipped with a projector mounted on the ceiling to support technology integration.

Sarah teaches upper-level sciences at the honors and Advanced Placement levels at the secondary campus. She describes her approach to teaching as one that focuses on getting students to take ownership of their learning. "I teach the college prep, honors and AP but even at the average regular levels [of courses], they [students] still need to take ownership of their learning." Based on that teaching approach, the activities Sarah designs to motivate students to take responsibility for their learning are different depending on the level of the course. According to Sarah, recognizing that students have different interests and different end goals, it is her responsibility as a professional to know where she wants her students to go and to determine the "big ideas" her students need to know. In this sense, she feels the need to have some control of the learning environment where she determines the framework, the major learning objectives. "I'm the teacher and I know what the objectives are I what my students to achieve. I feel I'm very differentiated with instruction [and] as the instructor,

there are lot of different ways [for students] to learn the information and [for me] to demonstrate the information. Although I determine the framework, I try to give a lot of choice and flexibility within that framework."

Sarah believes one would find a mix of teacher-centric and student-centric learning in her classroom, especially in the Chemistry classes. "My goal is that while I'm teaching the concepts, I am thinking about their future courses, whether it's college Chemistry or AP [Advanced Placement] chemistry. While I'm teaching the objectives, my goal is for them to learn the skills they will need." According to Sarah, every unit is viewed as a unique entity; some units are designed as very teacher-centric and others are designed as more student-centric.

> I have some units that are heavy with teacher lecture style,with student note-taking, . . discussions, and on-going assessments. But the 'information getting' is very teacher-centric. And then we have other ones [units] that are very inquiry-based, where the students are learning from experimenting and students are learning from discussion and I'm just facilitating that discussion.

One unit in particular is designed to be completely self-taught. The framework is developed as a treasure hunt, a "build your army of God and conquer the land of VSEPR, so it's kind of a Christian [activity]…using [the book of] Ephesians and the armor of God." This unit on molecules and molecular shapes uses the VSEPR (Valence Shell Electron Pair Repulsion) theory and contains different instructions,

different hands-on activities, and different readings and assessments. Students check their own work; they are the honor system to get their quizzes on their own when they are ready and then put them in the folder for Sarah to grade and return. "It's just very, very student centered…and at the end of each quiz they get a clue to the treasure hunt." The unit was created several years ago from just a "kernel of an idea" Sarah got from a History teacher. She designed the unit because she wanted students to have an opportunity to learn this "non-mathematical" subject matter on their own, concepts she believes are conducive to self-directed learning. Towards the end of the treasure hunt are items that not all the students will get to so the faster students go, the better the opportunity for them to get to some of the "extra things" embedded in the treasure.

According to Sarah, an essential skill for students in the 21st century would be how to search for information properly, "how to critically evaluate that information properly…is it a credible source or not?" Other essential skills for students would include how to work together and how to take responsibility for their own learning. For Sarah, this includes helping students understand the consequences for their choices and decisions. "We talk about they don't have time to study for their test so what is the consequence? Many times it's because they have done these extracurricular things and so they need to be able to handle the consequences for their actions and understand the consequences for the choices they make and living with them [consequences]." Sarah also believes that students

need to learn to handle disappointment. In her classroom she works with students in developing the ability to handle criticism. “We work at being very objective about our learning so students know if we criticize it is to correct, there’s nothing wrong with making mistakes [and] asking for help.” According to Sarah, this skill can only be developed in safe environments, safe classrooms and she feels it is her responsibility to create a classroom culture where it is okay to make mistakes. “We all need help; nobody’s perfect…so many of our students don’t know how to handle disappointment. They need to be able to handle criticism, disappointment, [and] to learn from their mistakes to be successful in life.”

As with other schools and the design of science classrooms, Sarah is limited in a design that would support her style of teaching and student learning. “My ideal would be to have a smaller learning environment or centers that are separate from the lab tables.” Using the layout and space she has, when her teaching is more process/discussion oriented Sarah has her students bring their stools to the front at the point where they can see the manipulative or demonstration to provide a more “intimate setting.” Sarah also likes group activities, especially with daily class-work. “I have activities where they know the [answer] keys are going to be…the answers to the worksheets so they can check it [answers] so if they don’t get the concept they can come up and look at the [answer] key.” According to Sarah, the goal of these class-work activities is not for the grade, but for students to discuss the information among their group and

learn the concepts using the resources that are available to them. For the most part, students are allowed to move freely about the room if they need to, "I'm not really rigid if they [students] need to get up while I talk, they can get up from their stools if they need to…they just can't leave the room without me!" Sarah also points out science posters on the walls that support the concepts she is teaching and a wall where she posts students' work that has received an "A" grade.

Sarah's school uses a block schedule of 90 minute class periods Tuesday through Friday and an "all classes schedule or 45 minute classes on Monday." Sarah feels her instructional style is best suited for 55 minute periods, the time frame she had when she first started her teaching career, but overall likes the block schedule because she breaks up the class time. "I rarely do the same thing for the entire period unless it's their [students'] choice…sometimes they'll get going and they just want to work especially on some on these self-paced units…but still there are different things for them to do so I get them out of their seats when I can and I structure the block so that we have lecture, activity, lab, so it is nice to be able to discuss the lab, do the lab and discuss it again.

Sarah sees her strength in creating units of study. "I'm getting ready to design an honors physics course from scratch over the summer which is really a lot of pressure because it has taken me 20 years to get Chemistry to where I like it. It's not exactly where I like it but I'm going to have to let it go for right now so I can focus on this other [course]." She designs her instruction around the course

units and objectives, rather than looking at the assessments first. She looks at the unit "big picture" and the "essential questions" then the individual chapter objectives. Based on the types of learner and the learning environment she wants to create, Sarah decides on the framework for teaching the unit.

> Once I've got that in mind then I think how am I going to get the students to achieve these objective . . . is it inquiry based, teacher-driven with lecture, or is it group work? Like one unit I have is intentionally divided into all three . . . one part is inquiry, one [part] is teacher and one [part] is group so I look at how I want to do that.

Once the decision for the framework is made, she looks at the appropriate level of worksheets, or questions, or labs she wants for her students. She considers the whole process as a"big brainstorming session" and is usually based on something she has taught before and may need to be tweaked or something else added to help bring it all together.

The course assessments are based upon what the students have done with the chapters and units, the labs, the discussions, "the big picture and the little objectives." In the planning of the unit, Sarah assesses not only the learning objectives but the lab objectives as well. She believes that having that "big picture" allows her to see how her students can be "challenged and not crater, especially when they all know there will always be two or three cumulative-type questions which they have never seen before that they should be able to answer if

they know all these pieces . . . they should be able to answer these questions." According to Sarah, including these types of "hard" questions on the tests allow her students to demonstrate critical thinking. At the beginning of the school year, students work together in groups on these cumulative types of questions and no grade is given. As the school year progresses there is less practice and students are expected to be able to answer these "hard" questions on their own. "If there's a multi-step question there is some information given but there's a part with no direction given, I'm [the student] wanting this piece but there's no direction given, no direct line between the two, then what do I do with this information in order to get this, or where's the middle piece that will give me the answer?" Sarah believes this type of learning takes practice, "students don't always come to us knowing how to think this way." and it takes modeling critical thinking by the teacher for students to develop this skill. The final assessment or exam is one that Sarah prepares to be global and representative of the course objectives.

Although students do some projects in her classes, Sarah limits the number because they do so many labs and observations. Students' lab books are graded based on the data collected and students' observations. In the chemistry classes, projects consist of abstract chemical posters, an element poster, and a "scientist scrapbook" where students learn about certain scientists and the students "journal from the scientists' perspective." Sarah provides her students some opportunities for presentations but believes that has decreased over the years because of the

number of concepts she feels she has to cover. Students present their posters to the class and they present their "scientist scrapbook" while dressed as the scientists or at least dressed in the time period. Sarah also has groups question other groups about their lab results or data collected or she calls on groups randomly to explain a process or concept they are learning. "I have a lot verbal explanations as well as written explanation . . . so we practice and they critique one another or other groups." Although she considers this a form of "peer critique," she does not include this in every unit and it is not as formal or intentional as it could be. "I actually limit that [peer critique] some because of self-esteem issues . . . I tend to be more teacher as the critic and limit student–student critiquing, so they are critiquing themselves and their own work rather than having their friend critique it."

Sarah indicated she had not officially heard the term "21st century skills." Although most of her teacher training was in pre-service, she has taken some learning differentiation courses before she started her doctoral work in chemistry. At her school, the administration has provided professional development on the way the brain learns and the millennial student which has helped Sarah pay attention to how students are learning and make changes and adjustments to her teaching as needed.

> I used to have students go up to the board all the time then I limited that.But now I'm going to start doing more of that because they need to be

> up in front of others [students] and being able to handle the critique like I said earlier . . . because they're going to be in front of others when they get to college. You know we say we're preparing them for college but we're also preparing them for life…they don't have a dress code in college but they will at work, you know, all these things, so they need to be able to handle things, to function in front of others students. They need to be able to say "this is what I think" and that whole peer-to-peer critique that I have minimized over the years, I'm starting to think this last year or two to that I need to put that back in because they don't get it anywhere else. So again, if I'm trying to teach them to be a better learner they need to handle that [peer critique]. I look at how our kids our changing and what caused the change and pay attention to that . . . especially teaching at the college for three years and then of course having three college students of my own. I see a lot and so I am continually thinking what can I do in my classroom that's going to make them better and that's why I like high school so much better because I have that goal, and it's not just the content.

