

A CASE STUDY OF THE IMPLEMENTATION OF A STEAM ELEMENTARY MAGNET
SCHOOL IN SOUTHWEST MISSOURI

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SCHOOL IN SOUTHWEST MISSOURI

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ABSTRACT

The purpose of this descriptive case study was to document the change process experienced within the Nixa, Missouri Public School system during the implementation of an elementary science, technology, engineering, arts, and mathematics or STEAM magnet school. This case study details the planning process of the magnet school through the end of the first semester of its second academic school year. Drawing from interviews of district administrators, building administrators, school board members, parents, and teachers, this study presents the STEAM framework and its influence on teaching and learning in an elementary magnet school. The researcher concluded the implementation of the STEAM magnet school affected the Nixa Public School district in many ways. The magnet school provided an innovative, educational choice to parents, students, and teachers and offered a unique learning environment enriched with technology. The STEAM focus and inquiry approach to learning contributed to students being actively engaged and excited about learning as well as contributed to the collaborative climate of the school. This study may serve as a guide for school administrators interested in implementing a similar STEAM elementary magnet school within their school district.

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CHAPTER ONE

INTRODUCTION

A Case Study of the Implementation of a STEAM Elementary Magnet School in the Nixa, Missouri Public School District

Introduction

Nixa Public Schools (NPS), a preschool through twelfth grade district with almost 6000 students, is located in southwest Missouri. Every year since 2002, the school district has earned Accredited with Distinction from the Missouri Department of Secondary and Elementary Education (DESE). As the largest and fastest growing school district in Christian county, the Nixa School District has experienced steady and rapid student growth. The district has an early learning center, five elementary schools, two intermediate buildings, a junior high school, an alternative high school, and a nearly 1600 student high school. As the community continued to create new residential developments, the populations among the five elementary schools became inconsistent and unbalanced in both student enrollment and socio-economic status with inequality among them. Some were over capacity while others had empty classrooms. Free and reduced percentages ranged from 30 percent to 62 percent. Test scores and enrollment were declining at Nixa's oldest and smallest elementary school- John Thomas Elementary (www.dese.mo.gov). Realizing the district was in need of a boundary line change and knowing that changing schools is difficult for families, offering parents a choice became an option with the long-discussed idea of a magnet school. John Thomas Elementary is centrally located in the district and a decision was made to convert the school to a science, technology, engineering, arts, and mathematics magnet school. Boundary lines changed from five elementary areas to four and families from throughout the district were invited to make application to the magnet school. This

school would have a STEAM curriculum (science, technology, engineering, arts, and math), twenty extra school days, technology-rich classrooms and extra professional development for teachers.

The rationale for this study is to document the changes experienced throughout the Nixa Public School district during the implementation of an elementary magnet school. Chapter one will provide a history of and explain the need for a magnet school in NPS. Chapter two will share what the research says about magnet schools and the change process. Professional development and the curricular emphasis on science, technology, engineering, and math will also be presented. In chapter three, the methodology of this case study will be explained. Chapter four will include the results of the data collections while chapter five will provide conclusions from the data and offer recommendations for further research.

The Need for Change

Stephen Kleinsmith became the Superintendent of the NPS in 2002. Under his tenure, the district has received many honors. The Missouri School Board Association, in 2006, awarded NPS with the highest overall academic proficiency with the lowest per pupil expenditure award. In 2007, NPS received the 417 Magazine's 'Best Place to Work' award and NPS has earned Accredited with Distinction from DESE for twelve consecutive years. Two elementary schools, Century Elementary and George Espy Elementary, as well as the Nixa High School received the Gold Star award from the state of Missouri. George Espy Elementary School earned the National Blue Ribbon award in 2009 and the Nixa High School was bestowed the same honor in 2013. Kleinsmith himself received Missouri's Superintendent of the Year award in 2010 (Kleinsmith, 2014). Despite the successes, Nixa Public Schools are experiencing a time of raplexity-rapid and complex (Kleinsmith, 2012). Since 2000, student population has

increased 45 percent (www.dese.mo.gov). New elementary schools have been constructed approximately every three years to accommodate the rapid growth. A kindergarten through twelfth grade enrollment projection study by Business Information Systems was completed in October, 2010 to assess the needs of the district. The need for immediate change was evident. A series of more than 40 input sessions were held to inform stakeholders, and to “...listen our way to a solution” (Kleinsmith, 2012, p. 2). Long range plans for a new junior high, a new high school, and a new elementary school were altered. Instead, the district looked for an avenue to give choice to parents and for their children in public schools, a choice that allowed opportunities beyond what other elementary schools were offering, and an opportunity to be on the cutting edge of educational change. Kleinsmith (2012) stated, “It’s proactive. If we aren’t proactive in some areas then eventually somebody is going to say, ‘I’m going to open up a charter school for profit.’ They will fill the void, and I would rather fill it with public education” (p. 4).

The idea to change John Thomas Elementary to a different type of school was sparked in a Board Retreat Discussion in 2005 (MAESP presentation Sept 28th, 2012). During the January 2011 Winter Board Retreat, a decision was made to move forward with a magnet school. Included in the board discussion was budgeting costs, community acceptance, and setting up a fair lottery system. The administration moved forward in review and development and kept the board involved in the process. Keeping their focus on doing what is best for Nixa students, the administration, the Nixa School Board, and the Nixa community worked together as a team.

