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An Action-Research Case Study of Professional Development on Essential Questions in a K-8 Private Parochial School

Ronda K. Cypret-Mahach
Lindenwood University

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by

Ronda K. Cypret-Mahach

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Dr. Lynda Leavitt, Dissertation Chair — Date: 10/28/16

Dr. Sherrie Wisdom, Committee Member — Date: 10/28/16

Dr. Joseph Alsobrook, Committee Member — Date: 10/28/16

Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work here at Lindenwood University and that I have not submitted it for any other college or university course or degree here or elsewhere.

Full Legal Name: Ronda Kaye Cypret-Mahach

Signature: Ronda K. Cypret-Mahach Date: 10-28-2016

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Abstract

The purpose of this action-research case study was the investigation of possible pedagogical transformations teachers experienced through participation in professional development training of Essential Questions and student learning; specifically student questioning, reading, and math achievement. The research in this study investigated two core focal points: the possible shift in a teacher's transformational practices after participation in professional development on Essential Questions (McTighe & Wiggins, 2013) and whether the implemented transformational practices led to a possible difference in student questioning skills in grades two through eight on the Measure of Questioning Skills, student achievement in STAR Math, and STAR Reading in grades two through eight. The researcher designed and implemented professional development for the faculty during one school year, based on Essential Questioning (McTighe & Wiggins, 2013) utilizing an enhanced digital lesson planner and on-line web forum, each designed by the researcher to support the components of professional development and collect data during the research period.

The researcher utilized the Measure of Questioning Skills (1993) pre and post-assessments with teachers of grades kindergarten through eight and students in grades two through eight, a qualitative survey of participants comprised of a questionnaire, interview, observation, lesson plans, and discussion boards, as well as classroom observations, teacher interviews, pre and post-survey questions, and reflective journaling to measure possible change in the level of implementation of Essential Questions demonstrated by teachers. Secondary student data included STAR Math and STAR Reading pre and post-assessments from grades two through eight.

Teacher perceptions reflected positive adoption of Essential Questions into lesson planning and teaching practice. Teacher participants demonstrated transformed practices of lesson planning, room design, and teacher-student interactions. Gathered data revealed a statistically significant increase in student achievement in STAR Math and STAR Reading assessments. Teacher participant Measure of Questioning Skills reflected statistically significant changes, as well. Student Measure of Questioning Skills revealed a significant increase in Stage 1 - Organizing Information questions, categorized as factual and procedural questions and an observable increase in Stage 3 - Extending Information questions, categorized as hypothetical and speculative questions.

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Chapter One: Introduction

The field of education consistently identified the development of students' intellect as a fundamental and primary goal for educators. Decades of educational narrative identified the importance of a student's individual command of knowledge and ability to negotiate intelligence and understanding through critical thought (Almeida & Franco, 2011; Bailin & Battersby, 2016; Boyaci & Atalay, 2016; Brown, Afflerbach & Croninger, 2014; Davoudi & Sadeghi, 2015; Halpern, 2013; Lai, 2011; Paul & Elder, 2014a; Wiggins, 2012). This fundamental goal reflected national, state, local, and professional mandates and required the educational community to provide critical thinking to students and indicate student success (Duesbery & Justice, 2015; Paul & Elder, 2013a; Pinkney & Shaughnessy, 2013; M. Tucker, 2016).

Researchers described questions as an indispensable tool used by educators in the achievement of critical thought (Brown et al., 2014; Costa & Kallick, 2015; Davoudi & Sadeghi, 2015; Kucuktepe, 2015; Lai, 2011; Marzano & Toth, 2014; McTighe & Wiggins, 2013; Paul & Elder, 2013b; Schrock & Benko, 2015; Tofade, Elsner, & Haines, 2013; Virgin, 2014; Wilhelm, 2012; Wiliam, 2014). Jacobs (2013) stated, "Arguably, questioning is the most timeless and fundamental stratagem employed by teachers from Confucius to Aristotle to Descartes to provoke learners" (p. vii). However, as stated by Wiggins (2013), "Study after study has shown that the majority of teachers' questions are leading and low-level, focused on factual knowledge" (p. 18).

In response to the increasing demands on critical thinking and intensifications in the rigor of curricular content, the principal at the research school, given the moniker: Metanoeo School for the purpose of this study, authored two school improvement goals

in 2011, aligned with the rudimentary goal of critical thought development. The goals included: “The students’ learning will be enhanced and deepened as a result of coordinated school-wide professional development for teachers” (Metanoeo School-School Improvement Process [SIP], 2011, p. 96), and “The students will acquire meaningful and lasting understanding, knowledge and skill, and the ability to regulate their own learning” (Metanoeo School- SIP, 2011, p. 97). The principal explicitly acknowledged the goals were to “improve students’ critical thinking skills” (A. Hoffman, personal communication, February, 2015). A review of the school improvement goals in October 2014, revealed previous professional development efforts had not “enhanced or deepened students’ learning” (School Improvement Action Plan, 2011, p. 3), as measured through student achievement scores on the Iowa Test of Basic Skills (ITBS) (University of Iowa, 2012), and critical thinking was not a predominately practiced goal in classroom teaching, as evidenced in observation and teacher lesson plans.

The researcher proposed a revised school-wide professional development plan in Essential Questions to support the development of critical thinking. Also necessary was the need to create specific measures to identify what professional development practices produced transformative changes in teacher practice related to student achievement. The purpose of this study included two core focal points: the transformational practices that could result from professional development in Essential Questions (McTighe & Wiggins, 2013), and if the implemented transformational practices led to a possible difference in student questioning skills in grades kindergarten through eight on the Measure of Questioning Skills (MQS) (see Appendix A), student achievement in STAR Math and STAR Reading in grades two through eight (see Appendix B).

Background of the Problem

Educators valued the development of critical thought within the individual learner as an educational goal throughout the history of instruction (Almeida & Franco, 2011; Bailin & Battersby, 2016; Boyaci & Atalay, 2016; Brown et al., 2014; Davoudi & Sadeghi, 2015; Halpern, 2013; Lai, 2011; Paul & Elder, 2014c; Wiggins, 2012). However, at the time of this writing, education had yet to celebrate consistent marked success within students' accomplished skill sets (Almeida & Franco, 2011; Arum & Roksa, 2011; Brown et al., 2014; Schaw & Robinson, 2012; Smith & Szymanski, 2013). Paul and Elder (2014b) indicated, "Though intellectual standards are central to the cultivation of the intellect, and hence should be placed at the core of teaching and learning" (p. 35) educational systems were far from this realism. "A huge gap exists between acknowledging the importance of critical thinking versus requiring it across the board regardless of discipline or the professor's teaching agenda" (Weissberg, 2013, p. 322).

Educators consistently used questions as a purposed tool to aid students in developing critical thought (Brown et al., 2014; Costa & Kallick, 2015; Davoudi & Sadeghi, 2015; Kucuktepe, 2015; Lai, 2011; Marzano & Toth, 2014; Paul & Elder, 2013c; McTighe & Wiggins, 2013; Tofade et al., 2013). "Questions are often used to stimulate the recall of prior knowledge, promote comprehension, and build critical-thinking skills" (Tofade et al., 2013, p. 1). Questions strategically planned were "especially important when teaching academic subjects because we [educators] cannot peer into students' brains to see what is going on" (Wiliam, 2014, p. 19).

> Knowing that questions are the gateway into students' thinking, masterful teachers don't just ask a lot of questions; they purposefully design and pose questions that are appropriate for each learning goal—questions that will bring about the specific kinds of student learning they are aiming for. (Costa & Kallick, 2015, p. 66)

However, studies revealed a substantial portion of educators continued to use leading and low-level questions fixated on factual recall (Pi-Hsia et al., 2014; Tovani, 2015; Wiggins, 2013; Wiliam, 2014). Additionally, the foundational theories and practice of Socrates, Bloom and Piaget fundamentally defined how questioning and critical thinking were associated, and if constructed, led to growing evolution of thought that questioned how those established beliefs were best utilized and interpreted by educators (as cited in Bennett, 2012; Case, 2013; Clemmitt, 2015; Stobaugh, 2013; Wiggins, 2015).

"Essential questions stem from the larger movement in education toward student-centered approaches to curriculum and instruction as opposed to teacher-centered" (Virgin, 2014, p. 202). Essential questions "connect students' lived experiences and interests (their only resources for learning something new) to disciplinary problems in the world" (Wilhelm, 2012, p. 25). Schrock and Benko (2015) stated, the way "to facilitate critical thinking and meaningful learning is to help your students use fundamental and powerful concepts to reason through essential questions of a course" (para. 4). Wiggins (2013) wrote, "And because the goal of essential questions is different than the goal of content acquisition, this principal is all the more critical" (p. 43). "Because imitation is one of the most powerful forms of learning, much of what students learn about questioning and problem-posing is a result of the teacher's modeling" (Costa & Kallick,

2015, p. 69). However, as reported by Obenchaini, Orr, and Davis (2011), "The development and use of essential questions involves a steep learning curve for many teachers and benefits from the opportunity to collaborate and reflect on practice" (p. 198). Ertmer, Sadaf, and Ertmer (2011) stated an educators' specific use of different question prompts stimulated diverse varieties of critical thinking, however, teachers who did not understand how to develop and use essential questions often missed the opportunity for thought development.

Educational researchers recognized preparing, presenting, and responding to questions as a key skill in teacher proficiency (Clark & Pittaway, 2014: Davoudi & Sadeghi, 2015; McTighe & Wiggins, 2013; Tovani, 2015; Wiliam, 2014). Costa and Kallick (2015) noted the unfortunate prevalence of teachers who did not understand proper questioning sequence and development. Successful transformation of teacher pedagogy stemmed from quality professional development experiences was an indispensable part of teacher development and school reform efforts (Editorial Projects in Education Research Center, 2011; Fishman et al., 2014; King, 2014; Marrongelle, Sztajn, & Smith, 2013; Petrie & McGee, 2012); however, educational research has at the time of this writing, as of yet lacked evidence to support amplified student achievement, as a consistent result of the efforts. Mizell (2015) described school districts as historically inclined to dedicate extensive amounts of time and energy into learning about student assessment, yet failing to scrutinize professional development efforts of teachers. The explicit practice of questioning and teacher knowledge of quality questions in the development of critical thinking required additional research (Pi-Hsia et al., 2014; Varela, 2012; Virgin, 2014).

Educational administrators relied on research-based information to make professional development choices (Drew & Klopper, 2013; Koellner & Jacobs, 2015; Mizell, 2014; Stewart, 2014). This researcher found no previous studies on elementary teacher professional development on essential questions (McTighe & Wiggins, 2013), teacher transformation, and transformational practices to identify a possible difference in student learning; specifically student questioning, reading, and math achievement.

Purpose of the Study

The unrealized School Improvement goals reviewed in 2014 at Metanoeo School and the gap in available research on elementary level teacher development in the use of essential questions with a focus on teacher pedagogical transformation, and student questioning and learning prompted this study. The purpose of this study was to investigate the possible pedagogical transformations elementary teachers experienced during a systematic professional development training (see Appendix C) in the use of Essential Questions (McTighe & Wiggins, 2013) and student learning; specifically student questioning, reading, and math achievement. The researcher designed an action research, case study inclusive of qualitative and quantitative measures. The structure of the study included an implemented professional development (Appendix C) for the teachers at the researched school during one school year, based on Essential Questioning (McTighe & Wiggins, 2013). This professional development opportunity included an enhanced digital lesson planner (Appendix D) and on-line web forum (Appendix E), each designed by the researcher to support the components of professional development and collect data during the research period. The study also included a qualitative survey of the participants comprised of a questionnaire (Appendix F), interview (Appendix G),

observation (Appendix H), lesson plans, and discussion boards (Appendix E), as well as quantitative measures of participants with the MQS. Student secondary data included pre and post-questions gathered from the MQS (Himsl & Millar, 1993) (see Appendix A), student achievement in STAR Math, and STAR Reading assessments in grades two through eight (see Appendix B).

Rationale

The field of education considered critical thinking an integral part of developing an intellect for most of recorded history. Thagard (2014) wrote, "Attempts to understand the mind and its operation go back at least to the Ancient Greeks, when philosophers such as Plato and Aristotle tried to explain the nature of human knowledge" (para. 2). Close to 2400 years later "critical thinking skills are often listed as the most important reason for formal education because the ability to think critically is essential for success in the contemporary world" (Marin & Halpern, 2010, p. 1) "Critical thinking has been an important movement in the education system in the US for a number of years" (Moseley et al., 2005, p. 20). Kettler (2014) further stated, "Developing skills of critical thinking is widely considered a worthy educational goal" (p. 127). "Educators, national government, and employers have identified critical thinking as a top priority for 21st-century thinkers" (Butler & Halpern, 2011, para. 11) and "it is highly valued as a skill of civilization" (Pinkney & Shaughnessy, 2013, p. 347). However, best practices in achieving critical thinking were limited and "if teachers and instructors don't understand them, or if the learning theory upon which they are based is underdeveloped or inappropriate, they are unlikely to have a positive influence upon teaching, training and learning" (Moseley et al., 2005, p. 46). Research completed by the National Center for Improving Student

Learning and Achievement in Mathematics and Science (NCISLA) stated, "One critical finding from this work is that teachers require substantive, long-term professional development about both student thinking and subject matter" (n.d., para. 3). This study aimed to add to the limited body of research on professional development in Essential Questioning that supports teachers in the development of pedagogical practices in critical thinking resulting in student achievement.

The education profession in the United States, as a collected whole, at the time of this writing, had not yet demonstrated the ability to consistently graduate deep and meaningful critical thinkers capable of the intellectual dexterity coveted as an integral component of a successful graduate. Arum and Roksa (2011) followed 2,322 students during their first two years of college to study "the extent to which they are improving their skills in critical thinking, complex reasoning and writing" (p. 30), and stated, "Commitment to these skills appears more a matter of principle than practice" (p. 35). While educators agreed "critical thinking skills in the curriculum help sustain an educated citizenry; prepares students for college, future careers, and life situations; and primes students to meet mandates of state and national tests and standards" (Stobaugh, 2013, p. 3), schools across the United States had not consistently graduated students reflective of this ultimate goal. Weissberg (2013) identified, "Unfortunately, calls for students to think critically almost always sidestep the prodigious problem of transforming a high-sounding idea into something that can be usefully interjected into lessons" (p. 318). The researcher encountered an abundance of discussion and opinion on critical thinking, and professional development practices, but encountered a gap in the literature on professional development shown to provide transformative practice in critical thinking

for kindergarten through eighth grade teachers utilizing essential questions with measured results in student achievement. The researcher was also unable to identify then-current supports for teachers participating in professional development in critical thinking that utilized a digital lesson planner and an on-line web forum. "There are few studies which have examined critical thinking skills among elementary student populations" (Kettler, 2014, p. 129) and "research on specific instructor-driven instructional practices that affect students' critical thinking is limited" (Shim & Walczak, 2012, p. 16).

"Modern mandates in education require that schools teach critical thinking" (Pinkney & Shaughnessy, 2013, p. 346). Directives for critical thinking attainment were noted in Public Law 107-110, commonly cited as the No Child Left Behind (NCLB) Act of 2001. This law provided a clear expectation of rigor in all aspects of a school's "basic program requirements," specifically identifying "multiple up-to-date measures of student academic achievement, including measures that assess higher-order thinking skills and understanding" (No Child Left Behind [NCLB] Act of 2001, 2002, p. 1450). In addition, the Common Core State Standards (CCSS) of 2009, specifically identified the necessity of critical thinking balanced with the importance of core foundational information and abilities. (National Governors Association [NGA], 2010, p. 2). The National Governors Association (NGA) (2010) research report further expanded "what students could read, in terms of its complexity, was at least as important as what they could do with what they read" (p. 2).

Research Questions and Hypotheses

Research Questions. Two research questions provided the framework for the mission of this research. The first question, How do teachers perceive their participation

in professional development on the use of Essential Questions and pedagogical practices?; gathered teacher insights through a qualitative survey of the participants comprised of questionnaire, interview, and on-line discussion forum. The second question, How do teachers design and deliver lessons after professional development on Essential Questions?; gathered information through observation, interview, on-line discussion forum and lesson plans.

Hypotheses. The hypotheses for this action research, case study included:

Alternate hypothesis 1. There is a difference in teacher pre-to-post-scores on the teacher Measure of Questioning Skills inventory.

Alternate hypothesis 2. There is a difference in student pre-to-post-STAR Math Scores.

Alternate hypothesis 3. There is a difference in student pre-to-post-STAR Reading Scores.

Alternate hypothesis 4. There is a difference in student pre-to-post-scores on the student Measure of Questioning skills inventory.

Theoretical Framework

The theoretical framework of this study utilized established and basic principles defined in action research and case study. Dick and Greenwood (2015) stated, "For action researchers a key concept is a dual commitment to both participation and action" (p. 195).

> In many fields, knowledge seems to expand from a common core of basic concepts outward, but action research has origins in multiple disciplines and geographical locations, and our shared task as an action research community has

> been to seek one another out and to form a common understanding of the breadth of theory and practice which inform our work. (Brydon-Miller & Coghlan, 2014, p. 226)

"The research is done to provide learning and understanding (and theory) that can be used by participants to improve their situation for the benefit of all" (Dick & Greenwood, 2015, p. 195). The combined research practices of action research and case study together created the theoretical framework for this research.

Assumptions, Limitations, and Scope

During this study, the researcher assumed participants received training and certification in educational practices. The researcher presumed participants answered honestly, candidly, and accurately to qualitative survey items of questionnaire, interview, and discussion boards, as well as quantitative measures of participants with the MQS. The researcher further assumed participants responded with professional and personal investment to professional development measures.

Limitations of the study included the specific nature of a working relationship between participants and researcher. The study represented an action-research case study of a singular location and used a convenience sample. Research bias was restricted by the use of a research assistant, anonymous teacher identifiers, and web forum for discussion boards; however, bias was still noted as a possible limitation due to perceptual misrepresentation, or interpretation. Additional limitation included the accuracy of the instruments selected to collect data: MQS (Appendix A), an assessment tool developed by Himsl and Millar (1993), STAR Math and STAR Reading assessment tools developed by Renaissance Learning (Appendix B). The scope of the study included a population of

24 certified teachers, and a student sampling of 152 kindergarten through eighth grade students at a single kindergarten through eighth grade school location. Data collected included pre and post-qualitative survey measures comprised of questionnaire, interview, observation, lesson plans, and discussion boards, as well as quantitative measures of participants with the MQS. Secondary quantitative measures of a systematic sampling of students included STAR Math and STAR Reading assessments of 152 students in grades two through eight.

Definition of Terms

The researcher demarcated the following terms, as purposed in this study.

Critical thinking. "The art of analyzing and evaluating thinking with a view to improving it" (Paul & Elder, 2014c, p. 2). For the purpose of this research, the Paul and Elder (2014c) definition of critical thinking found in the required reading, *The Miniature Guide to Critical Thinking: Concepts & Tools*, was presented to teachers during professional development sessions to provide a concise and identifiable definition.

Computer teacher. The research school had a full time, Missouri certified computer teacher whose responsibilities included teaching computer class to all kindergarten through eighth grade students. Part of the computer teacher's responsibilities included administering the STAR Math and Reading assessments to students during three assessment periods throughout the school year. The computer teacher should not be confused with the researcher's role of Technology Coordinator. They were separate positions and separate personnel.

Digital lesson planner. The researcher developed a customized digital lesson planner for teachers to utilize during the research process to support teachers in the use of

Essential Questions. The lesson planner included a weekly tracking system of the school curriculum covered in lesson planning, and recording of Essential Questions posed to students (see Appendix D).

Essential Questions book. A publication written by McTighe and Wiggins (2013) served as a professional development foundational component. The book was required reading for the professional development.

Essential Questions. As defined by McTighe and Wiggins (2013), a question with the following seven characteristics: "It is open-ended, thought-provoking and intellectually engaging, calls for higher-order thinking, points toward important, transferable ideas, raises additional questions and sparks further inquiry, requires support and justification, and recurs over time" (McTighe & Wiggins, 2013, p. 3).

Google Apps. An online platform for productivity that provided word processing, spreadsheets, and data collection tools. Google Apps provided collaboration and real-time feedback (Weinberger, 2016). For the purpose of this research, Google Apps were utilized to create a questionnaire (Appendix F), as well as to retrieve responses. Google Apps created a secure online web forum and discussion board (see Appendix E).

Measure of Questioning Skills. An assessment tool developed by Himsl and Millar (1993), available from Scholastic Testing Service, and designed to "assist teachers in determining the "quantity" and "quality" of students' questions and to encourage students to understand and learn the value of questioning in their school and life experiences" (Scholastic Testing Service, 2014, para. 1). This assessment "contains forms A & B each consisting of four pictures depicting various situations that elicit

questions. In a specified time, an individual records as many questions as possible that relate to ambiguous pictures" (para. 2). The test design included "all ages" (MQS, 1993, p. 14). For the purposes of this research, the MQS provided pre and post-test data by utilizing form A (pre) and form B (post) to show possible growth in kindergarten through eighth grade students' and kindergarten through eighth grade teachers' questioning skills (see Appendix A).

Metanoeo. As defined by Porter (1993) in The Oxford Companion to the *Bible*, Metanoeo means "a change of mind" (p. 646). For the purpose of this research, the use of the Greek Biblical term *Metanoeo* stood as a moniker for the research school.

Normal Curve Equivalent. As defined by Renaissance Learning (2013), "a norm-referenced score similar to percentile rank, but based on an equal interval scale . . . useful in making comparisons between different achievements tests and for statistical computations" (p. 1). For the purpose of this research, data analysis utilized NCE for STAR Math and STAR Reading growth indicators.

On-line discussion forum. The researcher developed an on-line discussion forum for teachers to respond to and discuss topics related to Essential Questions (see Appendix E). "The term "discussion forum means an asynchronous website component that enables users to exchange ideas by posting questions and answers on relevant subjects" (National Education Association (NEA), 2015, para. 2). For the purpose of this research, the use of the discussion forum gathered teacher responses to prompts and input on the topic of Essential Questions.

Padlet. An online platform that provided collaborative exchanges on a virtual wall. Each participant received a link to the virtual site where they added a text box for

comment or questions. For the purpose of this study, the researcher selected Padlet to gather participant input, comment, and question throughout the professional development, which allowed teachers a layer of privacy.

Pedagogical transformation. In the report, "Transforming Teaching: Connecting Professional Responsibility with Student Learning" (Commission on Effective Teachers and Teaching, 2011), effective teachers were described as "continually learning and growing in ways that improve their teaching practice and enhance student learning" (p. 12). For the purpose of this research, the researcher investigated if any pedagogical transformative learning occurred in teachers' beliefs on the value of Essential Questions as measured through data collection comprised of questionnaire, interview, observation, lesson plans, and discussion boards, as well as quantitative measures of participants with the MQS.

Professional development. "The strategy schools and school districts use to ensure that educators continue to strengthen their practice throughout their career. The most effective professional development engages teams of teachers to focus on the needs of their students" (Mizell, 2010, p. 1). For the purpose of this research, the professional development occurred during the course of one school year and included formal and informal sessions. The books, *Essential Questions* (McTighe & Wiggins, 2013) and *The Miniature Guide to Critical Thinking: Concepts & Tools* (Paul & Elder, 2014c), were required reading for the professional development participants. The professional development training was mandated by the school as a component of their professional responsibilities. Teachers provided consent to participate in the research study.