Sarah's experiences teaching at the college level provide her with a unique perspective of what her high school students need in preparation for college-level sciences. As the science department chair at her school, she also tries to use her experiences to help mentor the newer teachers because not only are these less

experienced teachers, but often they do not yet have children of their own. “As the mentor, as the more experienced teachers…we don’t want our teachers to only be good when they’ve been teaching 10 years…you want all them to have benefit from [our] past experiences.” For Sarah, it is more than teachers feeling comfortable with their content,

> It’s being able to see what their students have written, to hear what their students are saying, to be able to catch misconceptions, to be able to catch when they’re explaining something that’s not quite right, and taking those moments. . . paying attention to detail and taking the time and being able to ‘catch’ and so a lot of it is experience, knowing what the common mistakes are but if you’re not providing opportunities to get feedback [from the students], really good feedback throughout a unit, then there’s no way you ‘re going to know if you need adjustments or if your students are where you want them to be.

According to Sarah, it is critical for teachers, including experienced teachers to know how to get students to where they need to be, to be aware of the gaps in students’ learning, and to be able to fill those gaps. “Too often we just want to cover the chapter. Do we stop and ask did they learn what we wanted them to learn? It requires constant assessment . . . not just the end of the chapter tests. We should know throughout where our students are . . . students study and you can’t always predict the outcome, gauge that, but you should know who knows it [the

material] before the test is even given. I would say this is the most critical thing for all teachers."

Observations in Sarah's classroom confirmed her teaching methodology and the responses to the interview questions.

Summary

The purpose of this chapter was to present the voices of the teachers I interviewed during this study. The next chapter will present the data analysis through the lens of the frameworks of the andragogy/pedagogy continuum and students' acquisition of 21st century needs.

CHAPTER 5

DATA ANALYSIS

The purpose of this chapter is to present an analysis of the data collected using the frameworks of the andragogy/pedagogy continuum and 21st century skills development. The purpose of this study was to identify the congruence of teachers' educational orientation to teaching and students' acquisition of 21st century college and career skills. Four main chapter sections detail teachers' orientation to teaching, the ways in which their orientation to teaching supports 21st century learning needs, congruence of orientations to teaching and 21st century needs, and other salient realities discovered through the research.

Teachers' Educational Orientation to Teaching

The survey results of the Educational Orientation Questionnaire (EOQ) provided a baseline for the study with the participants' scores on the andragogy/pedagogy continuum (see Table 5.1). According to Hadley (Quam, 1998), subjects with standardized scores greater than zero (positive scores) are considered positively andragogic and those with standardized scores less than zero (negative scores) are considered positively pedagogic. A mean score of zero is considered neutral on the andragogic/pedagogic continuum. An andragogic orientation implies more student-centric methodologies by the teacher whereas a

pedagogic orientation implies the use of more teacher-centric methodologies (Grow, 1991; Knowles, 1980; Knowles et al., 1998; Pratt, 1988; Quam, 1998).

All participants in the study were high school science teachers in private Christian schools. According to their scores on the EOQ, four teachers scored in the pedagogic range (high pedagogy to low pedagogy) and two teachers scored in the andragogic range (low to mid-andragogy). There was an unintentional split of males to females who met the criterion of the study.

Table 5.1Andragogy/Pedagogy Continuum

+3 +2 +1 0 -1 -2 -3

High Andragogy High Pedagogy

Name	**EOQ Score**	**Teaching Orientation**
Steve	-3.0	High Pedagogic
Susan	-2.2	Middle Pedagogic
Sam	-1.5	Low Pedagogic
Syd	-1.4	Low Pedagogic
Sarge	+0.8	Low Andragogic
Sarah	+1.7	Middle Andragogic

Ways in Which Teachers' Orientation to Teaching Supports 21st Century Learning Needs

Twenty-first century learning skills needed by students from the perspective of teachers in this study are presented and discussed in the order of importance as reported through the teacher interviews:

a. Critical thinking and reasoning—for example, but not limited to: problem solving, analysis, logic, cause/effect.
b. Collaboration and communication—for example but not limited to: synergy, team resourcing, social skills, leadership.
c. Research and information literacy—for example, but not limited to: knowledge acquisition, source discernment, systems management, and technology.
d. Creativity and invention—for example, but not limited to: innovation, integration of ideas.
e. Self-directed learning—for example, but not limited to: adaptability, initiative, personal responsibility, work ethics, self-advocacy (CDE, 2009).

Critical Thinking and Reasoning

Based on the interviews and the classroom observations, all teacher participants, regardless of where they scored on the andragogy/pedagogy continuum, reported "critical thinking" as an important skill students need in the

21st century. However, as revealed in the literature review, teachers struggled with the definition of critical thinking and differed in their approaches to promote this skill.

Steve (high pedagogic) indicated that he helps students develop critical thinking through the use of complex text that he supplied students for their "four-inch thick" notebooks. Classroom observations confirmed students were given "complex texts" but students were not observed to have an opportunity to discuss the texts. Instead, when they received the handouts students put them in their notebooks and, with the exception of one student, the notebooks were placed on the floor or in students' backpacks while Steve lectured at the front of the classroom from the handouts and overheads.

Although Susan reported critical thinking as "high up there on the list," her instructional approach provided very limited opportunities for students to develop this skill. She reported her approach to teaching as one that is predominately "direct instruction" with some question-and-answer time during the in-class reading. However, even though "they [students] seem to like to respond," Susan limits the amount of dialogue among the students because she feels she needs to get them back to the textbook as I observed in her classes.

Syd (low pedagogic) and Sarah (mid-andragogic) both used an "inquiry-based" approach to teaching. Both teachers were observed using "constant questioning" to give students opportunities to reflect on their learning, to think

about why they got certain results and data from the labs, or why the answer to the problems in the assignments were a certain way. Both teachers were also observed allowing students to discuss questions and problems with their peers in small groups and then report back answers to the whole class. Meanwhile, the teachers moved from group to group to answer questions or redirect students if needed.

Syd also used “discovery labs” to help students develop critical thinking skills. Based on background knowledge and limited instructions, students are given certain pieces of lab equipment and chemicals and “turned loose to see what happens.” My observation was that after students completed the labs, they were able to verbalize connections of what they discovered to the previous knowledge, without the teacher telling them what they just learned.

Although not observed directly, Sarah described her “Land of VSEPR” (Valence Shell Electron Pair Repulsion) project as one that would build critical thinking and reasoning skills. Not only were students learning the concepts without direct instruction from the teacher, but they were using a “treasure hunt” format where students would gain new clues as they successfully completed assessments. Each clue, if read correctly, would lead them closer to the “treasure.” The faster students were able to work and complete the activities, the better the opportunity for them to find “extra gems” embedded in the treasure. As part of the assessment process, Sarah reported to include “hard” questions that allow her

students to demonstrate critical thinking and reasoning. These types of questions are frequently practiced throughout the school year and become more difficult and involved as the year progresses. Many of the questions are multi-faceted with limited information, requiring certain reasoning skills for students to answer the questions.

Sarge, low andragogic, sees critical thinking as a vital skill in the business world and in the military but indicated this skill is "in great shortfall" in his students. He considers the source of the problem to be the elimination of "composition and rhetoric" in overall educational process. Sarge believes his use of certain levels of questions on the assessments helps his students develop critical thinking because these questions require students to make inferences. Interestingly however, he only includes these types of questions in the honors classes and not in the on-level classes. Despite avowing that critical thinking skills were essential, Sarge did not describe any other activities he uses to build critical thinking and my classroom observations did not provide additional avenues for student development of this skill.

As with the other teachers, Sam, low pedagogy, considers critical thinking the "number one essential skill" for students, along with discernment while reading or researching information. He indicated that if teachers are not helping students problem-solve and think critically, then all students will do is memorize information that will be forgotten when the test is over. Projects described by Sam

(but not observed) include activities that would require reasoning skills based on background knowledge to apply to current situations. The year-long crime scene investigation involves labs where students have to identify a "mystery" substance using previous knowledge of properties of mixtures and compounds. Observations in Sam's classroom confirmed learning activities that supported this skill development through the use of the inquiry technique and problem-solving with the interactive "white board."

Collaboration and Communication

The second most important skill for students in the 21st century that was consistent among the teachers was the ability to collaborate and communicate. Steve and Susan, both scoring mid-to-high pedagogy, believe the use of class discussions helps students develop these skills. However, observations in their classrooms indicated more teacher-directed and teacher-led discussion with little participation from the students.

As Steve directed the students' attention to the information on the overhead, he would ask questions based on previous knowledge he reminded students they should have. However students were slow to engage in a discussion with Steve, but as he had warned me in the interview, this could be a result of the "visitor" in the classroom. Observations in his classes supported his comments that his approach to teaching is one that is "teacher-centered and teacher-driven and not that of a facilitator to help students discover or explore knowledge."

Susan's discussions were generated from the reading aloud in class with the students. She would stop after each section was read and ask questions related to the reading or notes provided in the overheads. Students would respond with the answers and occasionally ask additional questions that Susan would answer directly rather than opening the additional questions up to the class for discussion. Observations in her classroom supported her belief that teachers "set the tone, lead discussions . . . and keep things on track and bring kids back to the topic."

Teachers scoring more toward the low pedagogy/mid-andragogy continuum (Syd, Sarah, Sarge, and Sam) were observed using more group activities to foster collaboration skills as well as whole class discussions. Both Syd (low pedagogy) and Sarah (mid-andragogy) were observed leading class discussions but also offered small group discussions as well. Students in small groups had opportunities to report back group responses to the whole class. Syd also allowed time for lab partners to discuss lab findings with each other and with her before they reported to the whole class. Although whole group discussions were not observed in Sarge's and Sam's classes, there were times when both teachers used "turn to your partner" for discussion of a concept, or small table groups of four to five students for discussions.