Planning.

A design team of over 100 members was created and led by the Executive Director of Elementary Education, Debby Lawson. The team consisted of administrators, community members, teachers, and parents of the Nixa Public School district. Lawson selected key district

employees to lead the six sub-committees. The sub-committees were comprised of administrators, teachers, parents and community members who volunteered to be part of the design team. The design team was charged with the following six parameters established by Kleinsmith to guide the planning of the school:

1. Major focus on Science, Technology, Engineering, and Math (STEM)
2. Minor focus on the Arts (vocal music, instrumental music, art, theater)
3. Increase of 20 school days to the calendar (174-194)
4. Inclusion of student service learning projects
5. Personal electronic devices for the students (iPad, Kindle, Nook, etc.)
6. District not responsible for transportation

The design team worked in five teams- curricular, co-curricular, policy and procedures, communication, and technology. Lawson identified these five areas as key subjects that needed to be in place before presenting the entire design to Kleinsmith. Team meetings were held from September of 2011 to November of 2011, to discuss ideas and eventually create a plan for the new school. The design team had to determine what a magnet school was and defined it as a public school with special programs and instruction unavailable elsewhere in the school district that is specially designed to draw students from throughout the district. A magnet school draws a cross section of the community together. It is innovative, visionary, and gives choice to students and parents. It provides a targeted focus for instruction and meets the growing needs of students and the community. For the Nixa Public School district, a magnet school afforded an opportunity to balance free/reduced lunch percentage of students and student population in each school.

The teams presented their suggestions to the entire design team and after completing the final revisions, a resulting proposal was submitted to Kleinsmith. A few adjustments to the design team's proposal were made. Kleinsmith decided to explore the cost of providing limited transportation and chose the more traditional calendar set forth by the policy and procedures committee. This calendar closely mirrored the district's calendar only with the addition of twenty days added to the end of the school year. Kleinsmith presented the final plan to the Nixa Board of Education at the December, 2011 board meeting. The school board unanimously approved the implementation of the magnet school to be the educational institution to meet the needs of the next generation of Nixa citizens.

John Thomas Elementary

John Thomas Elementary, centrally located in the Nixa community, was the oldest of the five elementary schools. It received its namesake from Mr. John Thomas, a retired administrator and long-time supporter of Nixa Public Schools. Implementing the mission required a name change. This created the initial threat to the change initiative. The design team's sub-committee Communication suggested two potential names for the new school. The school board chose the name John Thomas School of Discovery thus keeping with the tradition of the school but adding the innovation element to the new name. Taking on the challenge of altering and redeveloping a school with fifty years of history, it was crucial for the administration to promote John Thomas School of Discovery as a progressive move for the district. In an open letter to the community, Kleinsmith introduced the idea behind the change which was an important element in maintaining the cultural integrity of the newly forming school. Bolman & Deal conclude culture forms the superglue that bonds organizations, unites people, and helps accomplish goals (2008).

Communication.

When it came to communicating about our magnet school idea, we used a process that engaged and educated patrons, openly reviewed options, encouraged appropriate participation by the faculty and community and reached a decision that is in the best interests of most (if not all) community members. We wanted everyone to feel as though he or she had a chance to be heard. Our goal was to get most people to *understand* what our plans are, not necessarily that they *support* it. I believe to a great extent this was accomplished (Kleinsmith, 2012).

Changing the name of the school to John Thomas School of Discovery (JTSD) blended the new vision for the school yet kept the tradition of the original school. The publicity committee continued to market the school and help with communicating the process of teacher and student selection. John Thomas School of Discovery would have a projected population of 437 students, one administrator, thirty teachers, and approximately ten support staff.

Curriculum.

The curriculum at JTSD, using an inquiry-based approach, would focus on a science, technology, engineering, arts, and mathematics or STEAM curriculum without losing sight of literacy. It would be integrated, innovative, and project/product based. Teachers would utilize twenty-first century learning skills and the curriculum would be rigorous.

Co-curricular.

The co-curricular activities would consist of elective classes, labs, studios, and centers. Additional opportunities would include after school clubs, curriculum integration, and a focus on the Missouri Learning Standards.

Service learning.

Service learning would be required for all students and the number of hours would be age-appropriate. The learning would be interest based, connected to careers, and support local charities. A major goal is to use community service, foster business partnerships, and showcase STEAM to the entire Nixa community.

Procedures and guidelines.

John Thomas School of Discovery would use a calculated lottery by family name instead of by individual student. The lottery would be run by an outside agency to ensure the fairness of the results. There was much discussion as to whether or not students from the same family would be given preference. For example, if a second grader was chosen from the lottery, would his fourth grade sister also have a spot? By deciding to keep families together, a foundation can be laid for strong school to home relationships, parent involvement, and school unity. If selection is based on individual student, families may experience a bias against them. Living in a time where every home is incredibly busy with jobs, after school activities, etc., splitting up households will only add to that stress and the number of interested parents may decrease dramatically if they cannot send all of their children.