Professional development web resource site. The researcher created and maintained a web resource page for teachers to support the components of professional development in Essential Questions. The web resource site included required readings, resources, and an on-line discussion forum for teachers (see Appendix E).

Renaissance Learning. The research school subscribed to Renaissance Learning for each student enrolled in the school. The subscription included an inter-related compliment of five on-line programs: Accelerated Reader 360, STAR Math, Accelerated Math, STAR Reading, and Math Facts in a Flash. For the purposes of this research, STAR Math and STAR Reading assessment data were generated during the three testing dates during the school year and identified as secondary data to show possible growth in student achievement.

Resource teacher. The resource school had a full time, Missouri certified resource teacher, whose responsibilities included serving students and working under district Individualized Education Programs, Learning Plans, English as a second language, or with struggling students. For the purpose of this research, the resource teacher had extensive knowledge in observing, and moving freely among various classrooms, served as the researcher's assistant to help minimize observer bias, as noted by Fraenkel, Wallen and Hyun (2012, p. 448). This individual also provided assistance in assigning a code to participants who agreed to participate in the research components of survey and interview, and kept participant information secure. The resource teacher collected consent forms, assigned participants a number, and assisted in removing all identifiers from interview and audio recordings.

Speech-to-text. Described by Matheson (2007), speech-to-text software "is computer software that automatically transcribes digital voice recordings without the need for typing" (p. 549). Matheson (2007) further stated, "This process can be used by researchers to lessen the time and physical effort of traditional transcription" (2007, p. 548). The researcher used speech-to-text software to transcribe pre and post-teacher interviews.

STAR Math. An assessment tool developed by Renaissance Learning (2010a, 2010b, 2013, 2015) to assess students' skill and level in mathematical development. STAR Math assessed a student's "inter-related prerequisite skills needed to further conceptual understanding and provide resources to help students achieve mastery" (Renaissance Learning, 2015, para. 5). The delivery of STAR Math was through a cloud-based log-in, specific to each student. STAR Math "identifies students' instructional math levels and compares their math achievement to that of students across the nation. The test provides norm-referenced and criterion referenced scores for students" (Renaissance Learning, 2010a, p. 3). For the purposes of this research, secondary data included student scores in grades two through eight, generated from the three assessment periods during the year.

STAR Reading. An assessment tool developed by Renaissance Learning (2010a, 2010b, 2013, 2015) to assess students' reading comprehension. The delivery of STAR Reading was through a cloud-based log-in, specific to each student. The STAR Reading test consisted of "multiple-choice items . . . based on the student's estimated ability level. If the student answered the item correctly, the software [increased] the difficulty level of the next item [to provide] an accurate assessment of ability" (Renaissance Learning,

2010b, p. 4). For the purposes of this research, secondary data included student scores in grades one through eight, generated from the three assessment periods during the year.

Teachers of grades kindergarten through eight. Full-time teachers defined by the *Personnel Policies and Procedures Employee Handbook* for the Archdiocese of St. Louis (2013) were "those who are not in a temporary or introductory status and who are regularly scheduled to work a minimum of thirty-five (35) hours per week . . . during "the school year" shall be regarded as "Regular Full-Time" (p. 9). Teachers employed by a Catholic school "should possess a valid [teaching] certificate from the State of Missouri or from another state and meet the credentialing requirements of the organization that accredits the school at which the educator is employed" (Archdiocese of St. Louis, n.d., para. 5). For the purpose of this research, the phrase, 'teachers of grades kindergarten through eight,' included full-time, certified teachers with a signed teacher contract with the research school. This included grade level, subject/content area, specialized, art, computer, physical education, and music teachers.

Transformation. Piaget defined transformation as "a possible construction of new structures, the enlarging of the initial structure that inserts itself in a more general structure as a particular case" (as cited in Bringuier, 1980, p. 40). For the purpose of this research, the researcher investigated if/any transformation in teachers' pedagogical practice occurred in the use of Essential Questions in teaching, as well as if any transformation in students' use of Essential Questions occurred.

Transformative learning. Defined in the Greenwood *Dictionary of Education* (Collins & O'Brien, 2003, p. 362) as "learning characterized by self-reflection and self-examination; especially learning designed to lead to a clearer understanding of oneself

through the identification of assumption, acquired earlier in life, that affect functioning in adulthood." A learning theory first developed by Mezirow that resulted in deep change or a transformation of tacitly acquired frames of reference - composed of sets of assumptions and expectations- that determined, filtered, and often distorted thought, emotion, decision making and action.

> Assumptions are beliefs about reality that are taken for granted and not usually reflected upon or questioned. The concept also involves reflective and cyclical processes of engagement in, and disposition for, discourse and dialogue in order to arrive at tentative best judgments upon which to act until new perspectives, evidence, or arguments are encountered that are found to be more justified and reasonable. (Collins & O'Brien, 2003, p. 362)

Summary

Education consistently focused on the goal of developing a student's intellect with ever-increasing levels of deftness that allowed for students growth in unbiased, independent, capable decision making (Almeida & Franco, 2011; Bailin & Battersby, 2016; Boyaci & Atalay, 2016; Brown et al., 2014; Davoudi & Sadeghi, 2015; Halpern, 2013; Lai, 2011; Paul & Elder, 2014a; Wiggins, 2012). Cloaked within a nebulous of definition (Almeida & Franco, 2011; Paul & Elder, 2010; Shim & Walczak, 2012), critical thinking was desired by the field of education, and mandated by national, state, local, and professional directives (Duesbery & Justice, 2015; Paul & Elder, 2013b; Pinkney & Shaughnessy, 2013; M. Tucker, 2016). However, while the desire of critical thinking thrived, the elusiveness of attainment remained a consistent problem within the field of education (Kettler, 2014, Miele & Wigfield, 2014; Virgin 2014).

The research school, identified in this study as Metanoeo School, set critical thinking as determined goals during the 2011 School Improvement process. The goals reflected a determination to prepare students for rigorous curricular content and increased critical thinking skills; however, a review of the goals in 2014 revealed unmet goals, as evidenced in yearly assessment measures and classroom practice. The researcher selected to focus on the development of critical thinking through the use and study of questioning. To construct an understanding of the problem, the researcher conducted a review of then-current research, narrative, and literature. The literature review in Chapter Two investigated six central focal points: the primary foundations of critical thinking in the field of education, definitions of critical thinking, mandates of critical thinking, developing critical thinking abilities of students, teacher professional development in the area of critical thinking, and transformation of professional development into classroom practice.

The researcher organized this dissertation to include five chapters. Chapter One introduces the purpose and rationale for study of professional development in Essential Questions. Chapter Two includes a review of then-current research, narrative, and literature, which illustrated the need for further research. Chapter Three encapsulated chosen methodology used for the research study, with established principles of action research and case study supported by mixed methods of qualitative and quantitative data collection. Chapter Four presents the results of the study, which reflected significant statistical indication for the use of Essential Questions. Finally, Chapter Five provides opportunity for the researcher to expand upon the results and discuss the significant findings.

Chapter Two: The Literature Review

Introduction

Through decades of teaching and learning researchers, educators, policymakers and stakeholders marked the importance of critical thinking. The significance of critical thought development and the desire to measure the command of this concept among our students' accomplishments was well-represented throughout the then-existing literature (Almeida & Franco, 2011; Bailin & Battersby, 2016; Boyaci & Atalay, 2016; Brown et al., 2014; Davoudi & Sadeghi, 2015; Halpern, 2013; Lai, 2011; Paul & Elder, 2014a; Wiggins, 2012). Decades of work dedicated to raising a student's understanding contributed to the then-accepted educational premise of intellect as a leading directive for education. Whereas the available literature embodied a wide path of investigation, theories, opinions, and techniques, the researcher selected to focus on the development of critical thinking through the use and study of questioning.

The research in this study initiated after a review of school improvement measures at the research school found identified goals unmet. In 2011, the research school, given the moniker Metanoeo School for the purpose of this research, identified two school improvement goals: "The students' learning will be enhanced and deepened as a result of coordinated school-wide professional development for teachers" (Metanoeo School- SIP, 2011, p. 96) and "The students will acquire meaningful and lasting understanding, knowledge and skill, and the ability to regulate their own learning" (Metanoeo School- SIP, 2011, p. 97). When asked to explain the second goal, the principal of the research school explained, the purpose was to improve critical thinking skills in students. In 2014, the researcher reviewed the goals and found school

achievement data and classroom teaching practice did not support successful attainment of either goal. The researcher completed this literature review to gain a wider professional understanding of the variables encompassed in critical thinking.

The association of questioning and critical thinking championed in educational research by the works of Socrates, Bloom (1956), and Piaget (1958) provided a foundational understanding of how the work and interpretation of each constructed, used, and evaluated questions in educational settings. The review also investigated a growing evolution of thought, which questioned those established beliefs (as cited in Bennett, 2012; Case, 2013; Clemmitt, 2015; Stobaugh, 2013; Wiggins, 2015). The researcher believed questioning established norms was essential in understanding the need for further research.

Education defined critical thinking in a varied tapestry of contributed offerings. The literature review investigated how the educational community developed an overall professional understanding of critical thinking amid variation (Almeida & Franco, 2011; Brown et al., 2014; Miele & Wigfield, 2014; Murphy, Rowe, Ramani, & Silverman, 2014; Paul, & Elder, 2013c). The variance in definitions reflected subtle, yet important shifts of focus in the approach of critical thought. The process an educator went through to build a development of critical thought was dependent on how critical thinking was individually defined (Almeida & Franco, 2011; Paul & Elder, 2010). Critical thinking described by Paul and Elder (2014c) included "the art of analyzing and evaluating thinking with a view to improving it" (p. 2). For the purpose of this research, the Paul and Elder's (2014c) definition of critical thinking, found in the required reading for the teachers working at the research school, *The Miniature Guide to Critical Thinking:*

Concepts & Tools, was presented to teachers during professional development sessions to provide a concise and identifiable definition.

The literature reviewed illustrated the depth of national, state, local, and professional mandates required by the educational community to provide critical thinking to students with marked success (Duesbery & Justice, 2015; Paul & Elder, 2013c; Pinkney & Shaughnessy, 2013; M. Tucker, 2016). The review provided a framework to understand what directives educators were presented and the specific language used indicative of critical thinking (Association of American Colleges and Universities [AAC&U], 2013; Missouri Department of Elementary and Secondary Education [MODESE], 2014; NCLB, 2002). The review of national, state, local, and professional mandates presented an overview of expectation the educational community worked within (Association for Supervision and Curriculum Development [ASCD], 2016; NGA, 2010; U. S. Department of Education, 2014).

To understand the then-current critical thinking capability of students, the review included an exploration into then-current commentary and data exemplified. To gain perspective on the research school's data and observed practice, the researcher reviewed the context of critical thinking in education as a larger whole. Then-current research and publication specific to critical thinking through questioning was also reviewed (Brown et al.,; Costa & Kallick, 2015; Davoudi & Sadeghi, 2015; Kucuktepe, 2015; Lai, 2011; Marzano & Toth, 2014; Paul & Elder, 2013a; McTighe & Wiggins, 2013; Tofade et al., 2013). Professional development and practice were also included in the review to gain perspective on then-current educator practice. The review revealed a void of available research on the development of teachers in the use of Essential Questioning, and further

sparse availability of research on the development of critical thinking in elementary children using Essential Questions. This examination of literature developed through six areas of investigated review: the primary foundations of critical thinking in the field of education, definitions of critical thinking, mandates of critical thinking, developing critical thinking abilities of students, teacher professional development in the area of critical thinking, and transformation of professional development into classroom practice.

Foundations of Critical Thinking in the Field of Education

Critical thinking was an integral part of developing an intellect for most of recorded history. Thagard (2014) wrote, "Attempts to understand the mind and its operation go back at least to the Ancient Greeks, when philosophers such as Plato and Aristotle tried to explain the nature of human knowledge" (para. 2). Plato and his student, Aristotle, were part of an ancestry of thinking, which exemplified critical thought traced back to Plato's teacher, Socrates. Socrates' bravura in the use of elicit questioning was considered the base of "western philosophy and the scientific method of inquiry" (Westervelt, 2014, para. 1). "He [Socrates] established the significance of asking questions that delved deeply and required more extensive thinking; questions that demand the importance of seeking out evidence and that examine both assumptions and resultant reasoning" (Barrera & Dowell, 2015, p. 173). Socrates, "despite having written nothing, is considered one of the handful of philosophers who forever changed how philosophy itself was to be conceived" (Nails, 2014, para. 1) and stood as the namesake of a method of questioning called the "Socratic Method" (Tienken, Goldberg, & DiRocco, 2010, p. 28).

"Socrates' question-and-dialogue-based teaching style has lived on in many classrooms as the Socratic Method" (Westervelt, 2014, para. 1). A succession of questions posed by a teacher or another individual, used to elicit critical thinking in another individual or student, defined the classic Socratic Method. The classic Socratic method defined by Maxwell (2014) led an individual into contemplation of any particular topic with "no guarantee of a correct answer" (para. 28). Plato's, *The Republic*, exemplified this style of questioning while Socrates questioned the character, Glaucon. Brown (2011) described the strategy Socrates employed through use of strategic questions asked of the student, Glaucon, to assist him in the development of a novel understanding of justice Glaucon had not considered prior. However, the set of asked questions did not require the student to arrive at any predetermined belief or designation (Tienken et al., 2010). The ultimate purpose of questioning used in the classic Socratic Method assisted one's ability to "know what they do not know" (Maxwell, 2014, para. 28).

In contrast, Maxwell (2014) further explained, the modern Socratic Method evolved to a fixed and specific point of knowledge the questioner or teacher predetermined. In the modern Socratic Method the student engaged with questions specifically engineered by the teacher to guide the student toward precise predetermined knowledge. Tofade, Elsner, and Haines (2013) identified "a noted benefit of the Socratic method is that students often uncovered personal knowledge deficits about the subject matter" (p. 4). "Another central aspect of the Socratic method is that the chosen topic, subject or phenomenon of the dialogue is investigated by means of concrete cases and experiences, formulated as narratives" (Ohrem & Weiss, 2015, p. 149).

A review of the research on the use of Socratic Method, Socratic questioning, and Socratic seminars revealed moderate-to-positive results. In *Motivation Towards Learning Perceived in Socratic Seminar Versus Traditional Lecture*, Roberson (2013) reported, "Results displayed Socratic Seminar as providing a more motivating experience towards learning in certain areas of motivation while lecture was seen to be more motivating for other areas of motivation" (p. xiii). Roberson (2013) stated, Socratic Seminar, when used in conjunction with a traditional lecture, presented a balanced approach and provided students with appropriate motivation for different situations.

Ohrem and Weiss (2015) investigated the association between action research and Socratic dialogue in "Philosophical Practice as Action Research: The Socratic Dialogue Method at Norwegian Folk High Schools" (p. 145) and showed positive results in the use of Socratic practice. The case-study research noted, "The research object of a Socratic dialogue when understood as participatory action research is the Socratic dialogue itself, and the phenomena, which are occurring through it – in short: the story-telling as such is the actual action which is investigated" (Ohrem & Weiss, 2015, pp. 167-168). In each of the three case studies of the research, participants experienced progressed learning perspectives central to the topics discussed during the Socratic dialogues. Further evidence presented in the research of Giuseffi (2015) "revealed moderate gains in leadership at the JROTC level" using the Socratic Method (p. 104). Giuseffi (2015) stated, Socratic practice had "an intellectual impact on the leadership thinking of the cadets" (p. 104). Zare and Mukundan (2015) completed a review of literature on the use of Socratic Method to improve critical thinking skills and found significant importance in the questions raised during discussions.

Available research reflected abundant literature on the use of Socratic questioning in adult learning and secondary education; however, the researcher was unable to find statistical data and researched practice in the use of Socratic questioning in the elementary grades. Researchers encouraged teachers to pose questions with ascending intellectual intricacy (Marzano & Toth, 2014) and engage students in Socratic practices (Wiggins, 2015). However, as questions teachers asked were examined at 22 primary schools by Kucuktepe (2015), "most of the questions (97.17%) asked by the classroom teachers during lessons did not meet the universal intellectual standards of Socratic inquiry" (p. 163). Kucuktepe (2015) further noted, "Teachers asked few questions (2.83%) that further encouraged student responses according to universal intellectual standards of Socratic inquiry" (p. 163). While Cleveland (2015) examined the use of specific Socratic practices in fourth-grade students and found the "application of the intellectual standards for critical thinking to reasoning increased," (p. i) more research was needed.

Whereas Socrates provided an agreed upon beginning for the development of critical thought through external questioning, two prominent figures positioned the foundation for how the field of education expanded the philosophy of critical thinking; Bloom (1956) and Piaget (1958). Pinkney and Shaughnessy (2013) identified Bloom's Taxonomy of Educational Objectives (1956) and Piaget's (1958) theory of Formal Operations as the initial constructs toward defining critical thinking in educational research. Richman, Permuth, and Richman (2013) described Bloom and Piaget as researchers who "helped develop the foundations for understanding how children learn" (p. 38). Published within a two-year span, Bloom's (1956) publication, *Taxonomy of*

Educational Objectives: The Classification of Educational Goals, and Piaget's (1958) book, *The Growth of Logical Thinking from Childhood to Adolescence,* co-authored with Swiss psychologist Inhelder, introduced the Formal Operational Stage in the development of logical thinking and provided the field of education decades of foundational sustenance. Listed in Holliman's (2014), *The Routledge Companion to Educational Psychology,* Piaget and Bloom were included in the list of eighteen "eminent scholars whose work has had a significant influence on the field of educational psychology" (p. 4). Bloom's Taxonomy "is one of the most widely cited sources for educational practitioners when it comes to teaching and assessing higher-order thinking skills" (Lai, 2011, p. 8).

In the *Taxonomy of Educational Objectives,* Bloom (1956) and a committee of college and university examiners, set out to produce a classification system of educational objectives. Written in the forward of the text, Bloom (1956) likened the effort to biology's classification system of scientific categories and proposed educators and researchers develop a clear understanding of the structure of the classification model and utilize the taxonomy in research, design, and understanding educational contexts. The completed taxonomy included six major classes and represented a "hierarchical order" (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956, p. 18). The six classes included: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom et al., 1956, p. 18). The authors identified three overarching domains in education: cognitive, psychomotor, and affective, with a fourth domain specifically described as "consciousness or awareness" (p. 19).

Integrated into educational standards, Bloom's (1956) Taxonomy became a fundamental element in educational development and design. "A staple of institutions of

quality learning throughout the world and a veritable synonym of lesson-planning" (Bennett, 2012, p. 109), Bloom's (1956) Taxonomy has been a consistent presence in learning to teach and design lessons. Belief in the value of Bloom's contribution continued amidst multiple revisions to the original taxonomy. "Clearly, Bloom's Taxonomy has stood the test of time" (Florida International University, n. d., para. 9). Bennett (2012) stated Bloom's Taxonomy was "seen as a way to make learning relevant, objective, and deep; it is considered indispensable in ensuring quality education by countless school systems" (p. 109).

Several revisions to Bloom's (1956) Taxonomy were presented over the years with the most noted, a revision published in 2001 by Bloom's former student Anderson and her co-editor Krathwohl (2001), who co-authored the original taxonomy with Bloom. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives,* the revised work "amended the names of the major cognitive process to indicate action because thinking implies active engagements" (Coffey, n.d., para. 4). Anderson and Krathwohl (2001) stated the reason for the revision was to provide a "common language" and "realistic examples" (p. xxii). The change from noun to verb form placed thinking in action terms and placed creation (which Bloom identified as synthesis) as the highest progression of knowledge (Dwyer, Hogan, & Stewart, 2014). Anderson and Krathwohl (2001) presented knowledge in a unique dimension containing "four categories: factual, conceptual, procedural, and metacognitive" (p. 5), which referred to strategic knowledge, knowledge about cognitive processes and tasks, and self-knowledge. Iowa State University's Center for Excellence in Learning and Teaching (2012) noted the revision redefined, "the cognitive domain as the intersection of the

Cognitive Process Dimension and the Knowledge Dimension" (para. 2) and provided the foundation for sequential progression into higher-order thinking skills.

Bloom's (1956) Taxonomy provided educators with a framework of design for decades and was described by those in the field as influential. Stobaugh (2013) stated, "Critical thinking as applied to K-12 schools was foundationally established in 1956 when Bloom edited the text titled *Taxonomy of Educational Objectives* (Bloom 1956)" (p. 11). However, Bloom's Taxonomy was not without critical review. While recognizing the influence of Bloom's efforts, Bennett (2012) wrote "the Taxonomy has critical problems with information, orientation, organization, and motivation" (p. 109). With the influence of Bloom's (1956) work embedded into the basic fibers of educational practice, Case (2013) stated, "It is arguably one of the most destructive theories in education" (p. 196). Case further explained, "The soundness of Bloom's original theory gives it credibility, while the subsequent distortions have caused the damage" (2013, p. 196). Stobaugh (2013) wrote, the basic truth was that teachers "lacked the necessary understanding of Bloom's taxonomy and the strategies to increase the critical thinking levels of assessments" (p. 57). "Many educators have a mistaken view of the Taxonomy and the levels in it" (Wiggins, 2015, para. 2). Wheeler (2012) suggested Bloom might have never intended a pyramid to represent the complexity of his work and further stated, "Criticism of Bloom's Cognitive taxonomy has been widespread" (para. 5).

While the taxonomy successfully classified cognitive thinking skills, the "organizing framework is dead wrong" (Wright, 2012, para. 1) and placed teachers on an unnecessary path of sequential advancement. Wiggins (2015) stated authors of Bloom's Taxonomy used frequently throughout education, "were concerned especially that no

single theory of learning and achievement" would provide sufficient structure for accomplishment. Bloom's (1956) Taxonomy specified the user should convert the taxonomy "from an empty set of terms and definitions to one that the reader finds workable and applicable to his own situation" (p. 45). Misguided application and use of Bloom's Taxonomy held "implications for all modern Standards documents" (Wiggins, 2015, para. 21).

While Bloom's (1956) Taxonomy provided a hierarchal structure to curriculum design and assessment in the pursuit of providing opportunities for students to develop intellectual abilities, Piaget's (1956) research provided educators an understanding into the process children go through while developing an intellect. Holliman (2014) referred to Piaget as "arguably the most influential figure in educational psychology" (p. 7) Piaget's (1958) contribution to cognitive development and use of scientific methods of observation set the precedent for countless researchers in education. Tanner (2016) wrote "Jean Piaget became a veritable institution unto himself in education and psychology" (p. 6). Piaget's (1958) contribution to educational practice had an immediate and lasting importance. Hopkins (2011) wrote, "Piaget's influence remains strong and . . . much of the revolution in cognitive neuroscience was anticipated by Piaget's approach" (para. 11). Piaget (1971) himself wrote, "Knowing does not really imply making a copy of reality but, rather, reacting to it and transforming it (either apparently or effectively) in such a way as to include it functionally in the transformation" (p. 6). "What cannot be doubted is that Piaget's ideas (or models, or theories) have had major impact on curriculum developments" (Wellington, 2015, p. 9).