All of the teacher participants in the low pedagogy/mid-andragogy range also provided more projects for their students that included a component for peer-to-peer and/or student-to-adult presentations. Sam's year-long project not only

provided many occasions for team collaboration, but also provided an opportunity for students to meet with adult experts in the area of crime investigations, giving students valuable real-life experiences outside of the classroom. The use of projects in Syd's honors science classes provided opportunities for students to collaborate with each other about the researched information they would present as well as the actual presentation itself. Some of the student projects were presented to outside adults (usually other teachers) who had been invited to view the project presentations.

Research and Information Literacy

All teachers interviewed agreed that research literacy and technology skills are important for students in the 21st century. My observations of teachers working in schools with more technology provisions (Sam, Syd, Sarge, and Sarah) was they provided more opportunities for students to use the technology and develop the skills necessary for not only computers, but telecommunications and audio- and video-based media as well. The use of projects by teachers scoring in the low pedagogy to mid-andragogy on the continuum (Sam, Syd, Sarge, and Sarah) provides students opportunity for research and allows students to create and use PowerPoints and other forms of media in their project presentations.

Syd's students were observed using a program on individual laptops that allowed students to interact with the teacher while working on assigned problems. As Syd was teaching how to set-up and solve the problems from the front of the

classroom, with her laptop in view she could identify students that were not on track with the problem-solving. In another class, students were presenting projects that required both research and technology skills. Each group provided information about their scientist that went beyond the boundaries of the textbook. Although all student groups used PowerPoints in their presentations, it was evident from the differences in group projects that students were given freedom to be creative in the design and development of the PowerPoints.

Sarge's students were also observed using individual laptops and the e-book edition of the textbook while he was lecturing from PowerPoints at the front of the classroom. Students were able to write notes in the margins of the e-books (using a stylus), as directed by Sarge. At one point during the lecture, Sarge directed his students' attention to the projected image on the board and students watched a video related to the subject matter that was embedded in the PowerPoint. Students' work that is posted on the walls indicated research was involved in the creation of the posters and confirmed the research opportunities for students reported by Sarge.

Sam and Sarah were only observed using PowerPoint presentations from mounted projectors onto interactive "white boards." However, at one point students in Sam's class were able to take turns coming to the "white board" and use a projected calculator to help solve assigned problems. Student work posted on the walls supported interview statements that these two teachers assigned

projects that required information literacy beyond the boundaries of the textbooks and various technology skills.

Steve and Susan (mid-to-high pedagogy) did not provide opportunities for students to develop technology skills because of the stated lack of technology in the school. Although projectors were mounted in both Susan's and Steve's classroom, my observation in Susan's classroom confirmed her interview response that "she is not there yet and it will be a steep learning curve" when she is expected to use the available technology. Observations in Steve's classroom confirmed his statement that teachers in his school still use "20th century" transparencies with an overhead projector.

Steve, high pedagogic, did report opportunities for research and his teaching methodology supported the importance of evaluating reliable sources through the use of "asking key questions." He uses the first six weeks of school to teach his students how to determine if a source presents truth or not, using the analogy of federal and counterfeit bills. Students also spend time researching worldviews of different scientists on major topics related to theories of evolution and creation science, as supported by the large, "four-inch thick" notebooks.

Sam, low-pedagogy, also reported the need for students to learn discernment so they could determine truths and factswhen researching for projects. He reported that he spends time helping students understand what are reliable sources and how go to other sources to see if the information

corroborates. Sam believes this is an important skill, especially given the number of projects assigned to his students in his class as well as other classes at his school. Syd, low pedagogy, and Sarge, low andragogy, both shared their appreciation for English teachers at their school who focus on the research and information literacy skills that students in turn bring to the science classroom.

Creativity and Invention

Although the terms "creativity and invention "were not used by the teachers as skills needed in the 21st century, teachers with EOQ scores moving toward the middle of the continuum and positively andragogic (Sam, Syd, Sarge, and Sarah) were more likely to provide opportunities for students to develop these skills with the use of student-driven and student-designed projects. Even when the teacher assigned the project topics and the outcomes that would be assessed, students were allowed to develop the content of the project and determine how the information would be presented. Sam's year-long criminal investigation project and Syd's "atom model scientists" project, both offered students opportunities of creativity in the student-driven development and presentation of the knowledge gained through the projects. These projects also provided opportunities for innovation and integration of ideas, aspects of invention that help to develop this skill.

Teachers scoring higher pedagogic were less likely to provide opportunities for projects. Both Steve and Susan indicated that although they

would like to do more projects, they both felt that students had enough "project-work" required by other teachers and classes at their school. Also, they both reported that the amount of information they need to cover in the school year limits and the amount of time taken up by projects, limited the number of projects they felt they could offer students. Observations in their classrooms revealed curriculum and textbook-driven instruction and assessments that can support certain levels of student knowledge and understanding but hinder the development of creativity in the learning process (Wagner, 2012; Zmuda, 2010).

Self-Directed Learning

Only Syd (low pedagogy) and Sarah (mid-andragogy) included "self-directed" learning as a vital skill for students in the 21st century. Sarge (low andragogy) also indicated his belief in "self-study," an aspect of self-directed learning. Syd's description of her own learning experience with the new technology at her school was the impetus that sparked her desire to promote this skill with her students. However, she could not articulate what she would do to promote the development of self-directed learning in her own students. Observations in Syd's classroom did reveal that students were not hesitant to ask questions while working on a Chemistry lab and probe for answers when their lab results were not the expected. To me, this indicates a "safe environment" conducive to student-teacher interaction and necessary for students to feel comfortable when making mistakes, hence promoting this skill of self-directed

learning. My observations also supported Syd's use of students to teach certain self-taught concepts in the honors classes. Students were required to learn concepts not taught by Syd and then teach them to the other students in the class.

Sarah's approach to teaching is one that focuses on getting students to take ownership and responsibility for their learning, an aspect of self-directed learning. According to her, this can only be developed in safe learning environments and it is her responsibility to create this type of classroom. Observations in Sarah's classroom revealed a safe climate of trust and mutual respect, allowing students to not only learn and grow from their mistakes, but to also be able to handle criticism and disappointment. Her "Land of VSEPR" project is completely "self-taught" and provides students an opportunity to learn non-mathematical science concepts using hands-on activities and frequent assessments to monitor student learning. Sarah considers this activity one that is "conducive to self-directed learning."

Susan also reported in the interview that she felt 21st century skills such as student initiative and taking responsibility for their own learning, "and not be[ing] held by the hand all the time" were essential. However observations in her classes with her teacher-centric approach to teaching did not reveal opportunities for students to develop these skills.

Sarge, low andragogic and "a firm believer in self-study," described his best learning situation with his college biology class as one of "independent"

learning. He talked about student-driven projects and how much his students reported learning on their own from the projects. However, my observations in his classroom of his methodology did not support the development of self-directed learning. The learning experiences I observed were very teacher-directed with lecture, students taking notes, and little student interaction. Although the climate in Sarge's classroom was one that promoted safety and student engagement with his teaching style and obvious relationships with students, his methodology indicated he was also in control of the learning environment and determined what concepts the students would learn and how the learning would be assessed.

Congruence of Orientations to Teaching and 21st Century Needs

Although all but one teacher indicated they had heard the term "21st century skills," teachers reported skills they believe students need for the 21st century that are comparable to those described in this study. My observations conducted following the interviews, for the most part, supported the responses of the teachers to the interview questions. Steve's orientation to teaching (high pedagogic), was congruent with his described approach to teaching as one that is "teacher-centered and teacher-driven" but not congruent to promoting 21st century skills. His classroom was designed to support his teaching orientation, with students seated in desks arranged in long rows facing the front on the classroom, providing optimal viewing of the overhead projector. Steve's lectures were accompanying by directions to watch the overheads and follow along with the

provided handouts. He also encouraged students to take notes from the overheads to help students in retention of the information for the tests. Steve did talked about the importance of having classrooms that are more "student-centered" in the 21st century but stated that "until we have a series of years where schools are made that way…[I] will remain more teacher-driven in my classroom to make sure students get the information they need."

Susan, mid-pedagogy, described the skills that students need for the 21st century but observations in her classroom indicated a very teacher-driven orientation to teaching, including students assigned seating in long rows, the use of prepared overheads, students reading aloud from the textbook, and student interaction only in response to Susan's questions from the reading during the class-time. Susan encouraged students to write down what she had provided on the overheads and emphasized the important concepts that students would see on the test. These observations supported Susan's orientation to teaching as measured by the EOQ (Quam, 1999) but not congruent with 21st century skills development. One other interesting observation in her classroom was that students were using an outdated textbook for this particular course. Susan still had students read aloud every word from the textbook but would occasionally stop the reading to say, "of course we know this is no longer relevant due to advances in technology."

Sam, low pedagogic, reported he had not heard the term "21st century skills" before his interview even though he has "only been teaching in the 21stcentury and believes he is doing it," whether it is something he does naturally or through what he has learned through pre-service and professional development. However, this young teacher articulated critical skills students need similar to the other veteran teachers. His described approach to teaching of one he considers both teacher-centric and student-centric would go along with his low pedagogic placement on the continuum. Although not observed, his descriptions of projects and activities would support the inclusion of student-centric learning activities. Observations in his classes supported the mix Sam reported, with both direct instruction at the beginning of the class period, students' active participation in the learning process, followed by small group collaboration on a teacher assigned activity.