Parental involvement.

In order to promote positive parental involvement, parents of JTSD students would be required to volunteer for a set amount of hours each semester as well as be encouraged to attend extra-curricular functions and become involved in the school's parent and teacher organization.

Technology.

With the understanding full implementation could take up to three years, the district sought to have grades kindergarten through second grade have a two to one ratio for shared

personal devices. Grades three through six would have a one to one personal device. Professional learning for teachers would center on providing and utilizing appropriate technology. A STEM lab and a station media production studio would become part of the building. Wireless access in building with power and network capability would be necessary to meet the mission of the school.

Faculty selection.

In a December 8, 2011 administrative memo, it was announced that Josh Chastain would be the new principal of John Thomas School of Discovery. His move to JTSD principal created a domino effect of administrative changes. His vacancy at Summit Intermediate School was filled by assistant principal Alysia Ackerman. With Debby Lawson retiring, Kevin Kopp, who was principal at High Pointe Elementary, filled her position as Executive Director of Elementary Education. Marilyn Hanna, former principal at John Thomas Elementary, became the principal at High Pointe Elementary. During a special faculty meeting on the morning of December 9, 2011, all of these administrative changes were announced to NPS faculty and staff by building administrators.

While continuing his role as principal of Summit Intermediate School, Chastain would also begin working to select staff for the new school. Teachers interested in working at John Thomas School of Discovery were directed to view the information on the school's website about the transfer process. The online application process was open from December 9-21, 2011 with the selection process completed over the Christmas break. Lawson and Chastain worked collaboratively to choose the right fit for the school. The staff selected would need to be proficient in technology. Chastain and Lawson were also looking for those teachers who would be enthusiastic and possess a strong work ethic to take on the challenge of creating a new type of

school. John Thomas School of Discovery staff members were announced in January. The early selection process was necessary since JTSD teachers would be coming from across the district. This early selection process also allowed the principals at the other four elementary schools to place those teachers from John Thomas Elementary who did not apply to teach at JTSD. Replacing teachers chosen for JTSD was a collaborative process with the Director of Human Resources, Kathy Whitworth, and the entire elementary administrative staff. Teachers from John Thomas Elementary who did not want to stay at JTSD submitted a form to the human resource department that included their top two choices for the school where they would like to teach as well as the grade levels they preferred. The elementary administrative team held several meetings to place teachers based on their preferences yet were also the best fit in their new position. All teachers were placed by March 1, 2012.

Promoting the new school.

On December 9, 2011, a letter to the parents and students of Nixa Public Schools was sent from Kleinsmith. The letter announced the school board's approval of JTSD as well as provided information about administrative changes, boundary line changes, and information about the new magnet school. The district held three community discussions on January 9-10, 2012 to have patrons view and discuss the boundary line changes. With the elementary boundaries changing from five to four areas, communicating the changes before the JTSD enrollment process was necessary. The enrollment process for JTSD opened on February 10, 2012 and ended on March 1, 2012.

In an effort to provide information about the new magnet school, a JTSD School Fair was held on January 31, 2012. District officials estimated nearly 2,000 patrons attended the Fair. Kleinsmith stated, "Attendance far exceeded any expectations we had. It was a real testimony to

the interest out there for this project” (Letterman, 2012, para. 2). Teachers at JTSD set up booths in the gym to showcase the type of learning that would take place at JTSD. A classroom showcasing the updates to the aging school was also open for public viewing. This Fair gave parents the opportunity to ask teachers, the principal, and district administration questions to help them decide if JTSD was the best fit for their child.

When the lottery selection process was completed, parents were notified either by email or phone call if their child’s name was selected for JTSD. The district received over 1200 application for the 437 spots. Lottery thresholds at every school campus were met and for every grade level. The students who were not selected were placed on a waiting list (Bowling, 2012). Preparations at John Thomas School of Discovery were underway for the opening of the new school on August 17, 2012.

Problem Statement

The problem is the implementation process of a STEAM magnet school and its effects on student achievement as an unknown factor that may have unpredictable consequences on the students, teachers and parents of the Nixa Public School district.

Purpose of the Study

The purpose for this case study is to document the change process the Nixa Public Schools underwent with the implementation of a STEAM magnet school. The theory presented studies the science, technology, engineering, arts, and mathematic, or STEAM, framework and its influence on teaching practices in an elementary magnet school.

Research Questions

In qualitative research, the questions are open-ended and evolve as the researcher considers and ponders the themes of their study. A primary question is usually broad and

general and then followed by sub-questions which give direct implications for data analysis. These questions then become the various topics explored in the data collection (Creswell, 2003). With this in mind, the following is a primary question applicable to this study on the implementation of a magnet school within the Nixa Public School system:

What were the effects of the implementation of a STEAM magnet school on students, parents, administration, and community members within the Nixa Public School District?

In an effort to narrow the focus of this case study, the primary question will be expanded upon with the following series of sub-questions:

Sub-questions:

1. What opportunities and threats to the change process did the teachers, administrators, and school board encounter with the implementation of the magnet school?
2. What effect did the implementation of the magnet school have on parent and teacher attitudes both at JTSD and in the other elementary schools within the Nixa School district?
3. From the teachers' perspective, what effect has the magnet school had on student engagement?
4. What professional learning did teachers receive to prepare them for teaching in a magnet school with a STEAM focus?
5. From the parents' perspective, what effect has the magnet school had on their child's attitude towards school?
6. From the administrators' perspective, what effect has the magnet school had on teacher attitudes and student engagement?