This review of literature revealed varied views on the work of Piaget (1958). Cherry (2015) wrote, while Piaget's theories opened the door to an innovative era of investigation, the theories had "also been the subject of considerable criticism" (para. 1). Muneja (2015) held that Piaget, like other prominent researchers, were a product of training and "theorized according to their own contexts" (p. 60). Since the time of Piaget's (1958) published theories, "research came up with different and various outcomes associated with many and various critiques that new research should take into account" (Agina, 2015, p. 1). Billington and Williams (2015) acknowledged Piaget's (1958) influence on generations of educators and developed school curriculums, but postured the possibility educators should "detect a number of theoretical problems concerning the manifestations of behaviorist and cognitivist psychological discourses in education during much of the twentieth century" (p. 234). Coon and Mitterer (2013) stated details of Piaget's (1958) theories were in disagreement with then-current research and Piaget "underestimated the impact of culture on mental development" (p. 105). The body of research held "evidence of a post-Piaget group of theoreticians trying to update" Piaget's work (Almeida & Franco, 2011, p. 181). Wynn (2016) wrote, "Although the Piagetian approach provided useful insights into cognitive evolution, it ultimately proved to be limited in its applicability (para.1).

For decades, the theories and research of Bloom (1956) and Piaget (1958) were definitive roadmaps for educators to use in building a student's intellect (Bennet, 2012; Costa & Kallick, 2015; Holliman, 2014; Tanner 2016). Often described as "helpful resources teachers use to invite students to operate at increasingly complex levels of thinking" (Costa & Kallick, 2015, p. 66). However, given the "significance of

questioning as a high-level cognitive strategy" (Davoudi & Sadeghi, 2015, p. 76) the review of then-current literature revealed a growing question in how educators defined the basic exemplars of higher-order thinking and questioning.

Critical Thinking

An examination of the literature on the definition of critical thought uncovered varied interpretations and found that many researchers and educators presented individually constructed definitions and elucidation. Coon and Mitterer (2013) defined critical thinking as "a willingness to actively reflect on ideas" (p. 17) while Paul and Elder (2014c) defined critical thinking as "the art of analyzing and evaluating thinking with a view to improving it" (p. 2). Halpern (2013) offered:

> Critical thinking is the use of those cognitive skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned, and goal directed the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions, when the thinker is using skills that are thoughtful and effective for the particular context and type of thinking task. (p. 8)

Black (2012) described critical thinking as "analytical thinking which underlies all rational discourse and inquiry" (p. 40) and believed critical thinking was "characterized by a meticulous and rigorous approach" (p. 40). Almeida and Franco (2011) concluded, "Critical thinking appeared to be a higher-order type of reasoning which employed cognitive skills and was directed by a motivational component in problem solving" (p. 182).

Facilitated achievement of critical thought was problematic, partly because of such varied incongruity over the definition (Almeida & Franco, 2011; Shim & Walczak, 2012). At the time of this writing, critical thinking had yet to be categorically defined, and often carried with it great discussion (Dwyer et al., 2014; Kettler, 2014; Murphy et al., 2014). Lai (2011) discussed the three diverse viewpoints of philosophy, psychology, and education taken in the construction of a definition of critical thought. "These separate academic strands have developed different approaches to defining critical thinking that reflect their respective concerns" (Lai, 2011, p. 4). The reality of different characterizations used to describe and define critical thinking birthed out of convention from distinct fields of study (Almeida & Franco, 2011). Hepner (2015) stated, "Although philosophers and psychologists disagree as to what exactly the term critical thinking entails, most researchers agree on some foundational facets of critical thinking, most of which regard the various behaviors and/or dispositions that a critical thinker must possess" (p. 77).

Mandates of Critical Thinking in Education

National, state, and local educational directives identified critical thinking skills through deep and meaningful learning as objectives. "Standards demand that the United States education systems strive for and attain, if not universal proficiency, at least visible progress toward this goal" of critical thinking (Pinkney & Shaughnessy, 2013, p. 346). Educators tasked with understanding how to define, develop, and provide critical thinking opportunities, were required by law, for student's level of understanding. Duesbery and Justice (2015) stated, "As the United States transitions to a national set of

learning standards which emphasizes higher-order thinking, it becomes essential" to teach critical thinking (p. 148).

Public Law 107-110, commonly abbreviated as NCLB, provided a clear expectation to incorporate rigor in all aspects of a school's "basic program requirements" and specifically identified, "multiple up-to-date measures of student academic achievement, including measures that assess higher-order thinking skills and understanding" (NCLB, 2002, p. 1450). NCLB also noted funding received by schools from the national level be used in various ways that included to "acquire and use advanced technology, incorporated into the curricula of the school, to develop and enhance the information literacy, information retrieval, and critical thinking skills of students" (2002, p. 1570).

The National Governors Association (NGA) and the Council Chief State School Officers expanded on the principals of educational learning criteria and began work on the CCSS in 2009. The development process included two categories: "college and career readiness standards, and Kindergarten – 12 standards" (Common Core State Standards [CCSS], n.d., para. 3). The CCSS for English Language Arts & Literacy in History/ Social Studies, Science, and Technical Subjects: Research Supporting Key Elements of the Standards, identified critical thinking specifically and balanced the importance of core foundational information and abilities. "Pedagogy focused only on higher-order or critical thinking was insufficient to ensure that students were ready for college and careers" (NGA, 2010, p. 2). The NGA (2010) research report further expanded, "what students could read, in terms of its complexity, was at least as important as what they could do with what they read" (p. 2).

Adopted by over 40 states, the CCSS brought educators the opportunity to work under shared expectation and guiding principles (ASCD, 2016). S. Tucker (2014) reported, "These new standards will challenge students to develop high order critical thinking and reasoning skills that they need to succeed in high skill jobs" (para. 3). However, while adopted into practice by many states, the standards were an ongoing debate nationwide. In his blog, M. Tucker (2016) discussed the intricacies of how to evaluate the progress of the adopted Common Core and the depth with which the debate must be understood. "No standards, whether the Common Core or any other set of standards, will produce measured results unless the kinds of system features described here--and many others besides--are put in place" (M. Tucker, 2016, para. 13).

The states of Missouri and Arizona provided further example of the national argument in adoption of Common Core Standards. Missouri adopted the CCSS into practice, however, Governor Nixon signed legislation in July 2014 to repeal the CCSS and created a new task force that developed original education standards to replace the Common Core (Berry, 2014). "The state board of education shall adopt and implement academic performance standards beginning in the 2016-2017 school year" (MO HB 1490, 2014, p. 13). While Arizona's State Board of Education voted in October 2015 to move away from the adopted standards toward standards designed to "fit the needs of Arizona's children" (Cano, 2015, para. 8). Educators in Arizona reported a mixed reaction following the vote. The Community Relations Manager for Phoenix Union High School District stated:

> We hope this isn't the final word, and that the standards committee will not completely abandon the rigor of Arizona's College and Career Ready Standards.

> With all the classroom work, resources invested and professional development done over the last five years, I am sure the teachers will be frustrated that we can't stay the course. (Cano, 2015, para. 21)

Concurrently the Missouri Department of Elementary and Secondary Education (MODESE) set a target goal to be in the "Top 10 by 20" to ensure all students in Missouri graduated "college and career ready" (MODESE, 2014, para. 2). The intent of the goal stated "a major improvement effort aimed for student achievement in Missouri to rank among the top 10 states by 2020" (MODESE, n.d., para. 1). Included in the definition of being "career ready" Missouri Learning Standards stated a "need (for) workers with the critical thinking skills . . . included as part of the Common Core State Standards" (MODESE, 2014, para. 7).

In response to the legal edict and adopted standards to improve rigor in educational programming, Missouri' s state-level education department also enacted teacher performance standards to achieve the requirements set forth in NCLB, the CCSS, Top 10 in 20, and Missouri Learning Standards. In the state of Missouri, the teacher evaluation system published nine standards to evaluate a teacher's proficiency (MODESE, 2013). Standard Four of the teacher evaluation listed critical thinking explicitly, "The teacher uses a variety of instructional strategies and resources to encourage students' critical thinking, problem-solving, and performance skills" (MODESE, 2013, p. 4).

National educational organizations' proven influential in today's educational environment also reflected the specific importance of critical thinking skills. The Association of American Colleges and Universities (AAC&U) stated as their mission "to

make liberal education and inclusive excellence the foundation for institutional purpose and educational practice in higher education" (AAC&U, 2013, p. 2). The AAC&U listed critical thinking as an essential learning outcome and key component in achieving "intellectual and practical skills" (p. 2).

In addition, The Partnership for 21st Century Skills (P-21), co-founded by the NEA and in partnership with the American Council on the Teaching of Foreign Language also listed critical thinking as a "21st-century student outcome" (n.d.a, para. 5). "Critical thinking and problem-solving" were defined as including the abilities to "reason effectively, use systems thinking, make judgments and decisions, and solve problems" (P-21, n.d.b, para. 1). The Commission on Effective Teachers and Teaching (CETT, 2011) echoed the importance of critical thinking in its final report, *Transforming Teaching: Connecting Professional Responsibility with Student Learning*. CETT (2011) stated the need for teachers and schools to become adept with the development of student's critical thinking skills. CETT (2011) further identified a repertoire of required teacher abilities to incorporate 21st-century skills into their teacher practice centered on critical thinking.

Standardized testing measures at the collegiate level also focused on critical thinking skills. The Collegiate Assessment of Academic Proficiency (CAAP) a standardized, nationally normed assessment program from American College Test (ACT), Inc., "enabled postsecondary institutions to assess, evaluate, and enhance student learning outcomes and general education program outcomes" (ACT, 2014, para. 1). Listed among the multiple measures the CAAP offered, was the ability to "measure student learning outcomes for Voluntary System of Accountability- critical thinking and

writing essay" (ACT, 2014, para. 2). An exemplar of higher education standards, the "General Education Assessment Program" was found at universities like the University of Central Missouri (2014, para. 1). "The General Education Assessment (GEA) is used to test critical thinking and intellectual skills. The GEA exam, a computer-based, multiple-choice exam, measures four core intellectual skill areas – critical thinking, reading, writing, and mathematics" (University of Central Missouri, 2014, para. 2).

Elementary and secondary standardized assessment reflected the specific importance of critical thinking. National standards brought a "new focus on high-level content and the application of higher order thinking skills" (Duesbery & Justice, 2015, p. 148). The nationally normed ITBS Form-E, administered annually to students in grades kindergarten through eight, identified critical thinking as a measured valuation. "Three cognitive levels, which provide a hierarchy of critical-thinking skills, are reported: Essential Competencies, Conceptual Understanding, and Extended Reasoning" (University of Iowa, 2012, p. 33).

The U. S. Department of Education (2014) Green Ribbon Schools recognition award honored schools since 2011 for "exemplary practices" in, the ability to "hone critical thinking skills" (para. 3). Schools who chose to apply for this award worked to prepare students for the competencies necessary to become college and career ready and equipped with 21st-century skills (Ed-GRS, 2014). "Critical thinking is an essential skill necessary to student success" (McDonald, 2015, para. 1) and further stated by the NEA (2010), "Teaching critical thinking and problem solving effectively in the classroom is vital for students" (p. 8). In this researcher's experience, under the dictate of national and state mandates, educational association positions, national awards, and standardized

testing, local school districts and individual schools created curriculums and standards that included critical thinking as a required component and expectation for teachers to provide in curriculum planning, lesson design, and formative assessments.

The review of literature revealed, while national, federal, state, and local mandates were initiated to improve the educational experience and higher-order thinking skills of students, the goal was collectively realized as a universal outcome (Almeida & Franco, 2011; Arum & Roksa, 2011; Brown et al., 2014; Schaw & Robinson, 2012). Smith and Szymanski (2013) stated, many teachers may have an "inadequate understanding or experience regarding the higher order thinking questioning methods or a feeling of time pressure to keep on pace with curriculum expectations" (p. 23). While the mandates "exist to reduce the tendency to follow fads or whims in educational strategies" (Smith & Szymanski, 2013, p. 17), many educators struggled to reach the intended goal of improved critical thinking. Wiggins (2012) posted, "Critical thinking is praised as a goal, but the work assigned often doesn't demand it" (para .18). "The majority of teachers are not adequately prepared to make the critical instructional shifts necessary to meet the requirements for rigor in college and career readiness standards" (Marzano & Toth, 2014, p. 6).

Developing Critical Thinking Abilities of Students

The field of education consistently identified the importance and serious need for students to develop critical thinking skills at levels proficient enough to become high-level thinkers. Throughout the years critical thinking was established as a primary goal of education (Bailin & Battersby, 2016; Boyaci & Atalay, 2016; Duesbery & Justice, 2015; Halpern, 2014; Magno, 2010; McDonald, 2015; McTighe & Wiggins, 2013; Miele

& Wigfield, 2014; Murphy et al., 2014; Niu, Behar-Horenstein, & Garvan, 2013; Pinkney & Shaughnessy, 2013). The importance of critical thinking was present in educational literature over decades of teaching and learning and identified as an essential element to learning (Almeida & Franco, 2011; Wilborn, 2013).

Educators steadily believed classroom settings provided opportunity to develop critical thinking skills within students. "For students to think critically, they should be taught how to be aware of the underlying specific ways to think" (Magno, 2010, p. 152). Maintained throughout the literature was the repeated belief that educational intervention would lead to improved critical thinking abilities in students (Almeida & Franco, 2011; Arum & Roksa, 2011; Bartos & Banks, 2015 Duesbery & Justice, 2015; Elder & Paul, 2012; Halpern, 2014; Kim, 2015; Lampert, 2013; McTighe & Wiggins, 2013; Stobaugh, 2013). Bailin and Battersby, (2013) stated, "Like any skill, critical thinking can be enhanced" (p. 2). Research constructed "a considerable body of evidence that thinking skills courses and thinking skills instruction embedded in other courses can have positive effects that are transferable to many situations" (Halpern, 2014, p. 13). "Teaching students how to thoughtfully make reasoned decisions based on weighing the evidence prepares them for real-life situations" (Stobaugh, 2013, p. 33). "Yet students tend to have very little instruction in how to go about the inquiry process and in understanding the criteria used to make such reasoned judgments" (Bailin & Battersby, 2016, p. xvii). Elder and Paul (2012) wrote, "The painful fact is that few students have been taught how to analyze" (p. 4).

While the importance of critical thinking was long recognized, the field of education had yet, at the time of this writing, to celebrate the ability to graduate students

with a genuine command and repertoire of higher level thinking skills. "American students, by and far, are not only enrolling in post-secondary institutions without critical thinking skills, but are being granted college degrees without developing the critical thinking skills necessary to do well in most mid-level corporate positions or to succeed in highly competitive graduate programs" (Hepner, 2015, p. 71). Students' ability to grow in proficiency, while enrolled in college was an identified concern for many educators. "Although it is widely agreed that fostering college students' critical thinking skills is necessary, discussion continues about how this can be realized through educational efforts" (Niu et al., 2013, p. 115). "Undergraduates are barely improving their Collegiate Learning Assessment-measured skills in critical thinking, complex reasoning, and writing during their first two years of college" (Arum & Roksa, 2011, p. 54).

The review of literature identified educators' consistent conviction that the use and study of questioning could be cultivated to develop critical thinking in students (Bailin & Battersby, 2013; Burton, 2010; Costa & Kallick, 2015; McTighe & Wiggins, 2013; Murphy et al., 2014; Tofade et al., 2013). Costa and Kallick (2015) stated, "One of a teacher's most important practices is designing and posing questions" (p. 66). "Questions are often used to stimulate the recall of prior knowledge, promote comprehension, and build critical-thinking skills" (Tofade et al., 2013, p. 1). Pi-Hsia et al. (2014) stated, education recognized the important objective of quality questions. Well-crafted questions "specifically model the kinds of thinking students need to emulate and internalize" to learn at higher levels (McTighe & Wiggins, 2013, p. 23). Ertmer et al. (2011) noted wide-ranging works which connected teachers' use of questions to elicit deep and meaningful student response "suggesting that different question prompts can

promote different types of critical thinking" (p. 3). Davoudi and Sadeghi (2015) reported findings that "reveal the indispensable role of teacher and student questioning in facilitating critical thinking, writing ability, reading comprehension, subject matter learning, metacognitive skills, and scaffolding learning process" (p. 76). However, "If the questions have not been carefully planned, there is a real danger of concluding that the students are on the right track when, in fact, their understanding of the subject is quite different from what was intended" (Wiliam, 2014, p. 17). "Most of the time, teachers asked [students] questions they already knew the answers to, leaving little space for original thought" (Tovani, 2015, p. 32).

Researchers identified teacher knowledge in preparing, presenting, and responding to questions as an important skill (Clark & Pittaway, 2014: Davoudi & Sadeghi, 2015; McTighe & Wiggins, 2013; Tovani, 2015; Wiliam, 2014). McTighe and Wiggins (2013) stated, "A key long-term goal of education is for students to become better questioners because . . . the ability to question is central to meaningful learning and intellectual achievement at high levels" (p. 18). "Asking appropriate questions is a difficult task and requires considerable practice" (Clark & Pittaway, 2014, p. 194). Essential Questions emerged as "the answer to multiple problems teachers faced" (Virgin, 2014, p. 202). "Understanding can be furthered only through constant questioning" (McTighe & Wiggins, 2013, p. 18). Virgin (2014) wrote, "Given how widely the [essential questions] framework has been used, however, research that specifically aims to uncover the impact(s) of essential questions is lacking" (p. 203).

While "numerous studies have been conducted to test curricula and interventions designed to cultivate these skills" (Miele & Wigfield, 2014, p. 520) more research

intended to investigate students' questioning must occur. "One of the key elements of solving problems, that is, students' questioning ability, has seldom been investigated" (Pi-Hsia et al., 2014, p. 317). Schwartz (2015) stated, "More investigation into measures to assess the practice of teacher questioning" is necessary. Harris (2015) stated, "A rich body of research shows that children use questions to learn at home—but this pattern changes when they enter school" (p. 24). Harris (2015) further stated, by the time students entered grade school "many students ask no questions whatsoever" (p. 29). "By the time kids reached adolescence, the love of questioning is sometimes gone" (Tovani, 2015, p. 33). An essential "dimension of 21st Century skills, critical thinking ought to be developed during primary education" (Boyaci & Atalay, 2016, p. 142). Reinsvold and Cochran (2012) found the use of questioning, "in order to enhance student higher-level reasoning may be much less common or straightforward than expected" (p. 763). "Too frequently teachers have set students up for failure" (Costa & Kallick, 2015, p. 69) because teachers did not understand proper questioning sequence and development. "Teachers predominantly ask lower-level cognitive questions that do not effectively stimulate critical thinking" (Tofade et al., 2013, p. 3). William (2014) stated teacher "questions often have not revealed important aspects of students' thinking, and therefore important misunderstandings go undetected" (p. 19).

Concurrent to the need for more information, few studies examined critical thinking among elementary students (Kettler, 2014). Murphy, Rowe, Ramani, and Silverman (2014) echoed a similar concern, "The research base on promoting critical-analytic thinking is nascent" (p. 561). Virgin (2014) identified "research specifically and

concretely considering how exactly these questions are best employed does not exist" (p. 201).

Professional Development in Critical Thinking

Schools and districts long recognized the importance of being able to maintain a faculty of informed teachers on then-current practice, articulate in the implementation of those practices and work toward student success. "Professional development (PD) for teachers is recognized as a key vehicle through which to improve teaching and, in turn, to improve student achievement" (Petrie & McGee, 2012, p. 59). The perceived value of PD stood uncontested yet, PD provided a constant and continual debate among educators and researchers. "Effective professional development is often seen as vital to school success and teacher satisfaction, but it has also been criticized for its cost, often vaguely determined goals, and for the lack of data on resulting teacher and school improvement" (Editorial Projects in Education Research Center, 2011, para. 1).

Sappington, Pacha, Baker, and Gardner (2012) published findings from a study titled, "The Organized Contradictions of Professional Development and School Improvement," which investigated the then-current role of professional development and its association to school improvement. The authors reported "evidence from 106 field studies suggested in the past 35 years little progress has been made to link professional development and school improvement" (p. 9). While PD was consistently considered an essential part of teacher development and school reform efforts, (Editorial Projects in Education Research Center, 2011; Fishman et al., 2014; King, 2014; Marrongelle et al., 2013; Petrie & McGee, 2012), educational research had, as of yet at the time of this writing, not produced substantial findings to support increased student achievement as a

consistent byproduct of the efforts. Steg and Lambson (2015) identified, "In an ever-changing landscape of priorities for teachers and principals, PD [has shown] an increasingly significant set of decisions deserving attention from all stakeholders" (p. 473). School decision-makers reached an acute juncture in the development of teacher practice with PD that justified student achievement. "The time has come to figure out how to bring professional development to scale so that teachers across the nation can lead the movement and work together to ensure all students have the desired learning opportunities" (Marrongelle et al., 2013, p. 203).

The field of education identified the need for a clear understanding of the effectiveness of PD and the connection it had with student achievement, yet also continued to struggle with how that could be accurately accomplished. King (2014) wrote, "While researchers and policy-makers acknowledge that teacher PD needs to be assessed and evaluated, there is often little clarity as to how this can be achieved" (p. 89). Hill, Beisiegel, and Jacob (2013) stated, "[it] is in fact critically important at this crossroad to re-evaluate the research paradigm in professional development" (p. 476). "Evaluation of teacher PD by schools has been described as the weak link in the PD chain despite it being linked with improved PD experiences and [possible] pupil outcomes" (King, 2014, p. 89). Fishman et al. (2014) stressed the "urgent need for PD designs that are effective in helping teachers successfully enact curricular reforms" (p. 261). "The biggest problem professional development encountered was that it was usually developed as an isolated requirement, with no real connection to daily teaching and with almost no teacher input" (Varela, 2012, p. 17). Reinsvold and Cochran (2012) stated, "Some

professional development activities might have unintended, even negative, consequences" (p. 764).

National, state, and local mandates for school reform prompted school administrators to engage their faculty in PD programs to help support the adoption and implementation of standards, such as data-driven instruction, the CCSS, technology implementations, and Next Generation Science Standards (NGSS), (Fishman et al., 2014; Hill et al., 2013; Marrongelle et al., 2013; Varela, 2012). Marrongelle et al. (2013) stressed the importance "to align expectations, provide quality education for pre-service and in-service teachers . . . in the implementation of CCSS, and to help ensure success for students" (p. 202). Marrongelle et al. (2013) further stated PD was "integral to the successful implementation of standards" (p. 203). Administrators found themselves accountable for providing teachers with information about reforms, policies, technologies, and approaches that led to improved pedagogy and student achievement; however, "insights into impacts of PD upon teachers' learning and classroom practices are arguably still limited" (Petrie & McGee, 2012, p. 60).