Syd's description of the 21st century skills students need and classroom observations were congruent with her placement on the andragogy/pedagogy continuum in the low pedagogy range. An experienced teacher who has taught in several private Christian schools, Syd brings a range of assessments and learning activities to the classroom that were not only described as student-centric but many were observed to be student-centric as well. Her described inquiry approach to teaching science, used to stimulate student discussions and student-reflection, and her desire to help her students become self-directed in their learning, is

congruent with a more andragogic approach to teaching, according to Knowles (1980). Several of Syd's classes were opened with a short session of problem solving using direct instruction and followed by students' practice of the problems. Students were then observed to work either independently or in small groups while Syd provided help as needed, an approach that would support Pratt's (1988, 1998) relational construct of teacher roles based on students' need. Observations in Syd's classroom confirmed a mix of teacher-centric and student-centric approaches to teaching that was consistent with other teachers with similar placement on the andragogy/pedagogy continuum.

Only Sarge, low andragogy, indicated he had heard the term "21st century skills" before his interview. Although his terminology did not match terms used in this study, his description of projects and activities he provides his students would support the development of certain 21st century skills and go along with his placement on the andragogy/pedagogy continuum. However, Sarge's reported use of a text-book driven curriculum and instructional planning and his use of curriculum-provided assessments, consisting of multiple choice, fill-in-the blank, and true/false questions, would reflect a more teacher-centric approach to teaching. Classroom observations confirmed a very teacher-centric learning environment with Sarge's direct-instruction of the content and students note-taking from the projected PowerPoints, indicating incongruence with his scoring on the EOQ (Quam, 1998). Sarge did close the interview with his excitement

about the upcoming project-based learning training he would receive during the summer break and he anticipated this could revolutionize how he uses projects in the learning process.

Sarah, mid-andragogy, reported similar 21st century skills students need as the other teachers and described her orientation to teaching as one that would be a mix of teacher-centric and student-centric learning and congruent with promoting 21st century skills. Although she determines the framework for the unit and the major learning objectives, she tries to give choices and flexibility within the framework. This approach would support Pratt's (1988,1998) relational construct and the roles teachers should take with students who have differing needs of support and direction. Observations in Sarah's classroom revealed the mix that she reported. In one class, students assigned to groups were finishing up calculations on previously teacher-assigned problems calculations that would support the next activity. Once group members were finished, the students in that group were allowed to start the lab activity on their own, without waiting for other groups to finish. Sarah moved around the room to address questions and give help as needed.

Other Realities About Teachers' Orientation to Teaching and 21st Century Learning Needs

All teachers interviewed expressed the desire to teach students the necessary skills for student achievement and success in the 21st century. However,

one theme that resonated with the teachers was concern about how to teach the skills while teaching the required curriculum and required standards. These teachers view the of the 21st century skills development apart from the traditional teaching of the many required standards and assignments that are given largely focus on foundational knowledge. Much of what teachers reported was confirmed in what I observed in the classrooms, that current educational philosophy dictates what and how much students need to know before they go to the next level.

My observations in the teachers' classrooms revealed that all the teachers had developed relationships with their students that would support a safe learning environment based on mutual trust. The interesting factor was the differences in the climate or tone of the learning environments. The supportive teacher-student relationships in Sarah's classroom were obvious. However, the tone of her responses to students individually as well as to the class as a whole, was one I consider more professional than the other teachers observed and students' responses were reciprocal. Because many students attend the same private Christian school for their middle school and high school years (if not their entire K-12 years) and teacher turnover is often low, students may have the same teacher for several years in the same discipline. My observation has been that teacher-student relationships can tend to become too familiar in nature, rather than mutual respect for positions that Knowles considers ideal for superior learning (see Table 2.2).

A final reality revealed through the interviews and observations was the lack of shared definitions of 21st century skills students need. The process of developing critical thinking in students for one teacher was very different from another. Even the term "21st century skills" was recognized by only one teacher. Supporting this reality is the issue of what constitutes 21st century skills and learning. It does not take much research to reveal the number of researchers, educational associations, and educational experts that have all determined what they believe are the essential skills for our students. I am not proposing this is a critical issue in the development of 21st skills but it does reflect problems leaders in schools could encounter if there are differences in understanding and articulating the 21st century skills and development in our schools.

Summary

The purpose of this chapter was to present an analysis of the data collected using the frameworks of the andragogy/pedagogy continuum and 21st century skills development. The purpose of this study was to identify the congruence of teachers' educational orientation to teaching and students' acquisition of 21st century college and career skills. Four main chapter sections detail teachers' orientation to teaching, the ways in which their orientation to teaching supports 21st century learning needs, congruence of orientations to teaching and 21st century needs, and other salient realities discovered through the research. Chapter

Six will provide a summary of the study, conclusions, recommendations, discussion, and final reflection.

CHAPTER SIX

SUMMARY OF THE STUDY, STUDY IMPLICATIONS, CHAPTER SUMMARY, AND FINAL THOUGHTS

"Learning is a lifelong journey and as on most journeys, it is important to have a destination in mind and a reliable means of transport to get there" (Trilling &Fadel, 2009, p. 95). The destination for students in the 21st century is to be prepared for and competitive in this global economy and to be life-long learners. Whether they are bound for college or destined toward a career, all students need certain skills and their skill sets to be competitive are the same (Bellanca & Brandt, 2010; Trilling & Fadel, 2009; Wagner, 2008). Although andragogy promotes principles of the adult learning theory (Knowles, 1978, 1980), andragogy and related teaching principles are also useful for instruction in 21st century schools and in the development of 21st century skill sets (Brockett & Hiemstra, 1991; Conner, 2004; Seirm, 2012; Wagner, 2008, 2012; Zmuda, 2010).

This study investigated the congruence of teachers' orientation to teaching (whether teacher-centric implying pedagogy or student-centric implying andragogy) and the learning needs of students for 21st century college and career readiness. The purpose of this chapter is to provide a summary of the research study and to present conclusions related to the usefulness of the frames of the andragogy/pedagogy continuum (Knowles, 1978,1980; Pratt, 1988) and

21st century learning needs (Bellanca & Brandt, 2010; Lemke et al., 2003; Trilling & Fadel, 2009; Wagner, 2008) for understanding the congruence of teachers' orientation to teaching. Included in this chapter are implications of the research and recommendations for future research in addition to the importance of this research to theory, practice, and the research knowledge base.

Summary of the Study

Today, the academic success of students across the continuum of education depends upon their ability to translate curriculum content and the skills of critical thinking and reasoning, creativity and invention, technology and information literacy, and communication and collaboration into career success in our competitive global economy. Traditionally students have been expected to be successful in teacher-centric classrooms, with learning environments entrenched with 20th century teaching orientations (Bellanca & Brandt, 2010; Darling-Hammond, 2010; Schrum & Levin, 2009; Wagner, 2008; Zmuda, 2010). Research indicates that although many teachers regard student-centric classrooms as highly desirable and acknowledge preferences for innovative methodology, secondary schools continue to engage in teacher-centric practices and express reluctance in shifting from these methods (Korthagen, Loughran, & Lunenberg, 2005; Meuwissen, 2005; Serim, 2012; Taylor & Fratto, 2012; Wellenreiter et al., 2010). Teaching strategies and learning needs are not always compatible. Congruence occurs when students' learning needs and educators' teaching

strategies are compatible – 21st century, digital-aged learners engage with student-centered teachers (Collins & Halverson, 2009; Fink, 2003; Grow, 1990; Taylor & Fratto, 2012; Vermunt, 1999). Incongruence often leads to friction and frustration for both the teacher and the learner (Grow, 1991; Pew, 2007; Serim, 2012; Wagner, 2008; Zmuda, 2010) and ultimately a lack of student academic success for the 21st century learner.

Orienting Theoretical Framework

For this study, the theoretical frameworks of the educational principles of the andragogy/pedagogy continuum and the skills needed for 21st century learning best supported my purpose in understanding the congruence of teachers' educational orientation to learning and students' acquisition of 21st century college and career skills. A side by side comparison of the frameworks (CDE 21st Century Skills and Abilities, 2009; Knowles, et al 1990; Partnership for 21st Century Skills, 2007; Trilling & Fadel, 2009) revealed overlapping skills and common characteristics (see Table 1.1). For the purposes of this study, the 21st Century Skills and Abilities, adopted by the Colorado Department of Education (CDE) in their desire to promote life-long learning among their students, was used: critical thinking and reasoning, collaboration and communication, creativity and invention, research and information literacy, and self-directed learning.

Setting and Participants

Teachers currently employed in regional member schools of the Association of Christian Schools International (ACSI) served as the population or data source from which the sample of study participants was chosen. Six teachers were selected for interviews and classroom observations based on the Educational Orientation Questionnaire (EOQ) scoring, two with low-to-mid andragogic scores, two with low pedagogy scores (close to neutral), and two with mid-to-high pedagogic scores. Two of the participants teach in a small Christian school located in a rural area outside of a major metroplex with a K-12 enrollment of 400 students. The other four participants teach in Christian schools with K-12 enrollments of 800 and 1000 students, located in suburban areas of their respected cities. The identity of the teachers was protected throughout the study through the use of pseudonyms with names starting with "S" designating science teachers.

Methods

The study was conducted in three phases. In Phase One, teachers from participating schools completed the EOQ for screening purposes. In Phase Two, selected teachers were interviewed in his/her classroom during the planning period. The semi-structured interviews were recorded digitally and played back to the participants to ensure the recordings accurately reflected the experiences of the teachers. In Phase Three, two concurrent classroom observations of the teacher-participants followed the interviews. In this way I was able to collect classroom realities that I could compare to the answers given by the teachers

during the interviews. The purpose of the observations was to collect data that could help confirm the congruence of the teachers' perceived orientation to teaching and their actual practices in the classrooms.