Limitations and Delimitations of the Study

According to Creswell (1998), “delimitations address how the study was narrowed in scope, whereas limitations identify potential weaknesses of a study” (p. 148). Limitations of this case study will be largely subjective, due to the reliance of the researcher’s observational skills and ability to analyze and interpret information. This study will be limited to the respondents who participated in this study. It will be further limited to the collection of data from the planning stages of the magnet school beginning in 2010 through the first calendar school year for JTSD, 2012-2013.

Role of the Researcher

As an administrator in the Nixa Public Schools, the researcher was a participant in the design team for the magnet school. The chosen principal for the school is also the researcher’s husband and their two daughters, grades first and sixth, were students at JTSD during the school’s first year. This put the researcher in a position of being a participant observer. The researcher had the opportunity to view this implementation from many perspectives. As a participant observer, the researcher was able to view the implementation process from the inside, as an administrator of another elementary school in NPS, as a parent of JTSD students, as well as from the outside as an investigator. The researcher was keenly aware of any potential biases she may have had and took them in to account as it is necessary for researchers in case studies to be sensitive of the inherent biases in this type of research (Merriam, 1998). The researcher also remained as neutral as possible throughout the entire process from the research and collection of data to the analysis and reporting of the findings in this case study.

Summary

The purpose of this study was to document the change process experienced by the internal and external publics of the Nixa Public School district during the implementation of an elementary magnet school. This case study describes and analyzes the implementation process from the planning stages through the first year the school was in operation. Interviews and focus groups were used for data collection. The participants included parents, teachers, administrators, and board members.

Chapter two contains a review of the literature to guide the research by defining the term STEM, examining the need for STEM education. Incorporating the Arts into STEM education will also be included in the STEM literature. Additionally, chapter two provides an understanding of a magnet school, giving a brief history of magnet schools and their role in education today. Research regarding how to effectively implement a professional development program to enhance the STEAM focus will also be shared as professional development is listed as a key element to the successful implementation of John Thomas School of Discovery. Lastly, the change process is discussed as it pertains to the effects of change on individuals and organizations along with research on how organizations can effectively implement change.

CHAPTER TWO

REVIEW OF LITERATURE

Introduction

This study is a narrative account of the implementation of a magnet school within the Nixa Public School District. It includes a description of the various elements involved in the implementation process including the educational focus of the school, the strategies used for implementation, and the elements of bringing about effective change.

The mission of the John Thomas School of Discovery is to prepare students for life in a culturally diverse and technology driven world of the 21st century. To accomplish this mission, the magnet school centers around a science, technology, engineering, and mathematics (STEM) focus. This chapter defines the term STEM, examines the need for STEM education, and explains the push for STEM education in the elementary grades in the United States. With the arts described as a minor focus of JTSD, Science, Technology, Engineering, Arts, and Mathematics (STEAM) will also be included in the STEM literature. Additionally, this chapter provides an understanding of a magnet school, giving a brief history of magnet schools and their role in education today. Research regarding how to effectively implement a professional development program to enhance the STEAM focus will also be shared as professional development is listed as a key element to the successful implementation of John Thomas School of Discovery. Lastly, this chapter discusses the change process as it pertains to the effects of change on individuals and organizations along with research on how organizations can implement effective change.

STEM education.

The acronym STEM stands for Science, Technology, Engineering and Mathematics and has been part of the educational vocabulary since 2001 (Fiorello, 2010). The former director of the National Science Foundation's education and human-resource division, Judith Ramaley, is credited with creating the STEM initiative "to revolutionize the teaching of certain subjects such as math and science" (Fiorello, 2010, para. 2). This approach to education incorporates engineering and technology into the regular curriculum by creating a meta-discipline.

Even though the acronym STEM means science, technology, engineering, and mathematics, it is much more than a combination of words. Science, technology, engineering, and mathematics education "represents a symbiotic relationship among the four interwoven fields" (Basham & Marino, 2013, p. 9). Encouraging an actively engaged classroom, a STEM curriculum is driven by problem-solving and exploratory learning. Science, technology, engineering, and mathematics education has been defined as

a standards-based, meta-discipline residing at the school level where all teachers, especially science, technology, engineering, and mathematics (STEM) teachers, teach an integrated approach to teaching and learning, where discipline-specific content is not divided, but addressed and treated as one dynamic, fluid study. (Brown, R., Brown, J., Reardon, K., & Merrill, C., 2011, p. 6)

Historically, the four subjects of STEM are generally taught separately. By adopting the STEM philosophy, these four subjects play an integral part in teaching of the whole and will be made complete by the use of technology. Incorporating technology may foster a creative and innovative way to problem-solve and apply what has been learned. As Fioriello (2010) claims, all students will benefit from the STEM program because it teaches independent innovation and

allows students to explore greater depths of all of the subjects by utilizing the skills learned. Successful STEM learning experiences call for the ability to think beyond lower level cognitive tasks. When students move beyond simply recalling facts in isolation, to a deeper understanding of the content, the learner is able to develop higher-order thinking skills. These skills will be necessary for today's students to become tomorrow's global leaders (Basham & Marino, 2013).