New mandates and reforms encountered by schools and districts provided a collected expectation for higher student accomplishment achieved through advanced implemented standards. The then-current educational reforms placed "enormous pressures on teachers . . . to teach fluency, comprehension, and critical thinking skills as an integrated whole" (Varela, 2012, p. 17). Burton (2010) stated, "Professional development can help teachers develop the skill to design and use questions that engage students in higher-level instructional processes" (p. 1) and "in fact, the implementation of the CCSS hinges on the success of professional development" (Marrongelle et al., 2013,

p. 203). Schwartz (2015) stated PD was imperative "to make sense of the complexity of teaching and to progress with teacher questioning in relation to content and student thinking" (p. 45).

PD served as the tool administrators and decision-makers turned to when faced with new reforms, policy, and curricular implementations, yet "hard data on which professional development models lead to better teaching are difficult to come by" (Editorial Projects in Education Research Center, 2011, para. 17). School administrators and decision-makers used personal conclusion, and not research-based results, to select and employ the types and models of PD presented to their faculty. Limited research placed schools in the position to make determinations on PD, based on best judgment and not on effective evidence (Gersten, Taylor, Keys, Rolfhus & Newman-Gonchar, 2014).

"The primary criticism of professional development is that it is insufficient to meet the learning challenges that schools face" (Sappington, Pacha, Baker, & Gardner, 2012, p. 3). "Further research needs to explore alternative models of PD that are contextually relevant and sustainable and focus on improved teaching while not neglecting outcomes for students that occur as a result of teacher change" (Petrie & McGee, 2012, p. 69). Hill et al., (2013) stated, "It is time to reevaluate recommendations for conducting research in the field of professional development" (p. 478). Varela (2012) noted PD that failed "to incorporate teachers' input and student data will not provide effective and productive learning experiences" (p. 20).

School improvement measures, national and local mandates, and curricular reforms identified critical thinking as an essential component. "The inclusion of critical thinking among the goals of academia has become commonplace" (Rowles, Morgan,

Burns, & Merchant, 2013, p. 21); however, "research on specific instructor-driven instructional practices that affect students' critical thinking is limited" (Shim & Walczak, 2012, p. 16). Smith and Szymanski (2013) stressed the importance of administrators having PD provided to teachers with ongoing and productive feedback about the development of higher-order questioning skills. The development of critical thinking was a noted necessity of required support and training. "No one should underestimate the difficulty of teaching students to think critically" (Willingham, 2008, p. 29). The NCISLA (n.d.) reported, "Teachers require substantive, long-term professional development about both student thinking and subject matter" (para. 4).

The identified benefit of critical thinking and higher order questions were not new to the field of education. Bloom's (1956), Romiszowski's (1981), Anderson and Krathwohl's (2001), and Marzano's (as cited in Marzano & Kendall, 2007) taxonomies all provided educators with frameworks that illustrated the importance of understanding the thinking progressions, but held "a possible weakness . . . in that they do not adequately elaborate on the manner in which one applies higher-order thinking processes" (Dwyer et al., 2014, p. 44). Giuseffi (2015) stated, "While the need for critical thinking and other 21st Century skills looms over the educational horizon, some share a dim view of what many schools are currently doing" (p. 2). Teachers faced with increased demands to provide relevant opportunities, that aid in the development of critical thinking, depend on high-quality PD. "Professional development must be frequently designed and redesigned to meet teachers' and districts' needs" (Hill et al., 2013, p. 478). Professional development intended to support complex processes, such as critical thinking required teachers to "demand high quality [professional] development

that helps mentor, nurture, and enhance their professional repertoire" (Varela, 2012, p. 17).

Included in the reasons teachers required high-quality PD was "educators' confusion and difficulty describing critical thinking" (Rowles et al., 2013, p. 23). The Editorial Projects in Education Research Center (2011) reported, "Professional development can help teachers develop the skill to design and use questions that engage students in higher-level instructional processes" (para. 3). The intricacy involved in the development of proficient and effective ways of supporting student acquisition of critical thinking skills was essential for the field of education to understand. "Past research has not yet fully addressed the impact of specific instructional methods on students' critical thinking and furthermore what has been published cannot answer why particular [methods] are more effective than others" (Shim & Walczak, 2012, p. 18). Over the last 60 years, the field of education worked to create an agreed-upon understanding of the process involved as individuals developed a command of complex and abstract concepts. Bloom (1956) wrote about the transfer and carryover of instruction the student applied to applicable situations stating, "Comprehending an abstraction will not certify that the individual will be able to apply it correctly" (p. 122). The field of education, 60 years later, found itself standing on the same threshold, unable to adequately and collectively define what worked in instruction and development with solid research and results. "The way the Common Core standards [were] written implies that they [were] designed to increase the level of cognitive learning as measured by Bloom's Taxonomy of Cognition" (Nordgren, 2015, p. 9).

Transformation of Professional Development into Student Achievement

Research identified high-quality teachers as an important and necessary component in reaching desired levels of student achievement. Bayar (2014) noted, "The impact of high-quality teachers on student learning and achievement has been debated and the benefits accepted over the last several decades by many researchers, educators, policymakers, and teachers' unions" (p. 320). The educational community agreed upon the importance of providing students access to teachers who demonstrated ability to help students attain higher levels of achievement. "Many educational researchers and practitioners [have] argued the most effective way to improve student achievement is to improve teacher quality" (Masters, Kramer, O'Dwyer, Dash, & Russell, 2012, p. 356). Local, state, and national mandates recognized the relationship between high-quality teachers and student achievement. Included in the NCLB Act of 2001 (Public Law No. 107-110) specific language identified all U.S. students who received education from "highly qualified" teachers (p. 1453).

Professional development continued to be the primary vehicle schools and districts employed to aid in the development and support of teacher skill and proficiency. "Across the United States, professional development (PD) opportunities for teachers abound and [have been] offered in a variety of formats" (Koellner & Jacobs, 2015, p. 65). The CETT (2011) stated, "School districts must ensure that the learning needs of educators are addressed through professional development that is a significant part of a teacher's work" (p. 12). Teachers and administrators continued to call upon PD as a method for improved and sustained teacher expertise throughout education and PD remained the "main method of improving in-service teacher quality" (Masters et al.,

2012, p. 372). Educators identified a "want and need [for] high-impact help to keep their skills well-honed and to maintain their personal efficacy as teachers" (Shaha & Ellsworth, 2013, p. 19). In the researcher's experience, the culture and practice of school function and improvement institutionalized and ingrained the PD experience.

Pertinent literature documented professional development, created and designed for teachers, through a variety of methods. "But always at the core of such endeavors [has been] the understanding that professional development is about teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students' growth" (Avalos, 2011, p. 10). PD was constructed, designed, and presented for the improvement and development of teacher practice that led to student achievement. Considered "one of the key mechanisms for improving student achievement" (Argentin, Pennisi, Vidoni, Abbiati, & Caputo, 2012, p. A-1), those who implemented PD should be mindful that "like any other educational intervention, it is critical that the design [be] research-based" (Masters et al., 2012, p. 357).

The increased attention and focus placed on teachers by reform efforts and mandates brought "a critical need to examine teacher professional development programs to determine their impact on teacher belief systems, teaching practices, and student learning" (Lumpe, Czerniak, Haney, & Beltyukova, 2012, p. 1). Darling-Hammond and McLaughlin (2011) called for a redesign and new methods of PD, along with the support and constructions required for longevity of support to teachers (p. 83). The researcher found an abundance of educational literature on the topic of PD, yet conclusive research on how to decisively support teachers to reach desired student achievement levels was unattained. "Despite such research, the body of literature [that has linked] professional

learning and development to gains in student performance and teacher-related outcomes arguably [has remained] inadequate" (Shaha & Ellsworth, 2013, p. 19).

Research projects showed some success in teacher PD and reflected a positive possibility for future success. Once such study completed by Opfer and Pedder (2011b) illustrated a connection between schools with high student achievement and the choice to engage teachers in professional development practices specifically designed to improve and nurture teacher competencies. "If student learning is to be improved, then one pathway for doing so is the provision of more effective professional learning activities for teachers in schools; where 'effective' activities result in positive change for teachers and their pupils" (Opfer & Pedder, 2011b, p. 3). Meister (2010) noted teachers regarded "student success, both academically and socially, as the most important part of their work" (p. 893) and challenged administrators to expand upon that knowledge and belief to develop better engagements in PD for teachers. The creation of purposeful, productive, and engaged PD remained a continuous challenge for teachers and administrators in both the understanding of how to design and how to implement. "With student learning and achievement being so greatly impacted by the quality of teaching, effective teacher development is important for any educational system to remain competitive in a global arena" (Bayar, 2014, p. 320).

Pedagogical practices in teaching associated with greater gains in student achievement demonstrated a level of transference through teacher participation in professional development. "The importance of these PD programs for improving teacher preparedness, in addition to their potential for impacting student achievement, has become accepted worldwide" (Bayar, 2014, p. 320). The amount of time invested in PD

focused on optimal teaching practices and designed to support teacher efficacy reflected greater student achievement (Lumpe et al, 2012) when aligned with invested teacher beliefs.

Research completed by Donnelly and Argyle (2011) on professional development in science and teachers' "willingness to adopt new strategies and activities . . . in their classrooms" (p. 475) illustrated the ability of PD to produce changes in classroom teaching and pedagogy. The findings reported by Donnelly and Argyle (2011) demonstrated positive adoption levels of new strategy implementation with suburban and rural schools while urban schools showed a lower rate of enactment (p. 487). The ability for professional development to lead to adoption into a teacher's repertoire was often interrelated with "specific characteristics of program design and dissemination" (Barlow, Frick, Barker, & Phelps, 2014, p. 16). However, "even though researchers offer numerous explanations for how to define an 'effective' professional development program, there is little agreement regarding what actually constitutes the key components of such [professional development]" (Bayar, 2014, p. 320). Professional development experienced great variance among researchers' results in both definition and adoption into teacher practice.

PD used to implement new curricular goals and standards, develop improved pedagogical techniques, and improve a teacher's compliment of skills and proficiencies had the intended goal of improved student achievement. Francis and Jacobsen (2013) stated, "Professional development is measured by the teachers' success in developing pedagogical competencies and perspectives, which are reflected in new visions and approaches to practice" (p. 320). Stewart (2014) reported, "Teachers gain a rich and

flexible understanding of subject matter when they grapple with it through cycles of exploration, implementation and improvement" (p. 31). "Yet few occasions and little support for such professional development exist in teachers' environments" (Darling-Hammond, & McLaughlin, 2011, p. 81). "Conventional professional development does not transform teaching" (Francis & Jacobsen, 2013, p. 320). Focus on higher student achievement and teacher ability to interpret new mandates required design and policy shifts in PD. "PD of this kind has created new images of what, when, and how teachers learn… and is moved away from top-down models with single solution implemented practices" (Darling-Hammond, & McLaughlin, 2011, p. 82). Stewart (2014) acknowledged, "Professional learning activities should be job-embedded, informed by data, centered on student work and how students learn, active, and occur over a length of time that will allow for cycles of development, implementation, and evaluation" (p. 31). Teachers demonstrated the need to have productive, supportive and engaging PD, defined by the ability to produce transformative practices in teacher pedagogy to bring about enhanced student achievement. "The success of this agenda ultimately turns on teachers' success in accomplishing the serious and difficult tasks of learning the skills and perspectives assumed by new visions of practice and unlearning the practices and beliefs about students and instruction that have dominated their professional lives to date" (Darling-Hammond, & McLaughlin, 2011, p. 81).

Researchers identified teachers with proficient pedagogical abilities who aided students in reaching higher levels of student abilities, created successful school systems. "These findings regarding the demand for better-qualified teachers compel policymakers, researchers, and educators to respond to the issue of teacher deficiencies by organizing

professional development (PD) programs" (Bayar, 2014, p. 319). "Efforts to redesign education ultimately require rethinking teachers' preparation and professional development" (Darling-Hammond, & McLaughlin, 2011, p. 83). To produce the transformations required for then-current educators to reach the desired levels proficiency, the format and design of PD required a necessary change.

Professional development had the intended purpose of providing experiences that led to improved pedagogical practices with the explicit goal of higher student achievement. O'Sullivan (2011) stated, "Teacher professional development is an issue that preoccupies the attention of those involved in education systems across the globe" (p. 112). Opfer and Pedder (2011a) reported then-current research misunderstood "the nature of teacher learning and underplayed the complexity" of how teachers acquired new skills and abilities (p. 378). Roseler and Dentzau (2013) identified, "Research indicates that learning occurs most effectively when the participants are equal partners in the learning community" (p. 621), yet "there is a lack of evidence of such teacher empowerment in the municipal consultant professional development model" (p. 621).

Summary of Literature Review

This literature review focused on themes central to creating an understanding of developed critical thought through the study and use of questioning. The review illustrated the accepted belief within the field of education that questions asked "strategically with specific goals in mind . . . lead students to deeper levels of learning" (Costa & Kallick, 2015, p. 69). "Teachers have always used questions to judge the level of a class's understanding before making a decision about whether to move on" (Wiliam, 2015, p. 41). Questioning was considered a key design variable for decades; "however,

one of the key elements of solving problems, that is, students' questioning ability, has seldom been investigated" (Pi-Hsia et al., 2014, p. 317). "There is a paucity of empirical data regarding how to most effectively use questions to teach" (Tofade et al., 2013, p. 1). Virgin (2014) stated, "Although essential questions are being widely used across content areas, a robust field of research specifically and concretely considering how exactly these questions are best employed does not exist" (p. 201).

The review also revealed the deep need for consistent professional development for teachers on the use of questioning. CETT (2011) identified, "Teachers want high-quality professional learning that is meaningfully connected to their daily work and to the students they serve" (p. 12). "These learning opportunities should be aligned to broader initiatives and goals within programs and states that allow connections from research to practice with feedback and reflection" (Stewart, 2014, p. 31). The field of education illustrated the desire to "ensure that professional learning and classroom practice are connected, which in turn strengthens student learning" (CETT, 2011, p. 13). Obenchaini et al., (2011) reported, "The development and use of essential questions involves a steep learning curve for many teachers and benefits from the opportunity to collaborate and reflect on practice" (p. 198). "Even after a full year of sustained professional development . . . with essential questions as the intended focus on teachers' unit and lesson planning, many [teachers] reported that they needed more extensive instruction on the use of essential questions" (p. 198).

The field of education established the fundamental belief, to best support teachers in development, and sustain teaching practices required a degree of professional development. "Active learning that allows for teachers to focus on specific needs within

their classroom has been found to improve teaching practices" (Stewart, 2014, p. 31). However, as stated by Mizell (2015), "School systems devote enormous resources to learning about their students' education, and its results, but they fail to examine and learn from the professional development of adults responsible for the students' education" (p. 9). Mizell (2014) further explained, "Some leaders regard professional development as a routinized component of the school system that drifts from year to year with little coherent direction, oversight, or assessment" (p. 9).

The specific practice of questioning and teacher cognizance of quality questions used to aid students' development of critical thinking require additional research (Pi-Hsia et al., 2014; Virgin, 2014). Educators relied on embedded questions, as a professional tool, for decades (Brown et al., 2014; Costa & Kallick, 2015; Davoudi & Sadeghi, 2015; Kucuktepe, 2015; Lai, 2011; Marzano & Toth, 2014; Paul & Elder, 2013b; McTighe & Wiggins, 2013; Tofade et al., 2013), yet, then-current detailed research of established elementary teacher professional development on questioning which transformed teacher practice was deficient. The *aspiration* to increase critical thought through questioning was abundantly supported in then-current literature (Obenchaini, Orr, & Davis, 2011); however, research of professional development in questioning for elementary teachers initiated a transformation on teaching practice and student questioning was under-represented in research literature (Varela, 2012; Virgin, 2014). The researcher could find no research, within the five years previous to this writing, on elementary teacher professional development on essential questions, which investigated teacher transformation and student questioning designed to increase critical thought in students.

The field of education established the belief, "questions are among the most powerful teaching tools and adopting best practices can significantly enhance the quality of instruction" (Tofade et al., 2013, p. 8); thus, essential to have research-based information to drive professional development choices (Drew & Klopper, 2013; Koellner & Jacobs, 2015; Mizell, 2014; Stewart, 2014). Stewart (2014) reported, "Appropriate conditions and characteristics of PD augment the potential for depth of understanding that leads to change in teaching practice" (p. 28). The research in this study contributed to available literature on elementary-teacher professional development of Essential Questioning and teacher transformation of practice, with investigation of student questioning. The researcher provides the methodology used for the research of this study in Chapter Three, reports the results in Chapter Four, and provides a summary of findings and opportunity for further research in Chapter Five.

Chapter Three: Methodology

Overview

The research design for this study was initiated when a 2014 review of Metanoeo School Improvement Goals, set in 2011, revealed school improvement efforts over three years had not produced observable teacher pedagogy and practice in critical thinking, with measured student assessment results in reading, math and questioning. School Improvement Goals, set in 2011, included: "The students' learning will be enhanced and deepened as a result of coordinated school-wide professional development for teachers" (Metanoeo School- SIP, 2011, p. 96) and "The students will acquire meaningful and lasting understanding, knowledge and skill, and the ability to regulate their own learning" (Metanoeo School- SIP, 2011, p. 97). The principal of Metanoeo School created the goals specifically to increase teacher pedagogy and practice, and student engagement in activities to enrich and develop student success in critical thinking. However, a review of the goals by this researcher in 2014 found no observable pedagogics of teachers that reflected specifically crafted practices in the use of questioning to enhance critical thinking, and student achievement scores on the ITBS (University of Iowa, 2012) did not reflect measured improvement.

The lack of transference from previous professional development efforts led by the principal of Metanoeo School, prompted this researcher to propose a revised school-wide professional development plan in Essential Questions (McTighe & Wiggins, 2013) to support the development of critical thinking. The researcher perceived necessity to create specific measures to identify what professional development practices produced possible transformative changes in teacher practice related to student achievement. Upon

review of then-current literature on elementary-level teacher development in the use of Essential Questions with, a focus on teacher pedagogical transformation and student questioning, the researcher identified a substantial gap. The need for improved pedagogical practices in critical thinking through effective use of questioning and the identified gap in literature prompted this study.

The purpose of this study was to investigate the possible pedagogical transformations elementary teachers experienced as they participated in a systematic professional development training in the use of Essential Questions (McTighe & Wiggins, 2013) and student learning; specifically student questioning, reading, and math achievement. The researcher designed an action-research case study with both qualitative and quantitative measures. The structure of the study included an implemented professional development for the teachers at the research school, during one school year, based on Essential Questioning (McTighe & Wiggins, 2013) with an enhanced digital lesson planner (Appendix D) and on-line web forum, each designed by the researcher to support the components of professional development and collect data during the research period. The study also included a qualitative survey of the participants, interview, observation, lesson plans, and discussion boards, as well as quantitative measures of participants' MQS. Student secondary data included pre and post-questions gathered from MQS (Himsl & Millar, 1993) (Appendix A) and student achievement in STAR Math and STAR Reading in grades two through eight.

Statement of the Problem

At the time of this writing, the void of literature on successful transformation of teacher pedagogy and practice in student questioning left many schools, like the research

school in question, isolated from critical information necessary for transformative professional development practices. Administrators identified professional development as the primary vehicle to bring then-current and relevant practice to their faculty and require research-based evidence to support professional development choices (Drew & Klopper, 2013; Koellner & Jacobs, 2015; Mizell, 2014; Stewart, 2014).

The purpose of this study was to investigate the possibility of teacher pedagogic transformation after professional development in Essential Questions (McTighe & Wiggins, 2013). The research design allowed the researcher to follow professional development, focused from initiation to possible transformation of pedagogy, with an auxiliary investigation into student math, reading, and questioning assessments. The study also allowed the researcher to investigate which tools and methods were supportive in triggering adoption of presented professional development in Essential Questions.

Research Questions and Hypotheses

Two research questions provided the structure for this research. The first question, How do teachers perceive their participation in professional development on the use of Essential Questions and pedagogical practices?; gathered teacher insights through a qualitative survey, interview and on-line discussion forum. The second research question, How do teachers design and deliver lessons after professional development on Essential Questions?; gathered information through observation, interview, on-line discussion forum and lesson plans.

The supporting hypotheses for this action research, case study included:

Null hypothesis 1. There is no difference in teacher pre-to-post-scores on the teacher Measure of Questioning Skills inventory.

Null hypothesis 2. There is no difference in student pre-to-post-STAR Math Scores.

Null hypothesis 3. There is no difference in student pre-to-post-STAR Reading Scores.

Null hypothesis 4. There is no difference in student pre-to-post-scores on the student Measure of Questioning skills inventory.

Appropriateness of the Research Design

The theoretical framework for this study originated from established principles of action research and case study, with mixed methods of qualitative and quantitative data collection. To encapsulate the journey of information from professional development meetings, sessions, and workshops to possible transformation into teachers' individual pedagogy included a subsequent review of student math, reading, and questioning assessments, and further required specific research designs. The inherent unpredictability of an individual teacher's engagement with task or information given during professional development and how or when teachers might possibly begin to transform the information into pedagogical practices required consistent levels of flexibility in data gathering.

Action research and case study provided the most authentic research methods to document and react to the ongoing professional development process. The presented professional development of Essential Questioning (McTighe & Wiggins, 2013) had an intended purpose to improve a specific need in Metanoeo School. Stated by Dick and Greenwood (2015), action research carried a two-fold obligation to both participation in learning and understanding new concepts and to the action of applying the learned

knowledge to benefit the particular situation. Action research and case study provided an ideal study of teacher behavior and origination of transformation. This research design allowed action, interaction, and reaction toward a set goal of school improvement.

The use of qualitative and quantitative data provided balanced exploration and record of data. Qualitative measures included a teacher questionnaire (Appendix F), interview (Appendix G), and observation (Appendix H) and provided the researcher insight into the intangible tapestry of individual teachers' experiences and thoughts. The use of quantitative measures included student secondary data of STAR Math, STAR Reading (Appendix B), and the MQS (Appendix A).

Research Design

Fraenkel et al. (2012) described the focus of action researchers as "getting information that will enable them to change conditions in a particular situation in which they are personally involved" (p. 15). Participants included 24 teachers of grades kindergarten through eight and represented a convenience sample. Teachers participated in professional development sessions for one school year and completed pre and post-survey items of questionnaire, interview, and measures of participants' questioning skills on the MQS. Secondary teacher data included lesson plans, observation, and web forum discussion boards. Newby (2013) stated, "convenience sampling is useful in a preliminary study of an issue, to identify what may be the key features to investigate in more detail or to test out the effectiveness of the survey procedure and survey instruments" (p. 253). In addition, "action research problems almost always focus on only a particular group of individuals . . . and hence the sample and population are identical" (Fraenkel et al., 2012, p. 595). A research assistant maintained teacher

anonymity. Student secondary data included pre and post-assessment scores of STAR Math and STAR Reading, and pre and post-MQS (Appendix A).

Following IRB approval the researcher attended the Professional Development Institute, "Essential Questions: Opening Doorways to Student Understanding," sponsored by the Association for Supervision and Curriculum Development (ASCD) on April 14, 2015, then designed professional development on Essential Questions for the school year 2015 – 2016. Included in the design was an enhanced digital lesson planner (Appendix D) to support the components of Essential Questions for all teachers to utilize and an on-line resource page (see Appendix E) for teachers to use that included on-line discussion forums (see Appendix E).