The data were examined through the lens of the andragogy/pedagogy continuum (Knowles, 1980; Pratt, 1988) for common themes (Boyatzis, 1998; Creswell, 2007) that would support the andragogy/pedagogy orientation to teaching and 21st century skills development (Bellanca & Brandt, 2010; Lemke et al., 2003; Trilling & Fadel, 2009; Wagner, 2008). Additional coding of information was used to help reveal other realities about teachers' orientation to teaching and 21st century learning needs. Overall, I was looking for information that appeared important to understanding the congruence between the teaching orientation and 21st century skills development (Merriam, 1998; Yin, 2003).

Summary of the Findings and Conclusions

To facilitate my study, the use of six research questions guided this study. The following is a summary of the findings and conclusions to each of the research questions.

What are teachers' educational orientations to teaching? Based on the survey results of the EOQ (Quam, 1998) teachers' standardized scores were placed on the andragogy/pedagogy continuum with high pedagogic scores on the right end of the continuum and high andragogic scores on the left end of the continuum (see Table 5.1). To control variance, high school science teachers from

private Christian schools comprised the sample of educators. Although this comes as no surprise, my conclusion is that teachers are not oriented similarly, despite educational training, teaching certifications, and professional development opportunities in science education. These teachers are not oriented to teaching in the same ways.

What are teachers' essential descriptors of their orientation to teaching? Based on the data collected through interviews, teachers described their orientation to teaching based on four aspects: their approach to teaching, their design of content delivery and assessments, classroom organization to support their teaching, and their purpose for teaching. Teachers with mid-to-high pedagogic teaching orientations described their approach to teaching as very teacher-centric. Their classroom design also supported their teacher-centric approach, with desks in rows facing the front of the classroom. Teachers with low-pedagogy to mid-andragogy orientations described a mix of teacher-centric and student centric approach to teaching. Description of their classrooms supported their approach to teaching as much as possible, given the pre-determined design of the science classrooms.

Teachers reporting a mix of teacher-centric and student-centric approaches to teaching described similar assessments to address students' 21st century needs. However, not all of their described assessments would necessarily promote 21st century learning. Projects and labs that are problem-based or inquiry-based in

design can help develop skills of critical thinking and reasoning, collaboration and communication, and research literacy. Other forms of assessment that are widely accepted as part of 21st century learning, including performance-type tests, journaling, e-portfolios, culminating projects, and opportunities for creation and invention, were not reported or observed by these teachers. Teachers with mid-to-high pedagogic orientations, as well as one teacher with the low-andragogic orientation, described assessments that are considered teacher-centric, i.e. quizzes and tests that are composed of multiple choice, true/false, and fill-in-the-blank type questions.

All teachers, regardless of their educational orientation to teaching, indicated their purpose for teaching was one that was based on a "calling" and a love for students. It is evident from their interviews and the observations that these teachers desire relationships developed with their students as evidenced also by comments that graduates still keep in touch with them. It is also evident from the data that their purpose for teaching is to prepare students for the 21st century.

Clearly, based on the interviews and the observations, how these teachers are preparing students for the 21st century is quite different. My conclusion is there is a difference between teachers with mid-to-high pedagogic orientations and teachers with low pedagogic to mid-andragogic orientations in their descriptors of their approach to teaching, their design of content delivery and assessments, and their classroom organization to support their teaching.

In what ways do teachers' orientation to teaching support 21st century needs? The 21st century skills of critical thinking and reasoning, collaboration and communication, creativity and invention, technology and research literacy, and self-directed learning were analyzed and discussed individually with examples provided to support the teachers' orientation to teaching and their actual practice in the classroom. Critical thinking was indicated by all teachers as a vital need for students in the 21st century. As the literature review indicated, these teachers varied in what they think represent critical thinking and how it is taught or promoted in the classroom.

Communication and collaboration were also reported by the majority of teachers as important skills for students. Again, as with critical thinking, teachers differed in their approaches to promoting these skills. Teachers with higher pedagogic scores were less likely to promote these skills with their learning activities and classroom observations, in part due to the amount of information they felt they needed to cover. Projects described by teachers in the low pedagogy to mid-andragogy provided students opportunities to develop these skills with exposure to real-life problems, also supporting the use of experience as a source for enriched learning according to andragogical principles of teaching (Knowles, 1980).

Research and information literacy skills were also reported to be important skills for students in the 21st century. Teachers in schools with supportive

technology for both the teacher and students (projectors, interactive whiteboards, and laptops), were observed using the technology to support the development of these skills. Although information literacy development was an important skill for all teachers, only Steve (high pedagogy and no supportive technology) described ways in which he promotes the skill. Others described projects which required students to research material outside the boundaries of the classroom and textbook, but these teachers did not describe ways in which they teach the skills needed for research literacy.

Although the terms "creativity and invention" were not mentioned by name as a 21st century skills, teachers with low-pedagogic to mid-andragogic teaching orientations described elements of projects that would support creativity and invention, but more so through the group presentations and the use of various medias. Teachers with mid-to-high pedagogic orientations did not promote these skills, as evidenced in their interviews and observations. However, as reported in the literature review, developing these skills requires time to think and the ability to take risks and schools have generally discouraged students from taking risks (Thomas & Brown, 2011; Wagner, 2008; 2012).

Self-directed learning was mentioned by name by only one teacher, Syd, with a low-pedagogic teaching orientation. Although I felt a sense of frustration by Syd in how to teach this skill, her description of teaching and learning activities and classroom observations supported her desire to promote this skill in

her students. Sarah's described need for her students to "take responsibility for their learning" is an aspect of developing self-directed learners and supports andragogic principles of teaching. Susan reported the need for students to take on more responsibility for their learning but her teaching orientation was clearly one that supported teacher dependency. One other teacher, low-andragogic, self-described as being a proponent of "self-study" but curriculum and assessment design, as well as classroom observations, did not support opportunities for student development of this skill.

Overall, it can be concluded that these teachers participating in this study know the essential skills students need for the 21st century. However, for teachers in the mid-to-high pedagogic range, although they can describe what needs to happen, they are not incorporating needed student-centered strategies into their classrooms.

In what ways are teacher orientations to teaching and 21st century needs congruent? Congruence of orientations to teaching and 21st century needs was supported from the data collected and analyzed. Teachers who placed in the mid-to-high pedagogic range on the andragogy/pedagogy continuum reported a very teacher-centric methodology that does not support 21st century skills and was confirmed with classroom observations. Teachers with EOQ scores that placed them in the low-pedagogy to mid-andragogy range on the andragogy/pedagogy continuum described a mix of teacher-centric and student-centric learning

environments, but indicated they probably leaned toward teacher-centric. The one teacher who scored mid-andragogy on the continuum also described her approach to teaching as one that was a mix of teacher-centric and student-centric. Observations in Sarah's classroom revealed a very student -centric orientation to teaching. Although Sarah indicated her framework for designing learning activities is more teacher-centric, the use of student input in the learning activities supported a student-centric learning environment that supports andragogic principles for teaching (Knowles, 1980). Only Sarge, who placed in the positive direction on the andragogy/pedagogy curriculum based on the EOQ results, interviewed with a student-centric orientation to teaching but was observed with a teacher-centric instructional methodology and assessments.

My conclusion is that teachers with low-pedagogic to mid-andragogic orientations to teaching are congruent with students' 21st century needs. Teachers with mid-to-high pedagogic orientations to teaching are not congruent with the learning needs of students in the 21st century. However, what also matters is that teachers do not always practice what they say matters to them.

What other realities are revealed about teachers' orientations to teaching and 21st century learning needs? There were several other realities revealed from the study regarding teachers' orientation to teaching and 21st century needs. Although teachers have the desire to move students beyond the surface level of knowledge and promote 21st century skills development, the dictated curriculum

and meeting certain standards has produced an certain angst in how to accomplish it all. Interviews with teachers in the higher range of pedagogy tended to be more concerned with the amount of information they needed to cover than teachers scoring in low-pedagogy to mid-andragogy range. Teachers in the low-pedagogy to mid-andragogy range were more likely to use authentic learning activities that provided students with opportunities to apply the concepts learned, thereby allowing for concepts to be covered while developing 21st century skills. However based on the study findings, teachers' ability to translate this orientation into classroom experience still proves to be difficult at times, given the pedagogy methodology so entrenched in our educational system.

How useful are the frames of the continuum of andragogy/pedagogy (Knowles, 1978, 1980; Pratt, 1988) and 21st century learning needs (Bellanca & Brandt, 2010; Lemke et al., 2003; Trilling & Fadel, 2009; Wagner, 2008) for understanding the phenomenon under review? Based on the data collected and analyzed in this study, teachers' orientations to teaching are congruent with their teaching strategies. Teachers who placed in the mid-to-high pedagogic range on the andraogy/pedagogy continuum not only reported a very teacher-centric methodology in their interviews in Chapter Four, but their orientation to teaching was confirmed through classroom observations as previously described in Chapter Five. Teachers with scores that were low pedagogic described a mix of teacher-centric and student-centric approach to teaching that was also supported by the

classroom observations. The one teacher with a mid-andragogic orientation to teaching also described a mix of teacher-centric and student-centric approach to teaching, however classroom observations revealed more student-centric learning activities and a learning environment that supported principles of andragogic teaching and 21st century skills acquisition.