STEM to STEAM.

To strengthen STEM skills and illicit creativity, the acronym STEM is evolving into STEAM. Science, technology, engineering, arts, and mathematics (STEAM) is the incorporation of the Arts in to the STEM curriculum. Incorporating arts in to science learning offers many benefits for students. "Hands-on, imaginative approaches to science education, using many of the methods used in the creative arts, have been shown to attract and retain young people in the fields of Science, Technology, Engineering, and Mathematics" (Bequette & Bullitt, 2012, p. 43).

Science, Technology, Engineering, Arts, and Mathematics programs offer a way for students to explore a deeper meaning to learning and are also instrumental in the teaching of the whole child (21st Century Schools, 2010). An additional benefit of STEAM programs includes encouraging teaching that creates stimulating and inspiring classrooms. Incorporating the Arts in to the STEM curriculum may be a way for educators to "help students to use their creativity and imagination to address interesting and important subjects, and where teachers push students to continue learning long after the exam is over" (Boykin & Noguera, 2011, p. 175).

Today's students face many challenges that will require creative solutions and in the coming decades, many of our best leaders may come from the art and design backgrounds. Employers of the future will also be looking for potential employees who have a solid liberal arts education (Gorgon, 2010).

Creativity and ingenuity have always been central to the American story of progress.

There is no greater integrity, no greater goal achieved, than an idea articulately expressed through something you made with your hands. We call this constant dialogue between eye, mind, and hand ‘critical thinking-critical making.’ It’s an education in getting your hands dirty, an understanding why you made what you made, and owning the impact of that work in the world. It’s what artists and designers do. (Maeda, 2012, para. 4)

One advocate for incorporating the arts into the STEM equation is Linda Keene, a professor of architecture and environmental design at the Art Institute of Chicago. According to Keane, “the ‘A’ for arts includes design, a process applied by professions in fields as diverse as urban planning and mechanical engineering. The arts and design create meaningful relationships between the built and natural environments” (Haller, 2012, para. 5). Science, technology, engineering, art, and mathematic programs are an opportunity for teachers to learn and teach about the many areas where STEM and art intersect. Infusing art into STEM allows for “a different way of perceiving and knowing and dealing with the world, as a means to expand the toolbox of science and engineering” (Wynn & Harris, 2012, p. 42).

Not only is STEAM gaining interest from educators but it has become a hot topic in government and research circles as well. In Rhode Island for example, House Resolution 319 “expresses the sense of the House of Representatives that adding art and design to federal programs targeting Science, Technology, Engineering and Mathematic (STEM) fields, encourages innovation and economic growth in the United States” (Maeda, 2012, para. 8). Innovation, the complex process of introducing novel ideas in order to develop cutting-edge breakthroughs, requires highly capable, creative thinkers. If the United States is to be successful

in developing future STEM innovators, then our educational system must work to identify and nurture ability (National Science Board, 2010).

One such innovator is Apple founder, Steve Jobs, who credits linking technology with creative thinking and artistic design as a key factor in his vast accomplishments (Wynn & Harris, 2012). According to Jobs, many people define design differently than he does. “It’s interior decorating...But to me, nothing could be further from the meaning of design. Design is fundamental to the soul of human-made creation that ends up expressing itself in successive outer layers of the product or service” (www.macstorie.net). Yet as budgets are tightened, it is the arts that are eliminated first in schools even as the arts are being recognized as essential to innovation. The hallmark of success in STEM and in art is innovation. It is innovation that drives major advancements in all fields (Wynn & Harris, 2012).

STEM and student engagement.

Student engagement can be defined as a "student's willingness, need, desire and compulsion to participate in, and be successful in, the learning process promoting higher level thinking for enduring understanding” (Bornia et al., 1997, p. 294). Another definition of student engagement is when one has a long-term disposition for learning, “viewing learning as fun, seeing it as important, seeing the value of working with and functioning as part of a team, being part of a social institution...these are critical lifelong skills” (Willms, 2011, p. 4). Student engagement can be separated in to three dimensions: behavioral engagement, emotional engagement, and cognitive engagement. Behavioral engagement is being actively involved in academic events. Emotional engagement consists of those positive feelings while performing those academic events. When students exhibit a mental investment in their thinking they are said to be cognitively engaged (Wu, Anderson, Nguyen-Jahiel, & Miller, 2013). Cognitive or

intellectual engagement is associated with student achievement. When students are intellectually engaged, they show motivation to learn and display effort in their learning (Willms, 2011).

Student engagement is essential for learning (Carter, Reschly, Lovelace, Appleton, & Thompson, 2012) and what teachers do in class influences student engagement (Marzano, Waters, & McNulty, 2005; Hattie, 2012). For students to be intellectually engaged, quality instruction provided to students is required (Willms, 2011). In order to increase student engagement, Marzano (2013), suggests teachers ask themselves four questions to assist in lesson planning where student engagement is the guiding element.