Teachers received an e-mail invitation to participate in the study's questionnaire and interview portions, along with corresponding consent forms. The school resource teacher, who acted as the research assistant, received all teacher responses and assigned a code (i.e. T1, T2 etc.) to participants. The resource teacher collected consent forms and kept them in a secure location until after the completion of the study. Participant names and assigned codes remained in a locked location unknown to the researcher.

Research Site and Participants

The research site was a private, parochial school located in a Midwest community. Population of the Midwest community reported an estimated 385,590 individuals (U.S. Census Bureau, 2016, para.8). Demographics of the Midwest community included a racial mix of White 87.9%, Black or African 4.7%, Hispanic or Latino 3.1%, Asian 2.5%, and two or more races 1.8%, (U.S. Census Bureau, 2016, para. 3). The research school had a history within the Midwest community extending beyond

123 years (St. Charles Borromeo Parish, 2016, para. 8). A convenience sample of 24 teachers participated in this study. Demographics of the teacher participants included 100% White, 22 female, and two male. Teaching experience of the participants included seven teachers with six to ten years of teaching experience and 17 teachers had over 10 years of teaching experience. The researched school received national recognition as a Blue Ribbon School.

Instrumentation

The research in this study utilized the following instrumentation to collect data:

Digital lesson planner. A digital lesson planner (Appendix D) was created in Microsoft Excel by the researcher, inclusive of the school's curricular goals for each grade level, weekly schedules, and links to support sites for creation of Essential Questions (McTighe & Wiggins, 2013). The digital lesson planner included links to the professional development discussion boards (Appendix E) and space to list the Essential Questions used for instructional purposes. For the purpose of this research, the lesson planner was available to all teachers.

Interview. Interview questions reflected a specific design to support the research questions of the study. The research assistant asked participants interview questions to retain participant anonymity. Conversations were recorded using speech-to-text software and allowed the researcher to have the text of the interview without the knowledge of identity of the participant.

Observation. Observations were a component of the professional development experience and occurred with all teachers who participated in the professional development experience. Secondary data included observation tracking sheets,

developed by the researcher and to minimize observation bias, as noted by Fraenkel et al. (2012, p. 448). The school's resource teacher completed two classroom observations per teacher, along with the researcher.

On-line web forum with discussion boards. The researcher created a Web Forum, through Google Apps, on a secure site; accessible only to participants. The web forum held resources for the teacher participants, as well as an on-going discussion board to support reflection of covered material in professional development sessions. The web forum and discussion boards were available to the teachers throughout the entire year (Appendix E).

Questionnaire. The researcher created a questionnaire in Google Apps, sent to participants with crafted queries directly related to the research questions. All teacher participants received the questionnaire through an e-mail link, with directions on how to click on the hyperlink and complete using only their participant identifier, assigned to them by the resource teacher. The researcher collected responses through Google Apps without collecting the identity of the participant. The questionnaire utilized in the research provided pre and post-data collection (See Appendix F).

Quantitative Instrumentation.

Measure of Questioning Skills. Authored by Himsl and Millar, (1993), this measure was described to "assist teachers in determining the "quantity" and "quality" of students' questions and to encourage students to understand and learn the value of questioning in their school and life experiences" (Scholastic Testing Service, 2014, para. 1). This assessment "contains forms A & B each consisting of four pictures depicting various situations that elicit questions. In a specified time, an individual records as many

questions as possible that relate to ambiguous pictures" (para. 2). The test was designed for "all ages" (MQS, 1993, p. 14) and was purchased by the researcher from Scholastic Testing Service. For the purposes of this research, the MQS provided pre and post-test data by utilizing form A (pre) and form B (post) to show possible growth in kindergarten through eighth grade students' and kindergarten through eighth grade teachers' questioning skills (see Appendix A).

STAR Math. An assessment tool developed by Renaissance Learning (2010a, 2010b, 2013, 2015) to assess students' skill and level in mathematical development. STAR Math assessed a student's "inter-related prerequisite skills needed to further conceptual understanding and provide resources to help students achieve mastery" (Renaissance Learning, 2015, para. 5). The delivery of STAR Math was through a cloud-based log-in specific to each student. STAR Math "identifies students' instructional math levels and compares their math achievement to that of students across the nation. The test provides norm-referenced and criterion referenced scores for students" (Renaissance Learning, 2010a, p. 3). For the purposes of this research, student scores in grades two through eight generated from two assessment periods during the year provided secondary data (Appendix B).

STAR Reading. An assessment tool developed by Renaissance Learning (2010a, 2010b, 2013, 2015) to assess students' reading comprehension. The delivery of STAR Reading was through a cloud-based log-in, specific to each student. The STAR Reading test consisted of "multiple-choice items . . . based on the student's estimated ability level. If the student answers the item correctly, the software [increases] the difficulty level of the next item [to provide] an accurate assessment of ability" (Renaissance Learning,

2010b, p. 4). For the purpose of this research student scores in grades two through eight generated from the two assessment periods during the year provided secondary data (Appendix B).

Sampling Procedure

The teacher participants in this research study represented a convenience sample. Bluman (2013) described a convenience sample as the use of subjects convenient to the researcher. Maxwell (2013) wrote, "There are situations in which convenience sampling is the only feasible way to proceed" (p. 97) to study situations comprised of a limited population. As this research was also an action research study with a specific identified improvement for the research school with 24 employed teachers, the use of a convenience sample was necessary. A systematic sampling scores of the 251 enrolled students generated secondary data. A sample size of scores from 152 students provided a 95% confidence level with a 5% margin of error.

Procedure

This research in this study is fully compliant with the regulations and mandates of the University Institutional Review Board and the U.S. Department of Health and Human Services (2009). The researcher completed the web-based training course, Protecting Human Research Participants, from The National Institute of Health (NIH). The study was of minimal risk to participants' health and well-being, and the possibility of risk or harm was no greater than the routine functions participants normally experienced in daily life. Prior to the commencement of research, the researcher received letters of approval from the superintendent (Appendix I) and principal of the research school (Appendix J).

The researcher designed professional development to extend throughout the school year, during monthly staff meetings. Sessions included a review of the last month's reading and discussion boards (Appendix E), a presentation of new material, collaborative time to discuss and practice new concepts, discussion of how implementation of new concepts in practice were going, and assignment of new material to read or implement. Sessions included full staff participation, and leveled-staff breakout sessions. Sessions additionally utilized online platforms, such as Padlet to collect anonymous input for ongoing questions and discussions. Padlet allowed the teachers to have ongoing discussions about issues with implementation, without identifying self within the community of teachers. The books, *Essential Questions* (McTighe & Wiggins, 2013) and *The Miniature Guide to Critical Thinking: Concepts & Tools* (Paul & Elder, 2014c), were required reading for the teachers. An online web forum of resources provided discussion boards (Appendix E) for teachers to respond to required readings discussion. Additionally, the researcher created a digital lesson planner (Appendix D) for teachers to utilize, that included links to resources, web forum, and discussion boards (Appendix E).

August 2015.

- In early August 2015, teachers received an introduction to the professional development topic, Essential Questions, and the study; both presented by the researcher. The teacher introduction also included the online professional development support site, created by the researcher in Google Apps (Appendix E), with a discussion board. The discussion board recorded data from August 2015 to May 2016. Teachers received an e-mail invitation to participate in the

study's questionnaire and interview portions, along with corresponding consent forms (Appendix K). Responses were received by the school resource teacher, who assigned a code (i.e. T1, T2 etc.) to participants. The resource teacher collected consent forms and kept collected forms in a secure location. Participant names and assigned codes remained in a locked location unknown to the researcher. Participants completed the survey and interview process identified only by their assigned codes.

- In late August 2015, kindergarten through eighth grade teachers participated in the MQS (Appendix A) during the first professional development session, using assigned identifiers for the purpose of anonymity. Data collected served as pre-data.
- In late August students participated in the MQS (Appendix A) in their homeroom. Data collected served as pre-data. Student consent forms were collected by homeroom teachers and given to the research assistant to place in a secure location (see Appendix L). Homeroom teachers planned alternative activities for students who did not return signed consent forms.
- In late August, students in grades two through eight participated in the computerized STAR Reading Assessment as a part of regularly scheduled school activity. Data collected through Renaissance Learning cloud-based service served as secondary pre-data.
- In late August students in grades two through eight participated in the computerized STAR Math Assessment as a part of regularly scheduled school

activity. Data collected through Renaissance Learning cloud-based service served as secondary pre-data.

- In late August teacher participants received an email pre-questionnaire (Appendix F) created in Google Apps, with an additional supporting link on the teacher professional development webpage (Appendix E). Participants completed the questionnaire using their assigned code. Data collected served as pre-data.

September 2015.

- Resource teacher began interview process using a prepared interview (see Appendix G). Interview sessions were recorded using a speech-to-text software. The research assistant removed all identifiers prior to the researcher receiving the text of the interview. Each interview session received a code assigned at the beginning of the research study.

September 2015 – May 2016.

- The research assistant and researcher observed teachers during classroom instruction; five bi-monthly times during the school year. To minimize observer bias, as noted by Fraenkel et al. (2012, p. 448), the research assistant completed two observations per teacher, along with the researcher. The researcher had no evaluative function towards teacher participants.

May 2016.

- All teacher participants received by email a post-questionnaire (Appendix F) created in Google Apps, with an additional supporting link on the teacher professional development webpage. Participants completed the survey and questionnaire using an assigned code. Data collected served as post-data.

- The research assistant conducted teacher participant recorded interviews using a prepared interview (see Appendix G) and speech to text software. The researcher assistant scrubbed all data of identifiers prior to the researcher receiving the text of the interview. The interview session was identified by the code assigned at the beginning of the research study. Data gathered served as post-data.
- The researcher facilitated MQS (Appendix A) given to kindergarten through eighth grade teachers during the last professional development session. Data collected served as post-data.
- MQS (Appendix A) given to students in grades kindergarten through eight by their homeroom teachers. Data collected served as post-data. Consent forms were collected by homeroom teachers, given to research assistant, and placed in a secure location.
- The computer teacher facilitated the STAR Reading and STAR Math assessment grades two through eight, as a part of regularly scheduled school activity. Data collected through Renaissance Learning cloud-based service, served as secondary post-data.

Ethical Considerations

The procedure for the protection of human participants included the use of several measures to provide participant anonymity, voluntary participation, and protection from physical and mental harm. The researcher provided a complete overview of the approval process and participant participation to all possible participants, including approval of the university, research school superintendent, and research school principal. Following the overview, participants received an e-mail invitation to participate in the research, which

included a complete description of participation, along with a corresponding consent form that included contact information to the researcher's Committee Chair, University IRB, and University Academic Affairs office. Participation was completely voluntary. The resource teacher collected the consent forms and kept them in a secure location unknown to the researcher. Responses were received by the school resource teacher, who acted as the research assistant and assigned a code (i.e. T1, T2 etc.) to participants. Participant names and assigned codes remained in a locked location unknown to the researcher. Research tools; interview and questionnaire avoided the use of any profane, offensive, or discriminatory language, tone, or insinuation. Research data collected remained private and discrete. The researcher made effort to operate at the utmost levels of impartiality.

Internal and External Validity

Possible erosion to the internal validity of this research included risk of bias from the researcher "because the data collector is well aware of the intent of the study" (Fraenkel et al., 2012, p. 595). Internal validity threats also included the possibility of participants answering questionnaire or interview questions in a manner to please the researcher or in participants inflated documentation of Essential Questions in lesson plans. Described by Maxwell (2013) as "the influence of the researcher on the setting or individuals studied, generally known as reactivity" (p. 124).

External validity threats included the nature of a single research site and highly individualized professional development. Stated by Fraenkel et al. (2012), "Action research studies are weak when it comes to external validity," due to the individualized nature of the study. However, there are methods "essential to the process of ruling out

validity threats and increasing credibility" (Maxwell, 2013, p. 125) of the researcher's conclusions.

The researcher took these considerations into the creation of the study. To avoid what Maxwell (2013) described as "boilerplate language that has been borrowed from methods books or successful proposals, without any demonstration that the author has thought through how these strategies will actually be applied in the study" (p. 123), the researcher recognized each threat to validity and identified measures designed to protect against deterioration to the intent of the study. The researcher's use of a research assistant, anonymous data collection tools, and participant identifiers minimized identified threats. The use of observation, documentation, and quantitative data collection further minimized a threat to validity.

Data Analysis

The researcher maintained an ongoing narrative of the research process in a journal to aid in reflective practices and memory recall of the research study. The researcher "began data analysis immediately" after acquiring any data from research tools by reading over the transcript and notes of interviews, observations, and gathered data from created documents (Maxwell, 2013, p. 104). Fraenkel et al. (2012) recognized the importance of examining collected data as they related to the proposed research questions. The researcher followed this process throughout the study.

The researcher examined questionnaire, interview, discussion boards, and observational data by identifying "units or segments of data that seemed important or meaningful in some way" (Maxwell, 2013, p. 107). The identified meaningful units and segments of data were coded and themed through content analysis and provided the

researcher with a means of organizing the data, as they related to the research questions. Fraenkel et al. (2012) described the process as "becoming familiar with the descriptive information collected and allow[ing] the categories to emerge" (p. 480). Maxwell (2013) indicated this process provided "clear direction for further work on the original" line of inquiry (p. 595). The researcher utilized a multifaceted collection of data that provided applicable evidence, which included questionnaire, interview, observation, and quantifiable data from the MQS and STAR Math and Reading data, and avoided "collecting merely anecdotal data, that is, just the opinions of people" (Fraenkel et al., 2012, p. 594). This robust collection of data provided the researcher with deeper insight and broader reflected perspectives from participants.

The researcher used a created observation sheet (see Appendix H) to collect both anticipated observations and observational narratives that were themed and coded. Interview sessions were taped and transcribed, and used pre-designed questions to initiate conversations. Transcribed conversations were then themed and coded. Questionnaires included pre and post-questions with multiole-choice answers and open-ended questions, to provide wider individual input from participants. Discussion boards were open-ended. The researcher identified emerging themes from gathered data and created a general focus for the investigation, as they related to the research questions.

Summary

This study investigated the possible pedagogical transformations elementary teachers experienced during a systematic professional development training in the use of Essential Questions (McTighe & Wiggins, 2013) and student learning; specifically student questioning, reading, and math achievement. The researcher conducted the

investigation through an action-research case study that included qualitative and quantitative measures. The construction of the study included professional development for the teachers at the research school during one school year, based on Essential Questioning (McTighe & Wiggins, 2013), and included an enhanced digital lesson planner (Appendix D) and on-line web forum, each designed by the researcher to support the components of professional development and collect data during the research period. The study also included a teacher pre and post-questionnaire (Appendix F), teacher interview (Appendix G), and teacher observation (Appendix H). Student data included pre and post-questions gathered from the MQS (Himsl & Millar, 1993) (Appendix A) and student achievement data in STAR Math and STAR Reading in grades two through eight. The researcher provides the analysis and results of the study in Chapter Four and completed Chapter Five to illustrate the significance of the findings and opportunity for further research.

Chapter Four: Results

The research in this study investigated two core focal points: the transformational practices resulting from professional development in Essential Questions (McTighe & Wiggins, 2013), and if the implemented transformational practices led to a possible difference in student questioning skills in grades two through eight on the MQS, student achievement in STAR Math and STAR Reading in grades two through eight. Participants included 24 certified teachers of grades kindergarten through eight with signed consent forms. A systematic sampling of the 251 enrolled students, which maintained a 95% confidence level with a 5% margin of error, and utilized a sample size of 152 students, generated secondary data for this research.

The researcher generated evidence for this research through several measures to provide a robust data set. Qualitative data measures included pre and post questionnaire, interview, observation, lesson plans and discussion boards, as well as, quantitative measures of participants with the MQS. Secondary quantitative measures of a systematic sampling of students included student MQS, STAR Math and STAR Reading assessments of 152 students in grades two through eight.

Research Questions and Hypotheses

During the research year, the researcher led teachers in professional development in the use of Essential Questions (EQ). The researcher attended the Professional Development Institute "Essential Questions: Opening Doorways to Student Understanding" sponsored by the ASCD led by Grant Wiggins on April 14, 2015 (see Appendix C). The researcher designed professional development to aid teachers in the development and use of EQ with readings from *Essential Questions: Opening Doors to*

Student Understanding (McTighe & Wiggins, 2013) and *The Miniature Guide to Critical Thinking: Concepts & Tools* (Paul & Elder, 2014c). Professional development sessions occurred once a month during staff meetings and continued throughout the 2015 – 2016 school year. An online web forum of resources also provided discussion boards (Appendix E) for teachers to respond to required readings and post to ongoing discussions. A digital lesson planner (Appendix D) created by the researcher provided links to resources, web forum and discussion boards (Appendix E). The researcher kept a journal during the research time period to assist with memory recall and identification of emerging themes and observations. The researcher identified two research questions for investigation.

RQ1: How do teachers perceive their participation in professional development on the use of Essential Questions and pedagogical practices?

RQ2: How do teachers design and deliver lessons after professional development on Essential Questions?

Null hypothesis 1. There is no difference in teacher pre-to-post-scores on the teacher Measure of Questioning Skills inventory.

Null hypothesis 2. There is no difference in student pre-to-post-STAR Math Scores.

Null hypothesis 3. There is no difference in student pre-to-post-STAR Reading Scores.

Null hypothesis 4. There is no difference in student pre-to-post-scores on the student Measure of Questioning skills inventory.

Qualitative Data Analysis

RQ1: How do teachers perceive their participation in professional development on the use of Essential Questions and pedagogical practices?

The researcher selected the following research tools to answer RQ1: pre and post-questionnaire, participant interviews, and online discussion boards. Pre and post-questionnaires had a participation rate of 24 of 24 (100%), participant interviews had a participation level of 16 of 24 (67%), and online discussion boards had a participation level of 24 of 24 (100%). The researcher examined questionnaire, interview, and discussion board data through content analysis by identifying data with consistent themes, as a means of organizing the information, as it related to RQ1.

The researcher identified three predominant themes from data collected specifically through questionnaire, interview, and online discussion board as related to answering RQ1, which included that 22 of 24 (92%) teachers reflected a positive perception toward Essential Questions (EQ) and toward learning and developing pedagogical practice in use of EQ. Additionally, 22 of 24 (92%) teachers reflected positive belief in the value of PD in EQ.

Teacher 19. 'I think that the professional development was "time well spent." After we read and did some examples, I applied the ideas in my classroom.'

Teacher 22. 'It was time well spent because if nothing else, it brought an awareness of the type of questions we are asking our children and the type of thinking we are expecting from them. I truly believe that teaching our children to think at an early age will produce lifelong thinkers and problem solvers.'

Teacher 3. 'I believe that some of my ideas for planning lessons and what I wanted the students to understand within their learning changed as I used EQ. It definitely takes practice in writing and using with the students.'

Teacher 23. 'Along with the objective of what I want my students to learn, I use the EQ as my focus toward that objective in my lesson plans, cooperative learning activities, and assessment.'

Teacher 7. 'Essential Questions increase student inquiry due to the fact that students will not be able to come up with a black/white answer. They must gather further information to make a well thought out response that supports their view. Each student questions others perspectives which continues the discussion and, at times, causes thinking to change.'

Questionnaire. Teacher participants received a pre and post-questionnaire during the research year (see Appendix F). Review of the questionnaire revealed 24 (100%) of teacher participants responded to the questionnaire. The questionnaire contained 14 short-answer questions. Respondents indicated a pre-self score skill level of EQ as 4 of 24 (17%) as uncertain, 11 of 24 (46%) as undeveloped, 3 of 24 (13%) as modest, 3 of 24 (13%) as average, and 2 of 24 (8%) as above average. Post-self scored skill levels of EQ indicated 1 of 24 (4%) as uncertain, 0 of 24 (0%) as undeveloped, 12 of 24 (50%) as modest, 7 of 24 (29%) as average, and 2 of 24 (8%) as above average (see Figure 1).

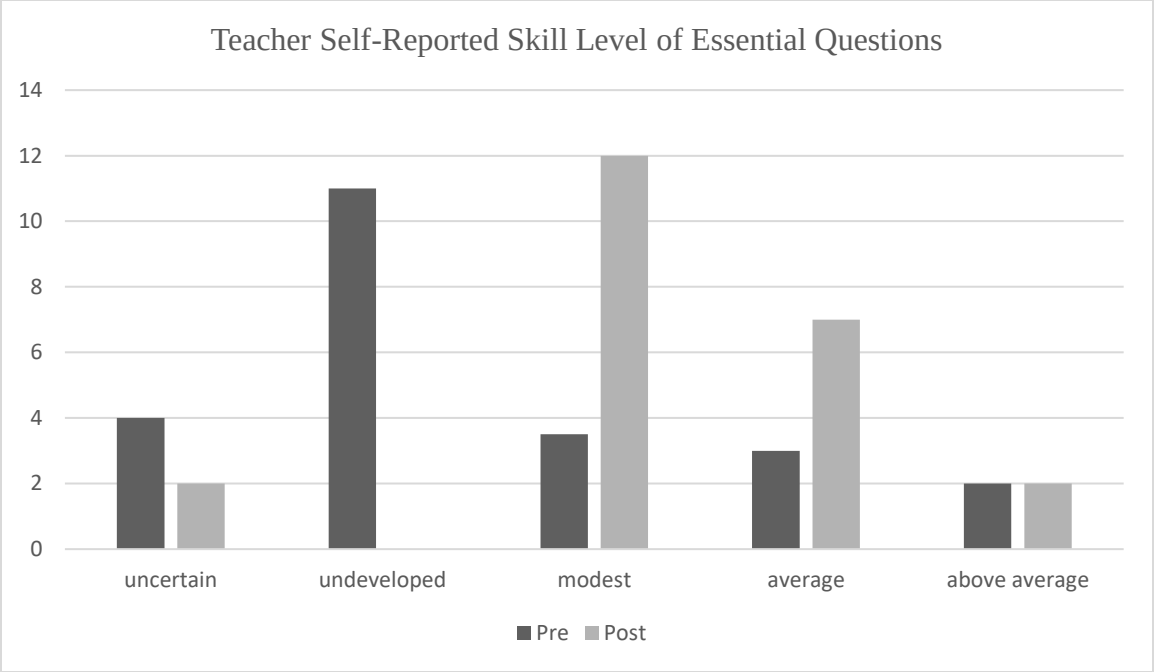

Figure 1. Teacher self-reported Skill Level of Essential Questions - Pre and post-professional development: 2015–2016.

Teacher participants considered if professional development on EQ was time well spent. A majority, 22 of 24 (94%) teacher participants, reported professional development on EQ was time well spent and perceived EQ would increase student inquiry, while two out of 24 (8%), participants did not indicate professional development on EQ was time well spent.

Teacher 20. 'Honestly, I would rather be learning about how to use technology in the classroom or reading/writing/math techniques. It is important to ask essential questions, but I think our time could be better spent with practical strategies.'

The questionnaire asked participants if educators' interest level in professional development training was influenced or not influenced by how important the participants perceived the topic, and 23 of the 24 (96%) of participants responded the participants' interest level was influenced by the perception of topic importance. One participant did

not perceive that the importance of the topic influenced his/her interest level in professional development.