I would consider only one teacher's orientation to teaching to be incongruent with his perception of 21st century learning needs and classroom observations. Sarge's score on the EOQ placed him low-andragogy on the andragogy/pedagogy continuum. His interview provided a description of student-centric learning activities; however his description of learning assessments and classroom observations revealed a very teacher-centric classroom. Sarge was also the only teacher who stated in the interview that he had previously heard the term "21st century skills" through professional development opportunities at his school. This raises the concern of the approach we take with professional development activities. Often our attempts at professional development, and for the most part pre-service teacher programs, are designed and delivered with pedagogic orientations and a "one size-fits all" as supported by the literature review (Glickman, Gordon & Gordon, 2013). For this teacher, informative professional development had provided him with knowledge and understanding of 21st century skills. However, as with many professional development programs delivered from a pedagogic orientation, the learning was not transformative to the learning and

assessment activities the teacher described in the interview, neither were the skills development observed in the classroom setting.

The two teachers with mid-to-high pedagogic orientations to teaching and corresponding interviews and observations both teach at a small private Christian school connected to a church and located in a rural area south of a major metroplex. In reflecting on their approach to teaching, the school culture and overall educational philosophy could have an effect on the teaching methodologies. Although size and demographics were not a factor considered in this study or in the teaching focus of 21st century needs, the demographics of this school and the connections to the church could play a role in the adopted curriculum and traditional teacher-centric classrooms.

One other observation is the teacher that scored in the mid-andragogic range also has a doctorate in her teaching field and she is an adjust professor at a local university. Her higher level of education and her experiences with college students (often adult learners) could influence how she teaches her high school students. Her approach to teaching could also be influenced by the knowledge and skills she knows her students need for success at the college level. However, if she is using the same teaching approach at the high school level that she uses at the collegiate level, this would support the use of andragogic teaching principles at the high school level to promote 21st century skills needed for college and career.

Overall, the frameworks for this study were useful in drawing conclusions regarding the congruence of the teachers' orientation to teaching and their actual practice in the science classrooms in developing 21st century skills. The congruence was more evident in teachers scoring in the low to mid-andragogic range and teachers scoring in the low-pedagogic range. One would expect to find that teachers on the more pedagogic end of the pedagogy/andragogy continuum would have a more teacher-centric approach to teaching that does not support 21st century skills development. Teachers with a low pedagogic to placement on the continuum would have a mixed approach to teaching with a tendency toward more teacher-centric in the planning of curriculum and assessments, as was observed. Teachers with low-to-mid andragogic scores would also have a mixed approach, but the tendency would be toward more student-centric with students actively participating in the planning of the learning experiences. Although the learning activities were observed to be student-centric with teachers in the latter category the planning of the learning experiences was still teacher-driven.

Of the subjects completing the EOQ survey, no one scored above the mid-andragogic range. One possible conclusion would be that given the pedagogic design of teacher pre-service programs and professional development opportunities, unless teachers are provided with andragogic approaches to teaching, K-16 teachers will still have more pedagogic tendencies in regards to their teaching orientation.

Study Implications

As identified in the design of this study and the supportive literature review, the need for students to be successful in the rapidly changing global environment requires development of 21st century skills of critical thinking and reasoning, creativity and invention, collaboration and communication, technology and research literacy, and self-directed learning. The research and the study data indicate these skills may not be easily taught through the use of 20th century factory-modeled schools with orientations to teaching that are teacher-centric, rather than student-centric, that support andragogic principles of teaching. Overall, the theory of the andragogy/pedagogy continuum to promote 21stcentury skills development was useful for this study, especially in the focused area of science education. With the push toward inquiry-based, problem-based and project-based learning for powerful learning in 21st century science classrooms and global competitiveness, the need to transform classrooms is vital (College Board, 2011 ; Trilling &Fadel, 2009; Jacobs, 2010; Wagner, 2008).

Based on the outcomes of this study, an approach to improving academics in Christian schools begins with an awareness of teaching orientations and the effect on the instructional program. Teacher orientations that are a mix of teacher-centric and student-centric learning tended to provide opportunities to develop 21st century skills of critical thinking and reasoning, collaboration and communication, research and information literacy, and creativity and invention.

However, as indicated in this study, although many of the skills may be important to the teacher, these skills can prove difficult to teach and provide opportunities to develop in predominately teacher-centric classrooms. And yet, these are the skills that are needed in the rapidly changing world, and these are the skills that are needed for our students to become the world-changers desired by ACSI schools (ACSI, 2012; CES, 2011).

Implications for Theory

Any research study should inform theory, practice, and research. The purpose of this study was to expand knowledge about the theory of the andragogy/pedagogy continuum as related to the development of 21st century skills in the K-16 arena. Although much has been written about the frameworks of 21st century skills and curriculum changes that are needed to develop the skills, little has be written about the effects of the teacher's orientation to teaching in the process. To expand knowledge about frameworks used for this study, the educational orientation of current ACSI member school teachers was assessed using Hadley's Educational Orientation Questionnaire (EOQ) and revised by Quam (1998). Follow-up interviews and observations with subjects were used to determine if teachers scoring higher on the andragogy/pedagogy continuum understand the essentials of andragogy and believe they are better prepared for student-centric teaching and 21st century skill development. The findings of this study revealed teachers with lower pedagogy to mid-andragogic scores on the

andragogy/pedagogy continuum had an educational orientation to 21st century learning and skills development and implemented certain andragogic teaching principles. However based on the research and the study findings, teachers' ability to translate this orientation into classroom experience proved to be difficult at times, given the pedagogy methodology so entrenched in our educational system. An implication for the development of this aspect of the theory would indicate needed changes in teacher pre-service programs and professional development to help support teaching principles associated with the andragogic/pedagogic continuum.

As indicated in the literature review, Knowles himself eventually determined that younger learners could also benefit from the principles of andragogy, even though their life experiences may be limited (Knowles, 1980; 1990). An implication for the development of this aspect of the theory would be to provide more authentic learning experiences for students in the K-16 arena that would use andragogic teaching principles to promote 21st century skills development. These experiences can be offered through the use of problem-based, project-based learning, and other authentic learning activities that actively include the learner in the process (Darling-Hammond, 2010; Trilling & Fadel, 2009; Wagner, 2012; Zmuda, 2010). However, this would imply that teachers would also need training with more emphasis on the teaching principles of andragogy to

help them create an academic program aligned with and leading to college and career readiness for students.

Implications for Practice

There are many benefits to be gained from expanding andragogic principles in our K-16 educational system to promote acquisition of 21st century skills for college and career readiness. Education that is accomplished through student-centric learning has several benefits for the learner. It is more likely to:

- provide greater relevance to the needs of the learner;
- develop proficiency with tools of technology;
- encourage the development of patterns for approaching and solving problems;
- build relationships with others to pose and solve problems collaboratively;
- promote creativity and invention;
- develop critical thinking and reasoning skills that can be applied to personal learning needs as well as school and work-related needs; and
- promote self-directed, life-long learners (Gibbons, 2002; Trilling & Fadel, 2009; Robinson, 2011; Wagner, 2008, 2012; Zmuda, 2010).

In practice, moving teachers and students toward the principles of andragogy, including more responsibility on students for their learning, shared responsibility in the planning of the learning experiences, and eventually less dependency on the instructor, means that teachers will need to adjust their

teaching methods according to the needs of the students for high/low direction. Developing a culture that allows for the gradual release of responsibility for learning from the teacher to the learner may entail a significant readjustment of expectations and relationships for all involved (Fink, 2003; Fisher & Frey, 2010; Gibbons, 2002; Grow, 1991; Pew, 2007; Serim, 2012). It is the underlying orientations of the teachers, the educational designers of curriculum, that shape the types of learning experiences students will encounter in the classroom to enhance development of 21st century skills (Fink, 2003; Grow, 1991; Pew, 2007; Wagner, 2008).

Although teachers in this study with orientations that are heavy pedagogic were able to describe skills students need in the 21st century, their teacher-centric learning environments and learning experiences for students are not conducive to the development of these skills. Even moving these teachers toward low-pedagogy and the center of the continuum could greatly enhance opportunities for their students to develop 21st century skills. As previously discussed, for the most part our pre-service training programs and professional development activities are designed to promote pedagogical methodology and traditional views of schooling (Darling-Hammond, 2006; Pew, 2007; Tate & Strickland, 2010). Ensuring that professional development opportunities provided for teachers include more andragogic approaches to teaching could help promote the congruence needed between the educator's teaching strategies with the 21st century student's learning

needs (Grow, 1991; Tate & Strickland, 2010; Vermunt, 1999). This type of training should also enforce "good teaching" as suggested by Grow (1991) and Pratt (1998) that is situational and assumes instructors 1) understand their orientation to teaching and 2) possess the ability to determine where their students are on the continuum of teacher dependence and adjust their teaching accordingly.

Implications for Research

Although this study explored the educational orientation and readiness for 21st century teaching among educators in private Christian schools, additional research that would support or disprove the findings, is desirable. One finding that emerged in the study was the possible difference in teacher's orientation to teaching based on the school size. Implications for additional research would be to use teachers from schools that are of similar size (all small student enrollments or all large enrollments) to see if the school size contributes to the teaching methodology. Another aspect that was not considered in this study was the overall school's philosophy to education that would also influence methodologies (teacher-centric or student-centric) and the impact on hiring of teachers. It would also be beneficial to determine the teaching orientation of the instructional leaders in schools to see what impact their orientation has on the overall instructional program in their schools. Implications for additional investigations are necessary in other academic disciplines and other venues of education, including public

schools, charter schools, and higher education, in light of the demands for 21st century learning and skill-sets necessary for college and career readiness.