- 1) Do I provide a safe, caring, and energetic environment?
- 2) Do I make things interesting?
- 3) Do I demonstrate why the content is important?
- 4) Do I help students realize that personal effort is the key to success? (p. 82)

Traditional, mechanical, lecture-filled teaching does little to affect student engagement (DeJarnette, 2011). Student learning is an active not passive process requiring the active engagement of the learner. Using an integrated STEM approach encourages the learner to be actively engaged in his or her learning (Thomasian, 2011). Students who are actively engaged in their learning demonstrate greater effort, are curious about the learning and take initiative (Patel, Franco, & Lindsey, 2013).

According to Hattie (2012), “When teaching and learning are visible, there is a greater likelihood of students reaching higher levels of achievement” (p. 18). Making learning relevant to students and providing them with specific feedback both contribute to student achievement. Rather than engaging in simply the transmission of knowledge, students and teachers should be involved in the construction of meaning (Drew, 2011). Providing feedback to students as they

are monitoring their own learning, can “provide greater confidence to engage further with the task” (Hattie, 2012, p. 120). Feedback can offer cues to help students focus on being successful with a task. Motivation is also a byproduct of feedback, causing students to put forth a greater effort into the learning task resulting in increased student engagement (Hattie, 2012).

Student engagement is also enhanced when teachers teach to the students’ frame of reference and connect new learning to their lives. “Powerful, passionate, accomplished teachers are those who focus on students’ cognitive engagement with the content of what it is that is being taught” (Hattie, 2012, p. 19). Involving students in their own learning is essential for students to be intellectually engaged in the learning process.

If students are not engaged in the learning process, all of the testing, data analysis, teacher meetings, and instructional minutes in the world will not motivate them to learn. In the final analysis, the only instructional program that makes a difference is one that involves students in their learning, demonstrates their social connectedness, and secures their investment in the future. (Kidwell, 2010, p. 30)

When schools focus more on the STEM processes, instead of traditional textbook teaching, students are better prepared for the real world of science (Roth & Eijck, 2010). The inquiry style of instruction accompanied in STEM curriculum challenges students to think beyond basic facts. “Engagement is higher in classrooms in which students perceive instruction as challenging and in which there are peers who are also similarly challenged” (Hattie, 2012, p. 52). Science classes that incorporate problem solving, critical thinking, and open-ended inquiry excite learners (DeJarnette, 2011). Excited learners are actively involved in their learning. “Not only do STEM lessons and activities excite young learners, but they also build their confidence

and self-efficacy in relation to their own abilities to be successful in math and science” (DeJarnette, 2011, p. 80).

A motivational element for students in the STEM curriculum is technology but technology integration for teachers can be challenging. The International Society for Technology in Education (ISTE) has developed programs to assist schools and teachers with technology integration. According to Meyer (2013) professional development programs aimed at providing teachers with tools and strategies for using mobile learning in the classroom have “had a positive effect on student engagement and interest in STEM subjects” (para. 1). Corporations are also assisting with technology integration. The Verizon Foundation created the Verizon Innovative Learning Schools (VILS) program to offer professional development training to teachers. The VILS programs includes both hands on and web-based resources for teachers to assist them in incorporating technology into their classrooms. The program also works to increase student achievement and student engagement in STEM subjects. Of the middle and high school students who participated in the VILS program, 40 percent demonstrated increased engagement (Meyer, 2013).

Push for STEM Education.

The opening paragraph of the 1983 report *A Nation at Risk*, states, “Our Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world” (National Commission on Excellence in Education, 1983). Thirty years later, the United States still struggles to lead in the competitive global marketplace. The economy of the United States is faltering and is falling behind other countries especially in the areas of science, technology, engineering, and mathematics. With fewer people graduating from colleges and universities in STEM-related

fields, employees are having difficulty competing with a high-tech, globalized workforce (Basham, Israel, & Maynard, 2010).

There is a growing concern for the state of STEM learning in the United States. “Roughly 75 percent of U.S. 8th graders are not proficient in mathematics when they complete 8th grade” (National Research Council, 2011, p. 3) and “only 16 percent of American high school seniors are proficient in mathematics and interested in a STEM career” (www.ed.gov/STEM). Employers are being affected by this lack of mathematical proficiency. Many employers state that job applicants are “lacking the needed mathematics, computer, and problem-solving skills to succeed and international students fill an increasing portion of elite STEM positions in the United States” (National Research Council, 2011, p. 3).

A study by Georgetown University Center on Education and the Workforce projects by 2018, nearly “eight million jobs in the United States economy will require a college degree in STEM” (Murphy, 2011, para. 3). The U.S. Department of Education also claims that 75 percent of the fastest growing occupations will require strong mathematics and science training (Becker & Park, 2011).

Successful STEM education requires a common vision among business leaders and educators yet a study conducted by students in the STEM Education and Leadership program at Illinois State University, found that STEM education is not fully understood. There really is not a clear vision for STEM education and there are inconsistencies on how STEM education is being implemented. The push for STEM education appears to primarily grown from a concern for a low number of future professionals to fill STEM jobs and careers (Brown, Brown, Reardon, & Merrill, 2011).