Teacher 4. 'I am more influenced if the topic interests or excites me, and if I think I can adapt it to my area.'

Teacher 14. 'I found our PD about EQs quite helpful this year. I enjoy staying up to date and are always searching for ways to prepare my student for this high tech century.'

Teacher 13. 'Definitely influenced by how important I believe the topic to be.'

Teacher 16. 'Of course, it is. For most people, how important or interesting a topic is influences or motivates them to put more effort into it. People of all ages will be more committed depending on the value they see in something.'

When asked about anticipated changes to assessment practices directly related to EQ, 21 of 24 (88%) participants indicated assessment practices would change due to EQ. Three of 24 (13%) participants did not perceive a change in assessment practices.

Teacher 2. 'Yes, I am looking at more of a self-identifying "what I learned" approach instead of students scoring their work numerically.'

Teacher 7. 'Yes. I want to use more self-directed assessments and find a way to bring in EQ to our assessment practices as a level.'

Teacher 13. 'Yes, I would like to increase the amount of projects that we do next year as opposed to having more written tests.'

Teacher 16. 'Yes, I think more E.Q. should be used on assessments than True/False, multiple choice, or short answer questions.'

Interview. Sixteen of 24 (67%) teachers signed a consent form and participated in an interview conducted by the research assistant, provided for participant anonymity. Each participant reflected on instructional practices and responded to six questions (see Appendix G). The research assistant recorded each interview session and used speech-to-text software to provide the text of the interview to the researcher. The researcher read the transcribed interview sessions and made note of consistent themes. Analysis revealed two consistent themes: how teachers used questions in instructional techniques and participant desire to be able to pick PD experiences. The first theme, how questions related to instructional techniques, noted within the participant responses, prevailed in 12 of the 16 (75%) of interview participant transcripts. The researcher did not directly ask teachers how they used questions or how important they valued questions; however, participant responses to the interview questions (see Appendix G) reflected a consistent description of the value and use of questions in teacher pedagogy and student learning.

Teacher 1. 'Intellectual curiosity is encouraged in students in many ways. Allowing students to ask questions and explore different perspectives instead of stifling students' questions because they erode class time is one way to encourage thinking. Another way is to ask students what they are interested in learning and let them lead more in class discussions. Students will be motivated more when they feel they have a vested interest in their academics.'

Teacher 2. 'When we do guided reading or are discussing a certain topic, if students have questions that they want further information on we look them up and discuss what we have found or I have a "researcher" that goes home and looks for the added information.'

Teacher 3. 'To review a technique, instead of doing a demo I ask a student to demo. Then I ask students, "now what should he do?" Usually more than one way to do it. "Why do we do this first?" I find this helps them think through the process rather than mindlessly going through the steps.'

Teacher 12. 'I would say that my style of teaching is to ask questions and have the students explore ideas. Also, when they ask me a question, instead of me just telling them the answer, I have the student or class problem solve it together. If the students are actually involved in their learning and trying to figure out their own understanding then I believe they will remember more.'

Teacher 15. 'My style of teaching is student centered. I try to have the students do the inquiry before we begin something new. I give them a challenge to see if they can meet it, like multiplying by double digits. Then I let them experiment and we compare answers to see who was closest to the correct answer. They love trying it on their own, before I explain it. I also do pre-testing with them and of course, post testing. They love to see how much they have improved.'

Interview sessions also triggered teachers discussing the importance of professional development and the ability to follow personal interest. Teachers identified a consistent value to being able to personally pick the PD in which they participated.

Teacher 6. 'When I learned about Cooperative Learning - I was thoroughly trained through many workshops that required application and evaluation from teachers - so we were held accountable to practice the tool. It was an extensive and well-invested use of training, application, and evaluation that added so much more to my teaching style and student learning as they practiced cooperative learning within their groups and

worked together. CL works most of the time - of course you'll always have some groups to troubleshoot issues, but overall it is one of the most important tools I use in my instruction which I have discovered has become an important foundation to build upon for other strategies in teaching and learning: EQ, Flexibly Grouping, and STEM/ STEAM/STREAM.'

Teacher 7. 'When I attended the state workshop and learned many new activities by attending the workshops. I was able to choose many sessions I was interested in.'

Online Discussion Boards. The researcher used content analysis with online discussion board data. Discussion boards allowed teachers open-ended reflection and comment on the required reading and classroom experience. Teacher participants' online discussion board posts reflected positive teacher perception on participation in professional development on Essential Questions in 22 of the 24 (92%) participant discussion board posts.

Teacher 3. 'I found the rules for EQ helpful, as well as the phases for implementing them. The response techniques or strategies gave me some good ideas to use with my students who expect and wait for the teacher to provide the answers. They are often hesitant to take risks and these strategies may help them gradually engage more in their learning.'

Teacher 24. 'The biggest takeaway was that considering another point of view is an open-minded way to help clarify and expand thinking and understanding. If a comment/question is challenged, it means the idea is being tested--it's not a personal attack. This is an important lesson for students.'

Teacher 18. 'I appreciated the possible EQs for the performing and creative arts. I especially liked the role of questioning, both by the students and the teachers.'

Review of the discussion board posts related to the research question, How do teachers perceive their participation in professional development on the use of Essential Questions and pedagogical practices?; and found 22 of the 24 participants posting clear references to positive reflection on their participation in professional development on EQ. Two participants did not reflect clear positive language in their posts nor did the posts include any language reflective of the use of EQ.

Participant 5. 'That each person needs to listen actively and participate.'

Participant 20. 'I need to continue to work on interdisciplinary units.'

RQ2: How do teachers design and deliver lessons after professional development on Essential Questions?

The researcher selected the following research tools to answer RQ2: pre and post-questionnaire, participant interviews, online discussion boards, observation, and teacher lesson plans. Pre and post-questionnaires had a participation rate of 24 of 24 (100%), one pre and one post-interview had a participation level of 16 of 24 (67%), and online discussion boards had a participation rate of 24 of 24 (100%). The researcher and research assistant conducted two observations per teacher throughout the study that included 24 of 24 (100%) teachers. The researcher reviewed 24 of 24 (100%) teacher lesson plans each month, to identify EQ used and frequency of EQ used in each subject. A content analysis identified emerging themes from collected data, as they related to RQ2. Fraenkel et al. (2012) identified content analysis as placing "descriptive information into categories" and themes (p. 480). Predominant emergent themes related

to RQ2 included: teacher independence in lesson planning and dissatisfaction with current curriculum; lesson planning with students, as a central focus and implementation practice; a shift in focus from teacher centered to student centered; modifications to room design, teacher-talk time, use of bulletin board space, materials requested for purchase, alterations to curricular outlines, and changed verbiage used on tours given to prospective parents; and from lesson plans: frequency and use of EQ.

Questionnaire. Pre and post-questionnaire reflected 24 of 24 (100%) participation. The researcher read and coded each response and analyzed for emergent themes related to RQ2 and identified two themes: teacher independence in lesson planning and dissatisfaction with current curriculum.

The pre and post-questionnaire asked teachers if they used EQ in lesson planning. The pre-questionnaire reflected 14 of 24 (58%) teachers who reported they did not use EQ in lesson planning and 10 of 24 (42%) teachers who reported they did use EQ in lesson planning. The post-questionnaire reflected 2 of 24 (8%) teachers who reported no use of EQ in lesson planning and 22 of 24 (92%) teachers who reported the use of EQ in lesson planning and. The data reflected an increase of 12 (50%) in use of EQ in teacher lesson planning. The questionnaire also asked teachers if lesson planning included use of the school's curriculum or purchased texts. Pre-questionnaire responses included 2 of 24 (8%) teachers who identified using the school curriculum alone, 10 of 24 (42%) teachers who identified using purchased texts or self-chosen curriculum standards, and 12 of 24 (50%) teachers who reported use of a combination of school curriculum, purchased texts, and self-chosen standards. Post-questionnaire responses included 2 of 24 (8%) teachers who identified use of school's curriculum, 13 of 24 (54%) teachers who reported use of

purchased texts or self-chosen curriculum standards, and 9 of 24 (38%) teachers who reported combined use of school curriculum, purchased texts, and self-chosen curriculum standards. Teacher comments on this question included displeasure in the then-current school curriculum as evidenced in remarks.

Teacher 2. 'No purchased text or school curriculum. All lessons found online or created by teacher, about 75% of content is teacher -developed.'

Teacher 7. 'For my students, I have to make materials that meets their different academic needs. I do use a fantastic phonics program I got the school to purchase for me. The curriculum is not well written, so I have to take care of that on my own.'

Teacher 14. 'I start with the school curriculum, but it is so vague that I need to do a lot of work on my own to add detail and rigor. I incorporate state standards, best practices, and resources I find online so that my students have instruction aligned to other top-achieving schools.'

On the pre-questionnaire 9 of 24 teachers (38%) reported students asked application and synthesis questions during units of study. This number reflected an increase on post-questionnaire reporting. On the post-questionnaire, 17 of 24 (71%) teachers reported students asked application and synthesis questions during units of study. The questionnaire asked teachers to identify the skills or experience perceived as necessary to apply Essential Questions in lesson design and instruction. Pre-questionnaire responses included 17 of 24 (71%) teachers who responded with statements that reflected the need for coursework, practice, study, and development of knowledge with an outside credible source. Post-questionnaire responses included 3 of 24 (13%) teachers who identified the need to study with an outside credible source, 11 of 24 (46%)

teachers who identified the need for practice, and continued study with fellow teachers, and 10 of 24 (42%) teachers who made mixed comments of curricular content knowledge.

Teacher 14. 'Knowledge of the curriculum and of the student's learning and academic level-objectives needed and helpful.'

Teacher 15. 'Collaborating with my colleagues helps me figure out how to use EQs more often with my primary students.'

The review revealed 18 of the 24 (75%) teachers clearly stated their lesson planning had changed, four out of the 24 (17%) teachers were non-descript, and two out of 24 (8%) teachers clearly stated 'No' and 'Not this year, sorry.' The researcher noted teachers discussed EQ design openly during lunch, staff meetings, and committee meetings. Teachers 7, 8, 17 and 19 wanted to completely re-design the curricular structure of the grade levels to include EQ in the basic curriculum.

Teacher 8. 'So it can spiral within the curriculum and students continue to learn, think, and grow in this type of inquiry which thus makes learning valuable overall. Yes, I started looking at things more from the student point of view'

Teacher 9. 'Yes. Along with the objective of what I want my students to learn, I use the EQ as my focus toward that objective in my lesson plans, cooperative learning activities, and assessment.'

Teacher 17. 'I feel like I am more aware of the benefit of E.Q. and look for ways to bring them into my lessons. Certainly, I think they help students learn to think more deeply, consider others' points of view, and gain truer understanding.'

Interview. The resource teacher conducted all interviews. All 24 teachers received an invitation via e-mail to participate in pre and post-interviews, of which, 16 of 24 (67%) teacher participants elected to participate. Teachers received interview questions prior to the interview (see Appendix G). Teachers who participated in the interview process discussed their lesson planning and design process. The researcher reviewed the transcript of the interview, as it related to RQ2: How do teachers design and deliver lessons after professional development on Essential Questions? The researcher coded the comments by relevant wording and identified predominant themes. The researcher found two central themes in teacher comments: lesson planning with students as a central focus and wanting to know successful practices for implementation.

Teacher 9. 'EQ does open up the thinking to many students, which maybe some students would never think of on their own.'

Teacher 10. 'Students are an active participant in the lesson and the information.'

Teacher 11. 'EQs definitely make students think and ask questions as they work on a lesson or activity.'

Teacher 12. 'I find myself asking more constructed response type of questions that doesn't always lead to one correct answer, but several. I know that is not the heart of EQ of the unit. But I am more aware of the type of questions to ask my students in class as well as in assessments.'

Teacher 16. 'Students have to participate in their own learning because the teacher's job is to step back and let the students lead the class. Students cannot just fade into the background. Everyone must participate in the discussion. You cannot discuss a subject without having to think about it carefully.'

The interview also provided teachers an opportunity to sidetrack the interview and ask more questions than they answered. Many teachers asked what other teachers were doing and saying and engaged in spontaneous conversation about implementation practices. The research assistant made note of consistent teacher interest in knowing other teachers' success and experience with EQ. The research assistant said to the researcher, 'I think those interviews were more for them [teachers] than us [researcher and research assistant].'

Teacher 1. 'I would like to increase the amount of projects that we [primary level teachers] do next year as opposed to having more written tests but we are going to have to plan this as a team.'

Teacher 14. 'I see a lot of changes for next year too, but I need to know what is working for them [other teachers]. How are you keeping your students from being rude to each other or making fun of what they [other students] say?'

Discussion Boards. Discussion boards provided a forum for anonymous expression of views and focal points following each professional development session and required reading in *Essential Questions: Opening Doors to Student Understanding* (McTighe & Wiggins, 2013) (see Appendix E). All 24 (100%) teachers participated in four required discussion forums throughout the year. The researcher took the discussion board comments and placed them into an Excel spreadsheet. The researcher coded the comments for relevant wording and common themes. The Excel spreadsheet also provided the researcher a way to see the continuum of teacher responses as they progressed throughout the year. Analysis of the discussion boards revealed a shift in central focus from themes highly concentrated on the mechanics of 'how' the teacher

could ‘do’ Essential Questions to a focus primarily centered on the benefit EQ would provide to students. The shift also represented a transition from an ego perspective, what the individual teacher would experience or need to learn, to a concern for what students would experience. The shift occurred in 18 of the 24 (75%) participants’ discussion board comments.

Teacher 18 began the year by posting, ’I am focusing on when and where I can add EQs in my daily lessons. I want my students to discuss in my classroom and continue at home with their families.’ Teacher 18 ended the year by posting:

> We need to change the role of the students and teacher and work on establishing a safe, warm climate where students feel they can take risks without fear of being wrong or judged. Setting up such a climate and implementing new processes in which the students assume the main role of moderator and educator requires a total shift in traditional practices. Like anything that is drastically new, it takes time to learn. I like how the authors give us the parameters and tries to anticipate the trouble areas. Letting go of control and taking on the role of listener and questioner is a process that can take time. A new culture does not come about overnight!

Teacher 18 demonstrated a shift in focus from how they would be in control of EQs in their lessons for their students, to language that focused on how students would feel and become more involved in the process.

Teacher 7 exemplified a similar shift. Teacher 7 posted at the beginning of the year:

> To be more aware of the types of questions I am using with my students and to increase the questions that lead to deeper thought and understanding' and ended the year by posting 'I [the teacher] am trying to clarify the roles and expectations for both students and teacher. I also think that involves establishing a certain level of comfort.

Teacher 6 began the year posting, 'How can I use essential questions with my students so that they can transfer their learning and skills from inside the classroom to their daily lives?' and ended the year by posting:

> How can we make the kids feel they are the teacher and I'm the learner? Do I make them relaxed in their diving into education or do I make them nervous they won't get an answer right? How do I make them feel comfortable asking questions and not worrying about answers? It's more important to use 'essential' questions, higher level, than "factual" questions.

This recurring theme was present in 18 of the 24 (75%) participant posts. Six participants (25%) who did not reflect a transitional theme from teacher-centered to student-centered included comments of acknowledgment of the professional development session or a restatement of required reading, but did not include pervasive language reflective of change. Posts from the six participants who remained centered on the use of 'I' statements or the central focus of how the particular teacher felt were exampled in comments, such as those by Teacher 5 and Teacher 20.

Teacher 5 began the year posting, 'I want to create the correct type of age appropriate question for each curricular goal.' Teacher 5 ended the year and posted, 'I need to ask more questions that require critical thought.'

Teacher 20 began the year by posting, ‘This is a great program. It asks us, the teacher the hard questions.’ Teacher 20 ended the year and posted:

> Nothing is guaranteed to succeed. Everyone is fair game. Random calling instead of having students raise their hands to answer. This is something I need to focus on in my classroom. Inappropriate responses should be responded to in non-evaluative manners, should avoid put-downs, and shouldn't make them feel silly or stupid.

Observation. Observations conducted during the research year provided insight into teaching and learning practice within the classroom. All 24 teachers received invitation to participate in observation through e-mail. Twenty-four of 24 (100%) teachers participated in both pre and post-observation. The researcher and research assistant, in non- evaluative roles, conducted two observations per 24 teachers throughout the research year. Total number of observations totaled 48. Observations lasted 15-to-20 minutes and utilized a tracking sheet created by the researcher (see Appendix H) to record observational data. Teachers selected the lesson, day, and time of observation. The researcher collected and analyzed observational data sheets through content analysis following the last observation.

Analysis of collected data included a look at EQs presented to students, classroom interaction, and classroom communication. The tracking sheet also identified length of discussion time. The researcher identified the following themes: modifications to room design, teacher-talk time, use of bulletin board space, and materials requested for purchase.

Modifications to room design included 8 of 24 (33%) teacher participants who completely rearranged classrooms to support student discussions during the school year and devoted classroom bulletin boards to posting of EQs. Three of the 24 (13%) teachers requested new furniture to replace individual desks with round tables. Most notable was the possible observable relationship between teachers who requested new furniture and rearranged classroom environments and the level of use of EQ and vocalization during professional development. The eight participants who rearranged classrooms and three participants who requested new furniture were also highly engaged and vocal about the importance of EQ during professional development sessions. The researcher also noted these 11 teacher participants reflected a tendency to arrange and re-arrange classroom environments throughout the year. The researcher observed, with EQ adoption, a teacher's tendency to see the classroom environment as a manipulative tool, as opposed to teachers who see the classroom environment as static.

Observations of teacher-talk time in classrooms utilizing EQs decreased while talk time and participation levels for students increased. Adoption of EQ and classroom discussion varied for each individual teacher. Teachers who were highly enthusiastic adopted classroom discussions early in the year, while other teachers were more moderate in adoption. At the end of the research year, 22 of the 24 (92%) teachers had tried some level of EQ in their classroom. During classroom visits the researcher observed eleven (46%) teacher participants utilizing EQ on a consistent basis, eleven (46%) teacher participants sporadically utilizing EQ, and two (8%) teacher participants with no evidence of the use of EQ.

Teachers spoke during professional development sessions about the process of implementing EQ into classroom lessons. Teachers noted the time it took for students to develop productive discussion skills; a particular concern for many teachers who wanted consistent feedback from each other on how classroom discussions and EQs were developing in classrooms. Discussion during professional development sessions in October, November, and December were almost entirely dedicated to the mechanics of developing productive student discussion behaviors. Teachers easily shared success stories; however, hesitated about openly sharing stories on what the teachers perceived as non-productive. Teacher 7 sought out the researcher and wanted advice on EQ implementation, but did not want to openly discuss with other teachers how 'poorly' she felt the first attempt in her classroom went. The researcher also noted differences in student-talk time and classroom behavior as the research year progressed.

Lesson plans. The researcher provided teacher participants with a digital lesson planner created in Microsoft Excel (see Appendix D). The lesson planner included a tailored template for teachers to record daily lesson plans and contained hyperlinks to support sites to aid teachers in the development of EQ. Also included in the lesson planner was the school's entire set of curricular goals for the teacher participant to use as a consistent review. Teacher participants could upload the lesson planner to teacher participant Google accounts and also had the ability to convert the lesson planner to Google sheets (see Appendix D). The researcher introduced the lesson planner to teachers prior to the school year, along with introduction to the research study. Teachers responded favorably to the lesson planner, but questioned the idea of monitored lesson plans.

Teacher 1. 'Oh wow, this is wonderful!'

Teacher 5. 'Are we being watched?'

The researcher assured teachers the lesson planner was theirs to use as it best supported them in the development and use of EQ. Four teachers were already using digital lesson planners and asked if the lesson planner was mandatory. The researcher shared with all teachers; the use of the lesson planner was not mandatory.

The researcher reviewed lesson plans by several means: teachers could share uploaded lesson planners with the researcher through Google Docs; teachers could copy paper lesson plans and share them with the researcher; and teachers could send a digital copy of lesson plans to the researcher through e-mail. The researcher reviewed shared lesson plans and recorded EQ used in lesson plans and the subject in which teachers used EQ.

A review of teacher lesson plans showed five of the 24 (21%) teachers began using EQ in August of 2015, and by December 2015, 22 of the 24 (92%) teachers began using EQ in lesson plans. The review also revealed two of the 24 (8%) teachers did not utilize EQ in lesson plans. Religion and science were the first subjects where teachers began to introduce EQ, followed by language arts and social studies. Use of EQ in lesson planning included: religion 54%, science 36%, social studies 6%, and language arts 4%. Use of EQ in Math was negligible, with only two lessons represented.

Researcher Observations

The researcher observed several unanticipated notable occurrences during the research year. Tours given to prospective parents began using verbiage that included the school's use and study of EQ, and EQ became a prevalent talking point in marketing

material designed for the new preschool program. Additionally, the entire curriculum framework for the new pre-school program was constructed from three central EQs: How do I learn?; How do I take care of myself?; and How do I know I am a child of God? Curricular design alterations were also evident in kindergarten through eighth grade teachers wanting to re-write curriculum to include EQs. The research school principal also began using EQs at staff meetings by writing EQs into the agenda and posting them on the board during meetings. The research assistant commented in December 2015, 'Teachers are really on fire with this [EQ].'

The researcher also noted one particular change in teacher-student classroom interaction during the year. As teacher-talk time decreased and student-talk time increased, in varying degrees depending on the individual teacher, classroom interaction behavior began to show a specific subtle change in middle school grades six through eight. Specifically, students began to speak in class without raising their hands. The researcher observed, in middle school grades six through eight, in classrooms with a high usage of EQs teachers were receptive to spontaneous discussion and question and did not respond negatively to impulsive or unprompted verbal engagement. This receptiveness lacked outbursts or distractive behaviors. Teachers' expectation for students to demonstrate appropriate classroom behaviors remained consistent.

The researcher made notice of teacher conversations among middle school teachers, beginning in January 2016, of this specific change in teacher-student engagement.

Teacher 7. 'I love how the students are really getting involved in their own learning and taking ownership.' A similar echo occurred among other middle school teachers who utilized EQ at a high rate.

Teacher 5, who did not utilize EQ, was particularly displeased with the change and openly said, 'You [other middle school teachers] need to get a lid on these students and stop letting them think they can just blurt out in class anytime they want.'

This specific dynamic began to become a point of contention among the middle school teachers from January 2016 to March 2016. Teacher 7 requested success stories with EQ not be 'celebrated' during professional development, because it brought too much attention to the teacher for letting students talk during class time. In March 2016, the issue appeared to dissipate in intensity, as the researcher noted no further conversations.

Quantitative Data Analysis

The research study identified four null hypotheses to support or reject through quantitative data analysis. Investigation of NH1: There is no difference in teacher pre-to-post scores on the teacher Measure of Questioning Skills inventory, included pre and post-MQS data from 24 of 24 (100%) teachers. The 24 teachers represented a convenience sample of purposeful selection who represented "privileged witness to an event" (Maxwell, 2013, p. 97). The 24 teachers participated in ongoing PD of EQ designed by the researcher and provided pre and post-data generated by the MQS. The research assistant collected all signed consent forms and stored all forms in a secure location, inaccessible to the researcher

Investigation of NH2, NH3, and NH4 included analysis of pre and post-secondary student data from a systematic sampling of the 251 enrolled students, which maintained a 95% confidence level, with a 5% margin of error, and utilized a sample size of 152 students. Secondary data included STAR Math and STAR Reading assessments and MQS responses.