Further research on the educational orientations of teachers should include extended observations of the teachers' classroom culture and their instructional activities. This study included two follow-up observations for each teacher, but a criterion for trustworthiness of a qualitative study includes extended time in the research setting or prolonged engagement between the investigator and the participants (Lincoln & Guba, 1985). However, based on my observations and the comparison to teacher interviews, I do not think extended time with the teachers or in their classrooms would have contributed to this study. Additionally, further research with this type of study would include the investigation of artifacts (lesson plans, assessments, project descriptions, etc.) that would also support the teacher's orientation to teaching, whether teacher-centric or student-centric.

Other studies for research would be to apply the relational constructs of Pratt (1988) and/or Grow's (1991) SSDL to high school learning situations. Although their models for teacher roles according to student needs were initially developed for higher education scenarios, the literature review revealed the need for better preparation in earlier years for students to become responsible for their learning, moving from teacher dependency to student participation in the planning of learning experience.

Chapter Summary

The overall significance of this study, based on the educational orientation among teachers and their perceived efficacy in developing classrooms that promote 21st century skill acquisition, is to raise an awareness of where teachers are on the andragogy/pedagogy continuum and move educational leaders and teacher training programs to facilitate better preparation for meeting the learning needs of 21st century learners. Findings from this study conclude that teachers with low-pedagogic to mid-andragogic orientations to teaching provide student-centric environments with more learning opportunities and curriculum designs that promote 21st century skill acquisition in students.

As expressed by Zhao (2009), "a nation's educational system functions on behalf of society to decide what kind of talents, knowledge, and skills are useful and what kinds are not" (p. 74). The development of the 21st century knowledge and skills of critical thinking and reasoning, information and research literacy, collaboration and communication, creativity and invention, and self-direction, is an important achievement in a 21st century, rapidly changing, and complex society. Educators need to gravitate toward the idea of instructors and students as partners in learning and other principles for superior learning proposed by Knowles (1980). Understanding the importance of this educational paradigm requires understanding of the concepts of pedagogy, andragogy, and development of 21st century skills (Bellanca & Brandt, 2010; Jacobs, 2010; Knowles, 1980;

Pew, 2007; Trilling & Fadel, 2009; Wagner, 2008). Regardless of teaching orientation, tremendous benefit exists in providing instruction based on a number of andragogical concepts and approaches that value individual growth and view education as a life-long process for the 21st century.

The process of planning and implementing authentic learning experiences in the classroom for the development of 21st century skills begins with the educational orientation of the teacher. The ability to prepare students for the current realities of the workplace requires that much of the time spent in school learning ought to relate to or even replicate the world of work (Darling-Hammond, 2006, 2010; Serim, 2012; Snyder et al., 2000). The experiential learning required for college and career readiness will need to go beyond the single text book/single styles of teaching and move towards methods engaging in learning that addresses real-world problems and promotes real-life skills and work habits (Darling-Hammond, 2010; Jacobs, 2010; Snyder et al., 2000; Wagner, 2012). However this will mean that the curriculum and methodologies used in our educational system reflect the 21st century classroom and teachers are themselves oriented to promoting andragogic principles and prepared for student-centric classrooms.

Final Thoughts

This study has been important to me because as a school administrator in a private Christian school it is my vision that all students graduating from our

school are equipped with 21st century skills for college and career readiness. Based on that vision, it is important that teachers I hire for positions in our school possess an orientation to teaching that reflects the needs of the 21stcentury classroom. It is equally important to understand my existing teachers' orientation to teaching to help overcome potential resistance to change when new student-centric programs are introduced to the curriculum.

As with any organization, administrators often hire teachers that do not fit the philosophy or learning culture of the school. Typically teachers are hired based on their educational background, qualifications, and experience. As indicated in this study, all of the participants had at least the science bachelor's degree to qualify them for teaching science courses at the high school level. However, a teacher with a teacher-centric orientation to teaching would not "fit" the educational philosophy of a school with a student-centric orientation to teaching. Although professional development opportunities can be provided to move teachers from a teacher-centric to a student-centric orientation, some teachers may not be able to make the paradigm shift.

Personally for me as the school instructional leader, knowing the teaching orientation of prospective teachers and the congruence of their teaching orientation with my school's philosophy of education before I hire them makes the transition into our school culture much easier. Once I discover the teacher does not fit the organizational philosophy and they cannot make that paradigm

shift, the non-renewal of their contract becomes much more difficult than if I had understood their teaching orientation from the beginning and not made the contract offer.

Further reflections on this study has prompted me to consider if the study results could be influenced more by the teachers' philosophy of teaching (which does not change) than their teaching orientation. I have been on this educational journey and have worked with many teachers in need of changes in their teaching methodologies. My background was originally nursing and nurse anesthesia. I fell into teaching 22 years ago when I was looking to spend more time with my young sons. A high school science position opened in my sons' private Christian school. My first experiences in the classroom were to teach as I had been taught (teacher-centric with direct instruction) and as I learned best (note-taking and memorization). Eventually I realized students were not really learning. Added to that, my methodology was boring to many students and my heart's desire was for students to love science. I look back now and through much trial and error, I moved from teacher-centric to student-centric learning, what I would now consider a change in my orientation to teaching. However, my over-arching philosophy of teaching did not change, and that was to produce lovers of science and life-long learners.

One last thought, when I began this study I believed that teachers would need to be at least mid-to-high andragogic on the EOQ to be able to develop the

identified 21st century skills our students need. However, based on the interviews and observations, I have since realized that the teachers scoring close to the middle of the andragogy/pedagogy continuum (on either side) were very capable of providing a learning environment that supports the development of these skills. Based on the current organization of our educational system, including the organization of private Christian schools, I believe we can make great strides in developing these needed skills in our students just by helping teachers shift their orientation to teaching to the middle of the continuum.

APPENDIX A

SURVEY

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Participants Consent Form

*** ELECTRONIC CONSENT: please select your choice below.**
Clicking on the "agree" button below indicates that:

- You agree to take part in this survey and that you understand that participation in this survey is voluntary.
- You understand that you are free to withdraw participation at any time before the point of submitting the survey.
- You understand that the online survey will take approximately 30 minutes.
- You understand that your responses will remain anonymous and any identifying information such as name, and email address will only be collected if you elect to participate in a follow-up interview.
- You understand that data will be stored and used for the PhD research of the student (Diane Bunker) until the completion of the PhD research.
- You understand that, by submitting this survey electronically you agree to take part in this research.

If you do not wish to participate in the research project, please decline by clicking on the "disagree" button.

◯ Agree

◯ Disagree

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Demographics

Gender

- ◯ Male
- ◯ Female

*** Number of years teaching**

- ◯ Less than 5 years
- ◯ 6 to 9 years
- ◯ 10 or more years

In what area(s) do you teach?

- ☐ Math
- ☐ Science
- ☐ English
- ☐ History
- ☐ Foreign Language

Other (please specify)

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Questionnaire

* **Below are statements about education, teaching and learning. These have been chosen to express different viewpoints.**

Please note: In completing this questionnaire keep in mind that the word "teacher" means yourself - the person filling out the questionnaire. In other words, your answers indicate your educational orientation in working with students.

For each statement please click on the box that indicates your attitude or position best - how much you agree or disagree with that statement.

Please respond to the following statements:

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. Education should focus on what is sure, reliable, and lasting.	○	○	○	○	○
2. Teaching effectiveness should be measured by students' increase in examination of their own feelings, attitudes, and behavior.	○	○	○	○	○
3. Students need a strong teacher who can direct their learning.	○	○	○	○	○
4. It is hard to keep people from learning.	○	○	○	○	○
5. Learning is an intellectual process of understanding ideas (concepts), and acquiring skills.	○	○	○	○	○
6. Effective learning occurs most often when students actively participate in deciding what is to be learned and how.	○	○	○	○	○
7. Giving examinations regularly motivates students to learn.	○	○	○	○	○
8. Organization of the content and sequence of learning activities should grow out of the students' needs, and with their participation.	○	○	○	○	○
9. It should be the teacher's responsibility to evaluate student achievement and assign grades.	○	○	○	○	○
10. The best sources of ideas for improving teaching and education are students.	○	○	○	○	○

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Questionnaire

*** Please respond to the following statements:**

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
11. Competition among students encourages keen learning.	○	○	○	○	○
12. A teacher by his/her behavior should show each student that his/her abilities and experiences are respected and valued.	○	○	○	○	○
13. A teacher should help students understand the values of our society.	○	○	○	○	○
14. To see education as a transmittal of knowledge is obsolete.	○	○	○	○	○
15. Students tend to be much alike.	○	○	○	○	○
16. It is the teacher's responsibility to motivate students to learn what they ought to learn.	○	○	○	○	○
17. Clear explanation by the teacher is essential for effective learning.	○	○	○	○	○
18. A teacher's primary responsibility is helping students choose and develop their own direction for learning.	○	○	○	○	○
19. A good teacher makes the decision on what is to be taught, when, and how.	○	○	○	○	○
20. A teacher seldom needs to know the average students as separate individuals.	○	○	○	○	○

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Questionnaire

*** Please respond to the following statements:**

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
21. A teacher should not change his expressed decision without unusually good reasons.	○	○	○	○	○
22. Emphasizing efficiency in teaching often blocks development of an effective learning climate.	○	○	○	○	○
23. Skip this question. Not applicable.	○	○	○	○	○
24. Evaluating his achievement should be primarily a responsibility of the student since he has the necessary data.	○	○	○	○	○
25. Competition among students develops conceit, selfishness, and envy.	○	○	○	○	○
26. A teacher should discuss his or her blunders and learnings with students.	○	○	○	○	○
27. A teacher should be sure that his questions steer students towards truth.	○	○	○	○	○
28. Educational objectives should define changes in behavior, which the student desires, and the teacher helps him/her undertake.	○	○	○	○	○
29. Most students are able to keep their emotions under good control.	○	○	○	○	○
30. Students are quite competent to choose and carry out their own projects for learning.	○	○	○	○	○