In an effort to create a clear and common vision, there is a national effort to improve education at all levels of the STEM discipline. The first initiative is called *The Partnership for 21st Century Skills*, where its primary goal is to prepare American students for the skills they will need to compete in the global economy. The *Partnership for 21st Century Skills* is both a public and private organization of leaders and educators in business and education. This initiative hopes to help build the skill set needed to succeed in STEM disciplines (www.p21.org).

The *Partnership for 21st Century Skills* “has been the leading advocacy organization in the United States focused on infusing 21st century skills into education” (Johnson, 2009, p. 11). Twenty-first century skills, as defined by www.curriculum21.com, are the skills students need in order to be successful in the 21st century. These skills include cross-curricular skills and learning to learn skills such as digital literacy, critical thinking skills, and problem-solving strategies.

The collective vision of the 21st Century Skills partnership is known as the *Framework for 21st Century Learning*. The Framework “describes the skills, knowledge and expertise students must master to succeed in work and life; it is a blend of content knowledge, specific skills, expertise and literacies” (“P21 Framework,” 2014, p. 1). There are six critical elements for creating 21st century skills. (1) *Emphasize core subjects*. Moving from a basis mastery of content knowledge to a deeper understanding of academic content is necessary for 21st century learning. (2) *Emphasize learning skills*. These skills include communication, problem-solving, and interpersonal skills. (3) *Use 21st century tools to develop learning skills*. Students will need to be proficient in information and communication technologies to succeed in this increasingly digital age. (4) *Teach and learn in a 21st century context*. When learning is relevant and meaningful to students, they have a deeper understanding of the content. Technology has

enabled classrooms to extend beyond the classroom wall and into the global community.

(5) *Teach and learn 21st century content.* Having a global awareness and being literate in economics, business and civics, are skills needed in the workplace. (6) *Use 21st century assessments that measure 21st century skills.* Standardized testing provides limited information on what students learn. Creating more formative and summative assessments to assess 21st century skills to improve teaching and learning, are necessary (Partnership for 21st Century Skills, n.d.).

Another national effort is the *Educate to Innovate* campaign. President Obama mandated this initiative to put the science, technology, engineering, and mathematic crisis front and center. Through the collaborative efforts of the federal government, leading companies, and educational societies, the *Educate to Innovate* campaign's focus is to improve the performance and skills of American students in STEM content (DeJarnette, 2011). The *Educate to Innovate* campaign effort includes over \$260 million in investments to both public and private endeavors with the goal to get American students back to the top of the pack in international science and math achievement. These investments will primarily be directed at increasing literacy in science, technology, engineering, and mathematics, improving teacher quality in math and science, and expanding STEM education for all groups-especially minorities and women (Office of the Press Secretary, 2009).

President Obama (Sept 16, 2010) said, "Leadership tomorrow depends on how we educate our students today-especially in science, technology, engineering and math." This increased awareness of the importance of a STEM education has resulted in some promising findings. According to the National Center for Education Statistics, from the years 2000 to 2009, there has been a 12.4 percent increase in the number of degrees conferred in science, technology,

engineering, and mathematics at Title IV colleges and universities (U.S. Department of Education, 2011). Even with this increase, STEM related jobs are unfilled due to a STEM-skills shortage ("STEM vital signs," n.d.).

In order to meet the demands of the high-tech global economy, the need for professionals in the field of science, technology, engineering, and mathematics continues to grow. An effort to increase the number of individuals in the United States who are in STEM professions has resulted in a greater focus placed on STEM initiatives in American (Avery & Reeve, 2013).

Our science, technology, engineering, and mathematics workforce is the backbone of our innovation economy and the source of our economic and national security. We must value science, those who do it, and those who teach it-and we must tap all of the talent this nation has to offer. Success begins in the classroom. (The Heritage Foundation, 2008, p. 1)

The proponents of STEM education believe that, "by increasing math and science requirements in schools, along with infusing technology and engineering concepts, students will perform better and be better prepared for advanced education or jobs in STEM fields, often referred to as the STEM pipeline" (Brown et al., 2001, p. 5).

The United States has become increasingly dependent on foreign-born talent to fill STEM fields as fewer U.S. students are entering STEM fields. In order to change that, the National Science Foundation suggests all students, including the most talented, "should have the opportunity to experience inquiry-based learning, peer collaboration, open-ended, real-world problem solving, hands-on training and interactions with practicing scientist, engineers and other experts" (National Science Board, 2010, p. 16) in STEM fields. This should begin early in a student's educational career as interest in STEM often begins to develop in elementary school.

Science, technology, engineering, and mathematics education initiatives are now numerous, thanks to many large corporations who support STEM programs and contests as a means of building their future workforce. However, the majority of STEM projects are geared towards high school students and universities. There are very few STEM initiatives that focus primarily on elementary school students and teachers. Yet, the pivotal foundation for future student learning is found in the elementary grades (Epstein & Miller, 2011). The optimal time to create an interest and connection in STEM fields would be in the elementary years (DeJarnette, 2011). “Early learning experiences can contribute to positive academic trajectories in STEM fields, thus a concentration in STEM at an early age can encourage children to believe that they can succeed in STEM domains” (Ricks, 2012, p. 10-11).