To investigate NH2: There is no difference in student pre-to-post-STAR Math Scores, the researcher collected student Normal Curve Equivalent (NCE) scores from pre and post-STAR Math assessments. NCE defined by Renaissance Learning (2013) "is a norm-referenced score similar to percentile rank, but based on an equal interval scale . . . useful in making comparisons between different achievements tests and for statistical computations" (p. 1). The researcher analyzed STAR Math NCE by conducting a historical review of growth from years 2012 to 2016, and through application of a dependent paired *t*-test.

The researcher investigated NH3: There is no difference in student pre-to-post-STAR Reading Scores, through a systematic sampling of the 251 enrolled students, which maintained a 95% confidence level, with a 5% margin of error, and utilized a sample size of 152 students. The researcher collected pre and post-secondary student data from STAR Reading NCE and conducted a historical review of years 2012 to 2016. The researcher also applied a dependent paired *t*-Test.

Investigation of NH4: There is no difference in student pre-to-post scores on the student Measure of Questioning skills inventory, included pre and post-secondary student data from a systematic sampling of the 251 students enrolled in Metanoeo School. The researcher reviewed student data and categorized it into three categories: Gathering

Information- Stage One, which contained factual and procedural question; Organizing Information- Stage Two, which contained purposive questions; and Extending Information- Stage Three, which contained hypothetical and speculative questions. MQS data provided "the quantity and quality of students' questions" (Scholastic Testing Services, 2014, para. 1).

Null hypothesis 1. There is no difference in teacher pre-to-post-scores on the teacher Measure of Questioning Skills inventory.

The researcher completed an analysis of 24 out of 24 (100%) teacher participant responses on the MQS assessment to detect if any statistical significance was present between pre and post-scores. The MQS comprised of four pre and four post-images. "Total working time is 20 minutes" (Himsl & Millar, 1993, p. 14) and consisted of participants viewing each image and generating questions about the image within a four minute timeframe. The researcher generated scores by reading participant responses and categorizing participant-created questions into three categories: Gathering Information- Stage One contained factual and procedural questions; Organizing Information- Stage Two contained purposive questions; and Extending Information- Stage Three contained hypothetical and speculative questions. Each stage consisted of sequentially descriptive and progressively higher levels of questions (see Figure 2).

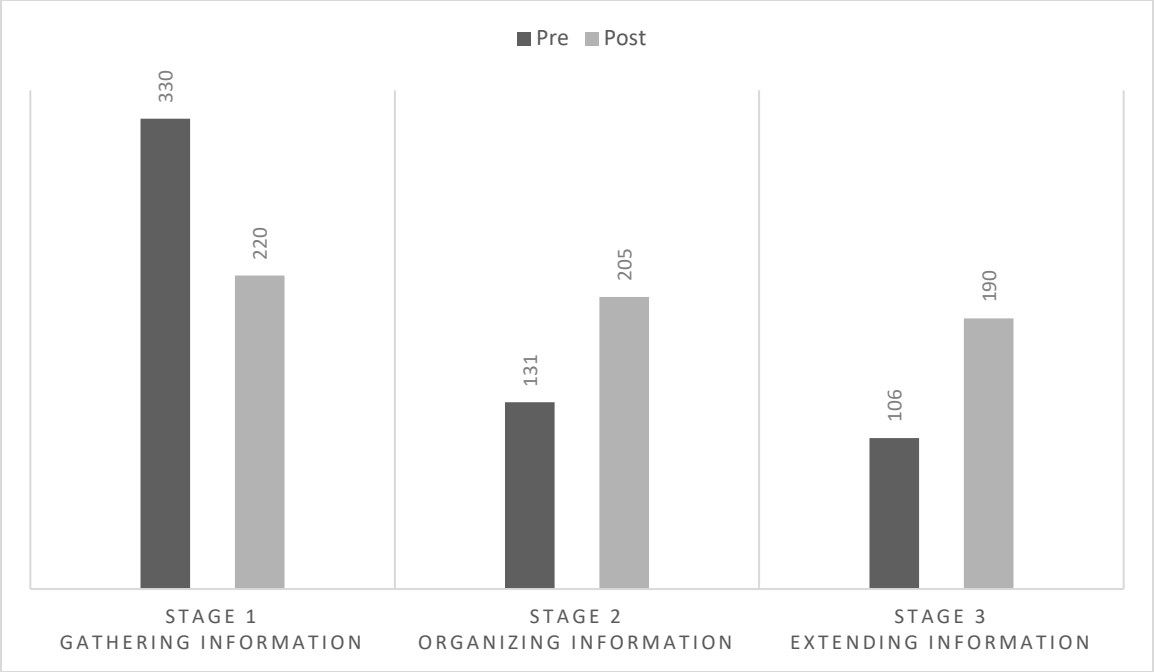

Figure 2. Measure of Questioning Skills - Teacher participant pre and post: 2015–2016.

Table 1

Measure of Questioning Skills - Teacher Participant Significance - 2015 – 2016

	M	SD	SE	a	df	Significance (2-tailed)	*t*	P-Value
MQS Stage 1	4.58	7.03	1.44	0.05	23	2.069	3.192	.004055
MQS Stage 2	-3.08	2.04	.42	0.05	23	2.069	-7.400	.00001
MQS Stage 3	-3.50	4.17	0.85	0.05	23	2.069	-4.112	.000426

A review of teacher participant MQS showed a decrease in Stage 1, Gathering Information. Stage 2, Organizing Information and Stage 3, Extending Information,

reflected an increase in post scoring. The researcher completed a paired *t*-test to identify a possible statistical significance between pre and post-scores.

The analysis revealed a significant decrease in Stage 1, Gathering Information (*t*-test value = 3.192) and a significant increase in Stage 2, Organizing Information (*t*-test value = -7.400), and Stage 3, Extending Information (*t*-test value = -4.112). Based on the analysis the researcher rejected Null Hypothesis 1 based on the statistical difference in teacher pre and post-scores on the MQS. The data supported a significant increase in MQS for Stage 2 and Stage 3.

Null hypothesis 2. There is no difference in student pre-to-post-STAR Math Scores.

Students enrolled in Metanoeo School participated in STAR Math assessments each year. The annual testing included a pre and post-schedule. For the purposes of this research, STAR Math NCE pre and post-scores, utilized as secondary data, provided evidence of a possible difference in student scores, as teachers participated in a year-long professional development in use of Essential Questions. A four-year review of STAR Math NCE pre-test scores showed minimal growth for years 2012 – 2013, 2013 – 2014 (post scores for 2013 – 2014 were unavailable), and 2014 – 2015. STAR Math NCE pre-test scores for school year 2015 – 2016 reflected a decline in pre-test scores from the previous year (see Table 2).

The researcher completed a dependent paired *t*-test on student STAR Math pre and post-scores for the school year 2015 – 2016. The dependent paired *t*-Test consisted of pre and post-mean scores of 152 students.

Table 2

STAR Math NCE Pre and Post-Scores: Four Year Review

	STAR Math Pre-Test NCE Mean	STAR Math Post-Test NCE Mean	Difference
2012 - 2013	58.779	61.335	+2.556
2013 - 2014	60.009	*	*
2014 – 2015	60.286	62.69	+2.404
2015 - 2016	58.776	63.038	+4.262

Note. Normal Curve Equivalent (NCE). As defined by Renaissance Learning (2013) "is a norm-referenced score similar to percentile rank, but based on an equal interval scale…useful in making comparisons between different achievements tests and for statistical computations" (p. 1). *= data unavailable.

As stated by Bluman (2013), sample sizes were random, dependent and normally distributed, and "only the gain or loss in values is compared" (p. 488). To support or reject the stated null hypothesis of no difference in student pre-to-post STAR Math for school year 2015 - 2016, the researcher utilized a significance level of .05 (see Table 3).

Table 3

Normal Curve Equivalent STAR Math Scores: 2015-2016

	M	SD	SE	a	df	Significance (2-tailed)	*t*
STAR Math	-4.26	10.84	.88	0.05	151	(+/-)1.976	-4.847

Note. M = mean of differences; SD = standard deviation of differences; SE = standard error; a = sensitivity of test; df = degrees of freedom; Significance = identifies critical and non-critical area; t = t value

Results indicated a significant increase from pre-to-post scores in STAR Math for school year 2015 – 2016 (*t*-test value = -4.847). To strengthen interpretation, the researcher analyzed the previous three years of STAR Math student scores. The analysis provided evidence of growth over the previous three years. The three school years before

the study research lacked significant growth with the exception of school year 2013 – 2014 in STAR Math, as the data was not available (see Table 4).

Table 4

Normal Curve Equivalent STAR Math Scores - Historical Review of Data: 2012-2016

Year	P value
STAR Math NCE 2012 - 2013	T(151) = -0.204, P = .838628
STAR Math NCE 2013 – 2014	*
STAR Math NCE 2014 - 2015	T(151) = -1.766, P = .079417
STAR Math NCE 2015 - 2016	T(151) = -4.847, P =.00001

Note. t = t statistic; (df) = degree of freedom or n-1, P = p value, * = data unavailable

A historical data review of STAR Math scores supported the statistical significance of data results for 2015-2016. Significant growth was not evident in previous years reviewed. As noted in Table 4, there was a lack of data available for review for STAR Math during the 2013 – 2014 school year, and based on the analysis of data, the researcher rejected the null hypothesis for 2015 – 2016 (t-test value = -4.847); there was a difference in pre-to-post-STAR Math scores.

Null hypothesis 3. There is no difference in student pre-to-post-STAR Reading Scores.

Students enrolled in Metanoeo School participated in STAR Reading pre and post-assessments each year. For the purpose of this research, STAR Reading NCE pre and post-scores were utilized as secondary data and provided evidence of a possible difference in student scores, as teachers participated in a year-long professional development in use of Essential Questions. A four-year review of STAR Reading results

showed a steady decrease in mean pre-testing scores for STAR Reading for school years 2012 - 2015 (see Table 5).

Table 5

STAR Reading NCE Pre and Post-Scores: Four Year Review

	STAR Reading Pre-Test NCE Mean	STAR Reading Post-Test NCE Mean	Difference
2012 - 2013	66.305	65.404	-0.901
2013 - 2014	59.439	60.185	+0.746
2014 – 2015	57.830	57.160	-0.67
2015 - 2016	55.410	59.608	+4.198

Note. Normal Curve Equivalent (NCE). As defined by Renaissance Learning (2013) "is a norm-referenced score similar to percentile rank, but based on an equal interval scale…useful in making comparisons between different achievements tests and for statistical computations" (p.1).

The researcher completed a dependent paired *t*-test on student STAR Reading pre and post-scores for the school year 2015 – 2016. The dependent paired *t*-test consisted of pre and post-mean scores of 152 students. Again, as stated by Bluman (2013) sample sizes were random, dependent and normally distributed, and "only the gain or loss in values is compared" (p. 488). To support or reject the stated null hypothesis of no difference in student pre-to-post STAR Reading for school year 2015 - 2016, the researcher utilized a significance level of .05 (see Table 6).

Table 6

Normal Curve Equivalent STAR Reading Scores: 2015-2016

	M	SD	SE	a	df	Significance (2-tailed)	*t*
STAR Reading	-4.20	8.92	0.72	0.05	151	(+/-)1.976	-5.802

Note. M = mean of differences; SD = standard deviation of differences; SE = standard error; a = sensitivity of test; df = degrees of freedom; Significance = identifies critical and non-critical area; t = t value

Results indicated a significant increase from pre-to-post scores in STAR Reading for school year 2015 – 2016 (t-test value = -5.802). To strengthen interpretation, the researcher analyzed the previous three years of STAR Reading student scores. The analysis provided evidence of growth over the previous three years. The three school years before the study research lacked significant growth (see Table 7).

Table 7

Normal Curve Equivalent STAR Reading Scores - Historical Review of Data: 2012-2016

Year	P value
STAR Reading NCE 2012 - 2013	T(151) = 0.556, P = .579034
STAR Reading NCE 2013 – 2014	T(151) = -0.505, P = .614295
STAR Reading NCE 2014 - 2015	T(151) = 1.950, P = .53028
STAR Reading NCE 2015 - 2016	T(151) = -5.802, P = .00001

Note. t = t statistic; (df) = degree of freedom or n-1, P = p value

A historical data review of STAR Reading scores supported the statistical significance of data results. Significant growth was not evident in previous years reviewed. The researcher rejected the null hypothesis for the 2015-2016 school year; there is a difference in pre-to-post-STAR Reading scores.

Null hypothesis 4. There is no difference in student pre-to-post-scores on the student Measure of Questioning skills inventory.

The researcher analyzed student scores on the MQS to investigate a possible difference in pre-to-post scores. Students completed the MQS as a pre and post-inventory. Student scores in Stage 1-Organizing Information and Scores in Stage 3-Extending Information increased, while scores in Stage 2- Organizing Information decreased (see Figure 3).

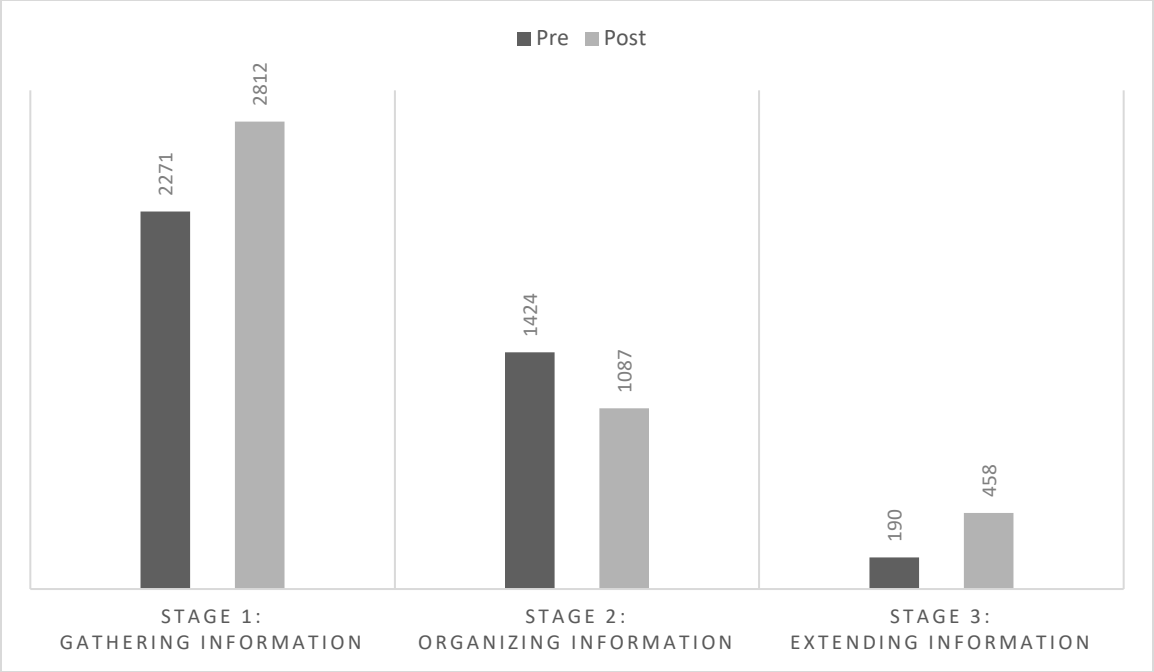

Figure 3. Measure of Questioning Skills - Student pre and post: 2015–2016.

The researcher completed a dependent paired *t*-test to analyze the number of questions generated in each of the three stages of the MQS (see Table 8).

Table 8

Measure of Questioning Skills – Student: 2015-2016

	M	SD	SE	a	df	Significance (2-tailed)	*t*	P-Value
MQS Stage 1	-3.56	20.59	1.67	.05	151	1.976	-2.131	.034708
MQS Stage 2	2.22	29.70	2.41	.05	151	1.976	.920	.35904
MQS Stage 3	-1.76	11.72	.95	.05	151	1.976	-1.855	.065546

The analysis concluded a difference in the number of Stage 1 questions (*t*-test value = -2.131) generated by students and no difference in the number of Stage 2 (*t*-test value = 0.920) and Stage 3 (*t*-test value = -1.855) number of questions. While the data showed an increase in Stage 1 and change in Stage 3 number of questions, no statistical significance existed for Stage 3, therefore the researcher failed to reject Null Hypothesis 4 for Stage 3. However, there was a significant difference for Stage 1; therefore, the researcher rejected the Null Hypothesis 4 for Stage 1 responses on the MQS.

Summary

Review of the qualitative and quantitative data revealed several areas of statistical significance along with common themes among the qualitative data collected. Exploration of the research questions, How do teachers perceive their participation in professional development on the use of Essential Questions and pedagogical practices?; and How do teachers design and deliver lessons after professional development on Essential Questions?; reflected 22 of 24 (100%) teacher participants who identified professional development in EQ as a positive and an influential experience. The qualitative questionnaire of teacher participants reflected changes in both teaching practice and lesson planning. Data analysis resulted in changes within the culture of the research school as evidenced in verbiage used on school tours, the desire of teachers to know what other teachers were experiencing with EQ, and changes to curricular design and framework. Quantitative data revealed significant differences in teacher participant MQS questioning skills. MQS questioning skills for teacher participants revealed a significant decrease in factual questions, significant increase in organizing information questions and significant increase in extending information questions.

Secondary data review of student STAR Math and STAR Reading assessments noted a significant increase pre-to-post assessment. The researcher analyzed student MQS scores and found a significant increase in Stage 1 pre-to-post factual and procedural questions and extending information questions and an observable change Stage 3 hypothetical and speculative questions. Chapter Five provides the researcher opportunity to discuss the significance of the findings and further opportunity for research.

Chapter Five: Discussion and Recommendations for Future Research

Researchers linked the ability to comprehend and manipulate knowledge to the value of life lived, and how opportunities encountered were responded to. "The quality of our life and that of what we produce, make, or build depends precisely on the quality of our thought" (Paul & Elder, 2014c, p. 2). The field of education has been required to aid students in reaching high levels of knowledge acquisition yet, struggled to develop consistent methods linked to high achievement. Pinkney and Shaughnessy (2013) stated, "Standards demand that the United States education systems strive for and attain, if not universal proficiency, at least visible progress toward this goal" of critical thinking (p. 346). At the time of this writing, critical thinking was yet to be unconditionally defined, and continued to spark countless discussion (Dwyer et al., 2014; Kettler, 2014; Murphy et al., 2014).

The researcher believed educational practice defined by memorized sets of facts and knowledge, specifically cultivated for students to learn by rote memory, essentially trained our students to think in factual perceptions and limited a student's ability for projected and synthesized thought. Wiggins (2012) wrote in his blog, "Education is the enterprise of making people more thoughtful, and too much mere work inhibits deep thought" (para. 5). Educators who championed the use of EQ understood the value in seeded information. "Ted Sizer first published the phrase in 1985, but the concept was truly championed by Grant Wiggins" (Virgin, 2014, p. 202). Sizer provided a field of possibility and left Wiggins to plant a seed in the form of an Essential Question. Essential Questions grew into a harvest of new perception and opportunity among teachers in the research school.

Research Questions and Hypotheses

The research questions and hypotheses examined in this study were:

RQ1: How do teachers perceive their participation in professional development on the use of Essential Questions and pedagogical practices?

RQ2: How do teachers design and deliver lessons after professional development on Essential Questions?

Alternate hypothesis 1. There is a difference in teacher pre-to-post-scores on the teacher Measure of Questioning Skills inventory.

Alternate hypothesis 2. There is a difference in student pre-to-post-STAR Math Scores.

Alternate hypothesis 3. There is a difference in student pre-to-post-STAR Reading Scores.

Alternate hypothesis 4. There is a difference in student pre-to-post-scores on the student Measure of Questioning skills inventory.

Twenty-two of 24 (100%) teacher participants experienced PD in EQ as a positive and influential. Teacher participants reflected changes in teaching practice and lesson planning. Data analysis revealed changes within the culture of the research school as evidenced in verbiage used on school tours, the desire of teachers to know what other teachers were experiencing with EQ, and changes to curricular design and framework. Quantitative analysis revealed significant differences in teacher participant MQS questioning skills in a decrease in factual questions, increase in organizing information questions, and increase in extending information questions.

Secondary data review of student STAR Math and STAR Reading assessments noted a significant increase in pre-to-post assessment. The researcher also found a significant increase in use of Stage 1 pre-to-post factual and procedural questions and extending information questions and an observable change in use of Stage 3 hypothetical and speculative questions.

Transformation

When teachers encountered results of the pre-Measure of Question Skills inventory given to students, the researcher observed a pivotal moment within data collection. Teachers spoke often about the data that reflected student-generated questions centered on the need for factual information and demonstrated little organizing or extending information by asking 'why' or 'what if' questions. As found in the literature review, Harris (2015) indicated research that reflected children's questioning patterns shift from using questions at high rates while at home, to a much lower instance once established in school, and "many students ask no questions whatsoever" (p. 29). "By the time kids reached adolescence, the love of questioning is sometimes gone" (Tovani, 2015, p. 33).

This researcher believed this awareness challenged the belief teachers comfortably created for themselves. Teacher investment was also seen in reviewing past student growth on STAR Math and STAR Reading assessments. Growth over the three years previous to this study, within the research school, stalled in STAR Math and wad declining in STAR Reading; however, teachers did not 'feel' the reality until they saw and reflected on the historical data. Having only seen STAR Math and STAR Reading data in one-year increments, teachers were unable to visualize the steady decline. One

teacher said, “Why didn’t anyone tell us?” and felt betrayed by the previous administrator.

Transformation of teacher pedagogy also occurred as teachers saw success in other teachers’ classrooms. Teachers consistently wanted information on the most productive method of implementation of EQ. Teacher curiosity to identify productive approaches exemplified the literature from Shim and Walczak (2012), “Past research has not yet fully addressed the impact of specific instructional methods on students’ critical thinking and furthermore what has been published cannot answer why particular [methods] are more effective than others” (p. 18). Lack of established methods in achieved critical thought created a need for teachers to seek successful practice among peers.

The concern for unproductive classroom behaviors created hesitation and a cautious approach; however, teachers who wanted to bring EQ and discussion into the classroom steadily sought out success stories from each other. The researcher observed a sense of caution in teachers who encountered interactions with the two teachers not invested in EQ and classroom discussions. The two teachers who expressed displeasure in the changes in classroom dynamics and increases in student verbal engagement levels became an obstacle to other teachers. While other teachers did not abandon EQ or classroom discussions, participating teachers did curb discussion of EQ and discussions while in the company of the two teachers who were non-engaged with the professional development activities, for a period of three months. As the researcher planned professional development during this time frame, the researcher asked Teacher 7 to share some success stories of the teachers’ experiences during the next PD meeting. Teacher 7

responded, 'No way. I don't want Teacher X to be all upset with me for letting the students talk in class. Not until he calms down.' The research school reflected the pressure and power of conformity and non-conformity issues.