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Questionnaire

*** Please respond to the following statements:**

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
31. A teacher should help students free themselves of fixed habits and patterns of thought that block their growth.	○	○	○	○	○
32. The major qualifications of a teacher are a grasp of subject matter and ability to explain (demonstrate) it clearly and interestingly.	○	○	○	○	○
33. It is better for students to create their own learning activities and materials than for the teacher to provide them.	○	○	○	○	○
34. A teacher should require assignments and grade them.	○	○	○	○	○
35. Use of a topical outline often blocks a teacher's perception of students' needs.	○	○	○	○	○
36. An educational program should be evaluated only in terms of its own objectives.	○	○	○	○	○
37. Competition among students develops courage, determination and industry.	○	○	○	○	○
38. A teacher should provide opportunities for warm relationships with students and among students.	○	○	○	○	○
39. Education should lead people to goals that result in orderly, reasonable lives.	○	○	○	○	○
40. Education should increase students' critical evaluation of our society and courage to try new, creative, satisfying behavior.	○	○	○	○	○

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Questionnaire

*** Please respond to the following statements:**

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
41. Often students do not know what is best for them.	○	○	○	○	○
42. When a teacher makes a mistake, he is likely to lose students' respect.	○	○	○	○	○
43. Maturity depends more on continuing growth in self-understanding than on growth in knowledge.	○	○	○	○	○
44. Students often "get off the subject" either intentionally or unintentionally.	○	○	○	○	○
45. Educational programs, which tell what should be learned and how, rarely help students learn.	○	○	○	○	○
46. Letting students determine learning objectives wastes too much time in irrelevant discussion.	○	○	○	○	○
47. The primary concern of a teacher should be the immediate concerns of the student.	○	○	○	○	○
48. Grades should reflect the student's grasp of the subject or skill taught.	○	○	○	○	○
49. Assignments by a teacher tend to restrict students' significant learning.	○	○	○	○	○
50. Tests prepared by students are usually just as effective as those prepared by the lecturer.	○	○	○	○	○

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Questionnaire

*** Please respond to the following statements:**

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
51. The goals a student sets for himself are the basis of effective learning and not the teacher's goals.	○	○	○	○	○
52. A teacher's mission is to help each student learn what he decides and to aid the student in achieving his personal goals.	○	○	○	○	○
53. If the teacher is not careful, students can take advantage.	○	○	○	○	○
54. Considering the possible effects on students, a teacher should usually play it safe rather than take chances.	○	○	○	○	○
55. Without a cooperative climate encouraging students to risk and experiment, significant learning is unlikely.	○	○	○	○	○
56. A teacher who does not plan the work for a class carefully is taking advantage of the students' ignorance.	○	○	○	○	○
57. To use students' experiences and resources for learning requires group activities rather than such methods as lectures.	○	○	○	○	○
58. It is a good rule in teaching to keep relationships with the students impersonal.	○	○	○	○	○
59. Planning units of work should be done by students and teacher together.	○	○	○	○	○
60. Good teaching is systematic - set up a clear plan and schedule that he/she must stick to.	○	○	○	○	○

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Follow-Up Opt-In/Opt-Out

***Would you be willing to participate in a follow-up interview and observation?**

- ◯ Yes
- ◯ No

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Follow-Up Contact Info

Please provide your name and contact information.

Name:

Email Address:

Educational Orientation Questionnaire (from Quam, K.F. 1998)

Thank You

THANK YOU FOR YOUR TIME IN COMPLETING THIS SURVEY.

APPENDIX B

INTERVIEW PROTOCOL

Interview Protocol

Grand tour questions to guide the interviews:

` 1) How would you describe your approach to teaching?

   a. What do you see as your role in student learning?

   b. Teacher-centric versus student-centric?

2) What would you describe as the essential skills our students need for the 21st century?

   a. Creativity and Innovation (for example, but not limited to: resourcefulness, originality, integration of ideas)

   b. Collaboration and Communication (for example, but not limited to: synergy, team resourcing, social skills, leadership)

   c. Critical thinking and Reasoning (for example but not limited to problem solving, analysis, logic, cause/effect)

   d. Self-direction (for example but not limited to adaptability, initiative, personal responsibility, work ethics, self-advocacy)

   e. Research and Information Literacy (for example but not limited to knowledge acquisition, source discernment, systems management)

3) How do you design your classroom?

   a. Arrangement of seating

   b. Are there areas for collaboration?

c. Are there areas for project based learning?

d. What is on the walls or displayed in the room?

4) How do you design instruction?

a. Direct instruction (with note-taking and worksheets)

b. Guided Instruction (teacher dialogues with students using inquiry/questions to be investigated)

c. Project based learning--students have a great deal of control of the project they will work on and what they will do in the project. The project may or may not address a specific problem.

d. Problem based learning--a specific problem is specified by the teacher. (Students work individually or in teams over a period of time to develop solutions to this problem)

5) How do you design your assessments?

a. Traditional tests/quizzes/papers (multiple choice, T/F, matching, essay questions)

b. Projects (dessert or main meal?)

c. Presentations (internal or public)

d. ePortfolios

6) How did you learn about 21st century skills development?

APPENDIX C

OBSERVATION RUBRIC

Critical Thinking and Reasoning Rubric

Entry - 1	
Teacher observation	Example
• Disseminates information with limited real world connections	
• Challenges students to complete tasks based on information recall	
Notes:	
Developing - 2	
Teacher observation	Example
• Provides direct instruction on critical thinking and problem solving skills	
• Creates opportunities for students to solve basic problems	
Notes:	
Approaching - 3	
Teacher observation	Example
• Incorporates problem- and project-based learning into instruction	
• Utilizes open-ended questions and emphasizes higher order thinking skills	
• Guides and encourages the use of appropriate resources to solve authentic problems	
Notes:	
Ideal/Target - 4	
Teacher observation	Example
• Develops and facilitates a learning environment where students are consistently engaged in using multiple resources to plan, design, and execute real-world problems; using technology to collaborate and solve authentic problems; and developing and answering open-ended questions using higher order thinking skills.	
Notes:	

Collaboration and Communication Rubric

Entry - 1	
Teacher observation	Example
• Disseminates information with limited student interaction	
• Initiates and regulates student communication opportunities	
Notes:	
Developing - 2	
Teacher observation	Example
• Creates structures for student communication within the classroom	
• Provides opportunities for students to work in groups on products and projects	
Notes:	
Approaching - 3	
Teacher observation	Example
• Models effective student communication	
• Provides opportunities for students to make global connections	
• Establishes student group norms to facilitate effective collaboration	
Notes:	
Ideal/Target - 4	
Teacher observation	Example
• Develops, facilitates, and assesses a learning environment where students initiate communication in real and non-real time; communicate and collaborate with learners of diverse cultural backgrounds; and form collaborative teams to solve real-world problems and create original works	
Notes:	

Creativity and Invention Rubric

Entry - 1	
Teacher observation	Example
• Limits instruction to specific content	
• Makes connections to existing knowledge	
Notes:	
Developing - 2	
Teacher observation	Example
• Provides instruction to accommodate a range of learning styles, interests, and capabilities	
• Prompts students to identify trends, make predictions and think skillfully	
Notes:	
Approaching - 3	
Teacher observation	Example
• Includes skill-based learning outcomes that exceed state standards minimum requirements	
• Provides opportunities for students to demonstrate collaboration, communication and critical thinking skills	
Notes:	
Ideal/Target - 4	
Teacher observation	Example
• Develops, facilitates and assesses a learning environment where students are consistently engaged in applying critical thinking, research methods, and communication tools to create original work; and collaborating effectively beyond the classroom to create original work	
Notes:	

Self-Directed Learning Rubric

Entry - 1	
Teacher observation	Example
• Provides direct instruction to support the learning process	
• Initiates and regulates student interaction opportunities	
• Organizes exercises for students to practice what they learned; prepares tests and exams to generate grades	
Notes:	

Developing - 2	
Teacher observation	Example
• Introduces questions/problems and orchestrates student investigations	
• Determines course outcomes and assessments	
• Provides limited opportunities for students to manage learning activities	
Notes:	

Approaching - 3	
Teacher observation	Example
• Provides a wide range of organizing learning for students' choice	
• Monitors students' self-correction and intervenes when necessary	
• Allows students to determine achieved course outcomes and timelines	
• Provides opportunities for students to manage learning activities	
Notes:	

Ideal/Target - 4	
Teacher observation	Example
• Develops, facilitates, and assesses a learning environment where students are able to work independently on a consistent basis; allows students to design learning activities, assessments, and demonstrate achievement; and creates a framework for decision-making and goal setting, a support system to guide student progress, and procedure to follow for self-correction and work modification if needed.	
Notes:	

Research and Information Literacy Rubric

Entry - 1	
Teacher observation	Example
• Provides print / digital resources for research and information acquisition	
• Directs student use of print/ digital resources	
Notes:	
Developing - 2	
Teacher observation	Example
• Models search techniques and critical analysis of various media and information sources	
• Provides controlled opportunities for student search and analysis of media and information sources	
Notes:	
Approaching - 3	
Teacher observation	Example
• Plans and implements strategies to guide student investigations	
• Supports students as they acquire, evaluate and ethically use information	
Notes:	
Ideal/Target - 4	
Teacher observation	Example
• Develops and facilitates a learning environment where students are consistently engaged in selecting appropriate digital tools to assemble, evaluate and utilize information; applying varied research skills to find and evaluate resources; and using information and resources to accomplish real-world tasks.	
Notes:	

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