The research school also began to show transformation of culture and identity. Individuals who conducted school tours included verbiage of student ownership of thought, Essential Question discussions, and teachers going through professional development on EQ. The concept of EQ became, at least for the research year, an important part of the school's identity. The principal at the research school developed a new preschool program during the research year, and the entire preschool curriculum developed from three Essential Questions. The researcher also saw a shift in curricular design, evidenced by several teachers wanting to re-write grade level curriculum to include EQ. Classroom furniture design transformed in 11 of the 24 (46%) classrooms. Design modifications included new furniture, new configurations and space usage, and bulletin board usage.

Personal Reflections

Established pedagogical practices that build a mastery of critical thinking within students remained an elusive goal of educators throughout history, to the time of this writing. However, teachers continued to hold the conviction that educational intervention developed critical thinking abilities in students (Almeida & Franco, 2011; Arum & Roksa, 2011; Bartos & Banks, 2015; Duesbery & Justice, 2015; Elder & Paul, 2012; Halpern, 2014; Kim, 2015; Lampert, 2013; McTighe & Wiggins, 2013; Stobaugh, 2013).

The field of education steadily reflected educators' belief to reach consistent levels of student achievement reflective of intelligent and independent thinking. The

reality, however, fell short of that goal. Education's vogue engagement with critical thinking continued throughout the decades and kept the profession at a fashionable distance from that goal. As a profession, educators struggled to find a balance between unified conformity and individual development. The researcher found teachers at the research school going through this very dilemma. While teachers wanted a clear and concise roadmap to implementation of EQ, teachers also valued their ability to individually interpret the implementation of EQ into classroom practice.

Recommendations for Future Research

The research in this dissertation investigated possible pedagogical transformations elementary teachers experienced as they participated in a systematic professional development training (see Appendix C) in the use of Essential Questions (McTighe & Wiggins, 2013) and student learning; specifically student questioning, reading, and math achievement. Research on the identification of transformative PD practices needs further study. Additional research on how to best support teachers as they adopt new practice into their repertoire also requires further research. Research focused on student academic success resulting from implementation of EQ will provide necessary information. While this research reflected improved student scores in STAR Math and STAR Reading, consistent results in various settings with other student academic measures must occur.

Much attention is required in the area of student questioning development in the field of education. The types and degrees of questions students develop and utilize are essential to be cultivated and understood. Evolving education's understanding of how questions are used, evaluated, and purposed are of exceptional concern and require a depth of further research.

Conclusion

Research from this study included qualitative and quantitative data for the examination of the research questions, How do teachers perceive their participation in professional development on the use of Essential Questions and pedagogical practices?; and How do teachers design and deliver lessons after professional development on Essential Questions? Data reflected 22 of 24 (92%) teacher participants identified professional development in EQ as a positive and influential experience. The teacher qualitative questionnaire responses reflected changes in both teaching practice and lesson planning. Research from this study also found indication of changes within the community of the research school, as evidenced in verbiage used on tours, desire of teachers to know what other teachers were experiencing with EQ, and changes to curricular design and framework. Quantitative data revealed significant differences in teacher participant MQS questioning skills. MQS questioning skills for teacher participants revealed a significant decrease in factual questions, significant increase in organizing information questions, and significant increase in extending information questions.

Secondary data analysis of student STAR Math and STAR Reading assessments reflected significant increases in both STAR Math and Reading scores. Student MQS reflected a significant increase in student factual questions, a decrease in organizing questions, and an increase in extending information questions.

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Appendix A

Measure of Questioning Skills: Scholastic Testing Service, Inc.

Measure of Questioning Skills
Asking Questions as a Way of Developing Critical Thinking Skills
Product Summary 2014

One way of developing our critical thinking skills is through asking questions. When measuring a student's questioning skills, we are interested in both the number of questions, as well as the type of questions being asked.

The Measure of Questioning Skills breaks the intellectual process into three stages of managing information: Gathering Information, Organizing Information, and Extending Information. We typically start with basic gathering information questions. As we develop better questioning skills, we will start increasing the number of questions at stages two and three.

The purpose of the product is to help develop questioning skills. This includes three parts:

1. Pre-assessment to measure the skill level
2. Applying strategies to help develop questioning skills
3. Post assessment to measure improvement

An individual's posttest results can be compared to:

1. the pre-test measure for the individual,
2. the overall group average performance, or
3. a base norm group.

The focus of the posttest measure is to look for:

1. an increase in the number of questions, and
2. a shift to more higher level questioning in stages two and three (Organizing and Extending Information).

Norms

Since there are no specific standardized strategies to be implemented or specific time lines between pre- and posttest measures, no tables of expected growth are available. The norm tables provided are meant to give an independent base line comparison of performance. As stated previously, it is recommended to focus more on developing and improving within your local group.

A review of the current *User's Guidebook* will provide a good understanding of the product and rationale. We are currently reworking the guidebook to provide a simpler method of scoring and reporting, with more emphasis on pre/post comparisons. This revision should be available by spring of 2015.

Appendix B

STAR Math and STAR Reading Assessments: Renaissance Learning, Inc.

STAR Math is a computer-adaptive assessment designed to give you accurate, reliable, and valid data quickly so that you can make good decisions about instruction and intervention. STAR Math, operating on the Renaissance Place Real Time platform, is part of a breakthrough comprehensive assessment system for data-driven schools, which also includes STAR Reading and STAR Early Literacy.

STAR Math is designed for students in grades 1 through 12, but can also be used with kindergarten students. It identifies students' instructional math levels and compares their math achievement to that of students across the nation. The test provides norm-referenced and criterion-referenced scores for students in grades 1 through 12; kindergarten students only receive criterion-referenced scores.

Most schools administer the test at least twice—in fall and spring—to get baseline data for each student and to measure growth over the school year. Many schools test more frequently. They use STAR Math for screening purposes in fall, winter, and spring, and they monitor the progress of students in intervention programs more frequently—perhaps monthly, biweekly, or even weekly.

STAR Reading is designed for students who can read independently. It measures students' reading comprehension and compares their reading achievement to that of students across the nation. The test provides norm-referenced scores for students in grades 1 through 12; kindergarten students who have begun to read may take the test, but norm-referenced scores are not reported.

Most schools administer the test at least twice—in fall and spring—to get baseline data for each student and to measure growth over the school year. Many schools test more frequently. They use STAR Reading for screening purposes in fall, winter, and spring, and they monitor the progress of students in intervention programs with weekly, biweekly, or monthly testing.

How STAR Reading Works. Students take STAR Reading at individual computers. The software delivers multiple-choice items one by one, and the student selects answers. After the test is completed, the software calculates a score, and teachers and administrators view and analyze reports that show results for an individual, class, grade, or school.

STAR Reading can provide accurate data in a short amount of time because it combines cutting-edge computer-adaptive technology with a specialized psychometric test design. The best way to understand how this works is to walk through the test-taking experience.

Appendix C

Professional Development Framework

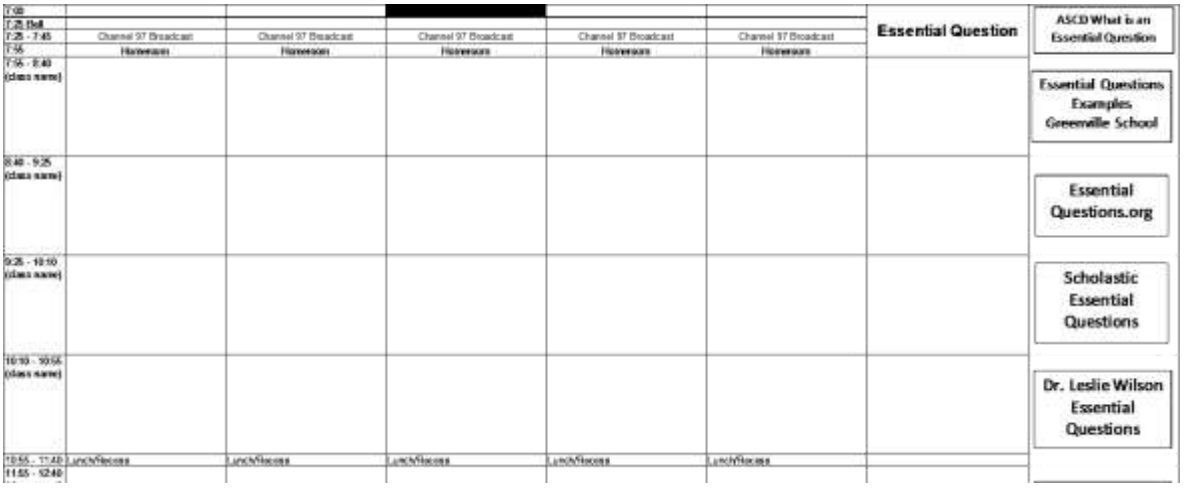
Following IRB approval the researcher attended the Professional Development Institute "Essential Questions: Opening Doorways to Student Understanding" sponsored by the Association for Supervision and Curriculum Development (ASCD) and led by Grant Wiggins on April 14, 2015, then developed professional development on Essential Questions for the school year 2015 – 2016. Included in the design was an enhanced digital lesson planner (Appendix D) to support the components of Essential Questions for all teachers to utilize and an on-line resource page (see Appendix E) for teachers to use that included on-line discussion-forums (see Appendix E). Components of the Professional Development included:

- Required Reading:
    - The Miniature Guide to Critical Thinking: Concepts & Tools (Paul & Elder, 2014)
        - For the purpose of this research, the Paul & Elder definition of critical thinking found in the required reading The Miniature Guide to Critical Thinking: Concepts & Tools (Paul & Elder, 2014) will be presented to teachers during professional development sessions to provide a concise and identifiable definition.
    - Essential Questions (McTighe & Wiggins, 2013)
- Monthly Professional Development Sessions August 2015 – March 2016
    - Sessions included: a review of last month's reading and discussion boards (Appendix E), a presentation of new material, collaborative time to discuss and practice new concepts, discussion of how implementation of new concepts in practice were going and assignment of new material to read, or implement. Sessions included full staff participation, and leveled staff breakout sessions. Sessions additionally utilized online platforms such as Padlet to collect anonymous input for ongoing questions and discussions. This allowed the teachers to have ongoing discussions about issues with implementation without identifying self within the community of teachers. Sessions also included examples and video Samples of EQ in action.
- On-Line Professional Development Site created by the researcher that included:
    - Discussion Boards, Resources and assignments

Appendix D

Digital Lesson Planner

The researcher created a customized digital lesson planner for teachers to utilize during the research process to support use of Essential Questions. The lesson planner included weekly tracking system of the school curriculum covered in lesson planning, and recording of Essential Questions posed to students. The lesson planner could be used in Microsoft Excel or uploaded to Google Docs.



The lesson planner included a complete curricular guide of the school's curriculum with a weekly grid to mark when the objective was covered.

Appendix E

Teacher Resource Site and Web Forum of Discussion Boards

Appendix F

Pre-Questionnaire

1. Define an Essential Question:
2. How do you perceive your current skill level in the development of Essential Questions?
3. How do you perceive your application level when implementing Essential Questions?
4. Do you use Essential Questions in your lesson planning? Yes or no?
    - If yes:
    - How often?
    - What subject(s)?
    - Do you post Essential Questions in the classroom?
5. Do your students ask application and synthesis questions during units of study? If so, how often?
6. Which do you use to lesson plan: the school's curriculum or purchased texts?
7. What skills or experience do you perceive as necessary to apply Essential Questions in lesson design and instruction?
8. Do you anticipate your lesson planning will change/will not change after completing professional development on essential questions?
9. Do you anticipate your assessment practices will change/will not change after completing professional development on essential questions?
10. Should Essential Questions be learned as a full faculty or as an individual teacher? Why?
11. Is your interest level in professional development training influenced/not influenced by how important you believe the topic is?
12. Learning about Essential Questions is "time well spent" or "time wasted" during professional development time?
13. Students who encounter Essential Questions and participate in student inquiry are more/less likely to be involved in their own learning? Why or why not?
14. Do you perceive Essential Questions increase/decrease student inquiry? Why?

Appendix F

Post-Questionnaire

1. Define an Essential Question:

2. How do you perceive your current skill level in the development of Essential Questions?

3. How do you perceive your application level when implementing Essential Questions?

4. During this year did you use Essential Questions in your lesson planning? Yes or no? If yes: How often? What subject(s)? Do you post Essential Questions in the classroom?

5. Do your students ask application and synthesis questions during units of study? If so, how often?

6. Which do you use to lesson plan: the school's curriculum or purchased texts?

7. What skills or experience do you perceive as necessary to apply Essential Questions in lesson design and instruction?

8. Did your lesson planning change after completing professional development on essential questions?

9. Do you anticipate your assessment practices will change/will not change after completing professional development on essential questions?

10. Should Essential Questions be learned as a full faculty or as an individual teacher? Why?

11. Is your interest level in professional development training influenced/not influenced by how important you believe the topic is?

12. Learning about Essential Questions was "time well spent" or "time wasted" during professional development time?

13. Students who encounter Essential Questions and participate in student inquiry are more/less likely to be involved in their own learning? Why or why not?

14. Do you perceive Essential Questions increase/decrease student inquiry? Why?

Appendix G

Interview

1. Describe a time when you remember learning something new:
2. Describe a time when you shifted your instructional design and/or implementation. What facilitated that change?
3. How do you design instruction to foster intellectual curiosity?
4. Describe a time when student's in your classroom were intellectually challenged/engaged:
5. How do you find classroom materials to support student learning?
6. How does educational theory support your educational philosophy and evident in your practice?

Appendix H

Observation Tracking Sheet

Subject: _____ Observer: _____

Grade: _____ Teacher: ID Code: _____

Date: _____

Essential Question: Click here to enter text.

☐Open Ended

☐Higher Order Thinking: *analysis, inference, evaluation, prediction*

1. **How was the question presented?** Click here to enter text.
2. **What Response strategy did the teacher use?**

☐Wait Time (p. 52)

☐Think Pair Share (p. 53)

☐Random Calling (p. 53)

☐Class Survey (p. 55)

☐More than One Answer (p. 55)

☐Probes for Thinking and Support (p. 55)

☐Devil's Advocate (p. 56)

☐Other:

3. **How long did the discussion last?** Click here to enter text.
4. **What was the participation level of students?** Click here to enter text.
5. **What resources did the students have available to answer the Essential Question?**

Click here to enter text.

6. **Does the teacher take a grade on group discussions?** Click here to enter text.
7. **Did students ask new questions?** Click here to enter text.
8. **How was the room arranged?** Click here to enter text.

Appendix I

Superintendent Approval Letter

ARCHDIOCESE OF ST. LOUIS
Catholic Education Center
4445 Lindell Boulevard
Saint Louis, MO 63108-2403

Catholic Education Center
p) 314.792.7302
f) 314.792.7399
kurtnelson@archstl.org

February 12, 2015

Ronda Mahach
Technology Coordinator
St. Charles Borromeo Catholic School
431 Decatur Street
St. Charles, MO 63301

Dear Mrs. Mahach,

I have received your proposal to conduct your doctoral action research project in the Archdiocese of St. Louis under the auspices of Lindenwood University.

I am pleased to grant you permission to conduct your study on professional development and critical thinking at St. Charles Borromeo Catholic School. Please continue to work with the principal, Mrs. Ann Hoffman, your doctoral advisor, and the Institutional Review Board of Lindenwood University to ensure that the final design of the project includes appropriate safeguards for faculty and students.

I look forward to learning about the results of your study and the implications for professional development efforts in the schools of the Archdiocese.

Best wishes to you as you work on this project and complete your doctoral degree.

Sincerely,

Kurt Nelson, Ph.D.
Superintendent of Catholic Education

Copy: Mrs. Ann Hoffmann, Principal, St. Charles Borromeo School

CATHOLIC SCHOOLS

ARCHSTL.ORG

Appendix J

Principal Approval Letter

St. Charles Borromeo School
Nationally Recognized Blue Ribbon School of Excellence

February 16, 2015

Dear Mrs. Mahach,

With this letter, I am giving you permission to conduct your study on professional development and critical thinking at St. Charles Borromeo Catholic School. It will be important to work directly with me in all stages of planning and implementation of the project.

The possibilities present with your study are an exciting challenge for our school and I look forward to seeing your ideas in practice and the evaluation of the results of this study.

Best of luck in your research as you pursue your doctoral degree.

Sincerely,

Ann Hoffman

Ann Hoffman

Principal, St. Charles Borromeo Catholic School

431 Decatur Street ~ St. Charles, Missouri 63301 ~ (636) 946-2713 ~ (636) 946-3096 fax
www.borromeoschool.com

Appendix K

Adult Consent Form

Lindenwood University
School of Education
209 S. Kingshighway
St. Charles, Missouri 63301

Informed Consent for Participation in Research Activities

An Action Research-Case Study Investigation of Professional Development on Essential Questions in a K-8 Private Parochial School in the Midwest.

Principal Investigator Ronda K. Cypret-Mahach
Telephone: 636-544-0688 E-mail: rkm825@lindenwood.edu

Participant_____
Contact info _____

1. You are invited to participate in a research study conducted by Ronda K. Cypret-Mahach under the guidance of Dr. Lynda Leavitt. The purpose of this research is to investigate the possible pedagogical transformations teachers experience as they participate in professional development training in the use of Essential Questions and what possible results those transformations have on student questioning, reading, and math achievement. The researcher serves as the Technology Coordinator and is the implementer of the professional develop experience with the teachers.

2. a) Your participation will involve
   - Completing a pre and post survey that will be made available to participants through a website created to support professional development in Essential Questions. The pre survey will be made available during the month of August 2015 and the post survey will be made available during the month of May 2016. Participants will complete the survey and submit it using an assigned code to help protect the participant's anonymity. The survey should take no more than 15 minutes to complete.
   - Participating in a pre and post interview. The pre interview will be completed during the month of September and the post interview will be completed during the month of May. The interview will be conducted by the school's resource teacher using prepared questions. The interview will use speech to text software to capture the participant's responses. Prior to the researcher receiving the text of the interview, all identifying information will be removed. The duration of each interview will not exceed 20 minutes.

b) The amount of time involved in your participation will be 15 minutes for each survey and 20 minutes for each interview for a total of 70 minutes anticipated time of participation. Compensation for your time and participation will include a $5 gift certificate and your name entered into a drawing for a $50 gift certificate.

Approximately 20-28 participants will be involved in this one site Action Research-Case Study research.

3. There are no anticipated risks associated with this research.
4. There are no direct benefits for you participating in this study. However, your participation will contribute to the knowledge about Professional Development in the use of Essential Questions and student achievement and may help society.
5. Your participation is voluntary and you may choose not to participate in this research study or to withdraw your consent at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw.
6. We will do everything we can to protect your privacy. However, the small population of 20-28 participants may inadvertently reveal participant characteristics. As part of this effort, your identity will not be revealed in any publication or presentation that may result from this study and the information collected will remain in the possession of the investigator in a safe location.
7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, Ronda K. Cypret-Mahach at 636-544-0688 or the Supervising Faculty, Dr. Lynda Leavitt and 636-949-4756). You may also ask questions of or state concerns regarding your participation to the Lindenwood Institutional Review Board (IRB) through contacting Dr. Jann Weitzel, Vice President for Academic Affairs at 636-949-4846.

I have read this consent form and have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my participation in the research described above.

_____ _____

Participant's Signature Date Participant's Printed Name

_____ Ronda K. Cypret-Mahach

Signature of Principal Investigator Date Investigator Printed Name

Appendix L

LINDENWOOD

INFORMED CONSENT FOR PARENTS TO SIGN FOR STUDENT PARTICIPATION IN RESEARCH ACTIVITIES

An Action Research-Case Study Investigation of Professional Development on Essential Questions in a K-8 Private Parochial School in the Midwest.

Principal Investigator Ronda K. Cypret-Mahach
Telephone: 636-544-0688 E-mail: rkm825@lindenwood.edu

Participant _____
Parent Contact info _____

Dear parent,

1. Your child is invited to participate in a research study conducted by Ronda K. Cypret-Mahach under the guidance of Dr. Lynda Leavitt. The purpose of this research is investigate the possible pedagogical transformations teachers experience as they participate in professional development training in the use of Essential Questions and what possible results those transformations have on student questioning, reading, and math achievement. The researcher serves as the Technology Coordinator and is the implementer of the professional develop experience with the teachers.

2. a) Your child's participation will involve
   - The Measure of Questioning Skills comprised of four pre and four post images. Participants look at the given image set and generate as many questions as possible within the allotted time of four minutes for each image.
   - Students complete the activity as a classroom activity with their homeroom teacher.
   - The whole class completes the activity at the same time.
   - Total working time is 20 minutes

   b) The amount of time involved in your child's participation will be 20 minutes.

4. There are no anticipated risks to your child associated with this research.

5. There are no direct benefits for your child's participation in this study. However, your child's participation will contribute to the knowledge about student questioning and may help society.

6. Your child's participation is voluntary and you may choose not to let your child participate in this research study or to withdraw your consent for your child's participation at any time. Your child may choose not to answer any questions that he or she does not want to answer. You and your child will NOT be penalized in any way should you choose not to let your child participate or to withdraw your child.

7. We will do everything we can to protect your child's privacy. As part of this effort, your child's identity will not be revealed in any publication or presentation that may result from this study.

8. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, Ronda Mahach at 636-544-0688 or the Supervising Faculty, Dr. Lynda Leavitt at 636-949-4756. You may also ask questions of or state concerns regarding your participation to the Lindenwood Institutional Review Board (IRB) through contacting Dr. Jann Weitzel, Vice President for Academic Affairs at 636-949-4846.

I have read this consent form and have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my child's participation in the research described above.

Parent's/Guardian's Signature Date	Parent's/Guardian's Printed Name
Child's Printed Name	
Signature of Investigator Date	Investigator Printed Name

Curriculum Vitae

Ronda K. Cypret-Mahach served as the Technology Coordinator at St. Charles Borromeo School since 2009. Ronda earned a Master's Degree in Education from Lindenwood University in 2002 and completed her Bachelor of Arts in Education with an additional minor in English at the University of Missouri-St. Louis in 1991. Included in her certifications are Early Childhood Education, Elementary Education, and Middle School Language Arts and Social Studies. Anticipated completion of her Education Doctorate in Instructional Leadership is December of 2016.

Ms. Mahach was inducted into Alpha Chi in February 2015 and considered this an honor that reflected her dedication for academic pursuits, and the importance Ronda always placed in acquiring knowledge and performing at the highest degrees of ability. Contained in her awards are Summa Cum Laude Honors with Lindenwood University, Magna Cum Laude Honors with the University of Missouri-Saint Louis, Suburban Journal Teacher of the Week in 2003, a three-time recipient of the St. Louis Regional Child Care Partnership Scholarship, and Teacher of the Year for the YMCA in 1995.

Ms. Mahach's teaching experience included serving students in the Title 1 remedial reading and math program with Wright City Elementary School, Kindergarten teacher with the YMCA Early Childhood Center, and Kindergarten teacher with St. Charles Borromeo School. Ronda served as a host teacher for student teachers and as a mentor teacher to new teachers entering the profession. Her deep commitment to education and to the students and families she serves has been ever present in all Ronda's endeavored activities.