Elementary grades offer unique opportunities for integrative approaches to STEM education and are absolutely the place to begin these integrative approaches. “If America hopes to effectively address the ‘STEM pipeline’ problem, we must find ways of developing young learners’ interest in STEM education and must sustain that interest throughout their remaining school years” (Sanders 2009, p. 22). While scientific problem-based activities are primarily seen in middle school and high school classrooms, elementary students have the cognitive abilities to engage in STEM content and their accompanying problem solving activities (DeJarnette, 2011). Science, technology, engineering, and mathematic activities are exciting to the learner and help to build confidence in their own scientific learning.

Infusing a STEM curriculum in to elementary classrooms creates academic gains for students. The results of a STEM education include increased problem-solving skills, critical thinking, and analytical thinking in students as well as lead to better real-world connections in the curriculum (Brophy, Klein, Portsmor, Rogers, 2008). An increase in student engagement and

improved reading scores are also found to be a result of Elementary STEM (NTA Reports, 2013).

Magnet Schools

Throughout the planning process, John Thomas School of Discovery was called a magnet school and based on the definition of a magnet school, this was the appropriate term. According to Merriam-Webster dictionary, a magnet school is a school with superior facilities and staff and often has a specialized curriculum designed to attract pupils from throughout a city or school district ("Merriam webster dictionary," 2012). Magnet schools were originally conceived as a means of promoting integration in racially divided communities. They were designed to entice racially and ethnically diverse students from different neighborhoods. Innovation was a second component as magnet schools typically offer special themes such as science, the arts, or communications (Hendrie, 1998).

Brief history of magnet schools.

The 1954 Supreme Court decision in *Brown vs. the Board of Education* ordered the desegregation of schools and is believed to have been the catalyst for the migration of white, middle class parents to urban areas (Rossell, 1990). Since the *Brown* decision, magnet schools have become one of the most frequently used policy options to encourage white, affluent families to return to high minority schools (Bauch & Goldring, 1996).

Magnets schools opened in the late 1960s and early 1970s with the original purpose of desegregation. The first magnet school opened in 1968 in Tacoma, Washington and the second school opened in 1969 in Boston, Massachusetts. Within a decade, hundreds of magnet schools opened up all over the country (Rossell, 2005). Magnet schools provided an educational option

so attractive that students and parents would be drawn to it. This would reduce the need for involuntary desegregation measures within the school district (Metz, 2003).

Supporters of magnets schools have the assumption that aligning curriculum with students' interest will improve student achievement (Edward, Walters, & Smith, 2010).

Early magnet school curricular programs mirrored specialty school themes such as mathematics, science, and performing arts. But magnet school programs were designed to be different in one very important way-magnet school enrollment was driven by student choice based on interest rather than selection of students by testing. (U. S. Department of Education, 2004, p. 1)

Kansas City magnet schools.

Kansas City, Missouri experienced the most expansive and expensive desegregation plan in United States history. In the late 1960s, the school district enrolled more than 70,000 students. However, by the 1980s, parental confidence faltered due to teacher strikes and ineffective leadership. Enrollments in the schools declined to just 35,000 students (Dunn, 2008). Affluent whites moved to the suburbs and those who could afford it enrolled in private schools. The African American population became the majority. In 1985 a federal district judge took partial control over the troubled Kansas City, Missouri, School District (KCMSD) on the grounds that it was an unconstitutionally segregated district. Students attended run down facilities and experienced low academic performance. In an effort to bring the district into compliance, the judge ordered the state and district to spend nearly \$2 billion to build new schools, integrate classrooms, and improve student test scores (Ciotti, 1998).

With the enormous budget, the district built 15 new schools and renovated existing schools. Included in this project was the implementation of over 60 magnet schools. These

schools were state-of-the-art facilities. They had Olympic-sized swimming pools, planetariums, robotics labs, art galleries. The list of amenities was extensive. The magnet school programs had such themes as foreign language, technology, arts, and environmental sciences. They were designed to attract the suburban, middle-class students, in the hopes of improving school culture “whereupon blacks’ achievement would rise to match that of whites” (Ciotti, 1998, p 4).

By March of 1997, the judge finally agreed to let the state stop making desegregation payments to the district after 1999. There was little to show for all the money spent. Although the students enjoyed perhaps the best school facilities in the country, the percentage of black students in the district had continued to increase, black students' achievement had not improved, and the black-white achievement gap was unchanged (*Jenkins v. Missouri*, 1997).

The two primary objectives of the Kansas City plan was desegregation and improved learning. Neither of these objectives occurred. Instead, the plan drew criticism from the other school districts in Missouri who at that time were facing challenging budgeting issues. Teacher salaries were frozen, luxuries such as field trips and some extracurricular activities were canceled, and some teachers even lost their jobs due to budgetary cuts. Jay Nixon, Missouri attorney general, complained that “44 percent of the entire state budget for elementary and secondary education was going to just nine percent of the state’s students who were living in Kansas City and St. Louis” (Ciotti, 1998, p. 6).

Magnet schools today.

Given the increasing pressure to offer additional public school choices, magnet schools have been forced to evolve (Fleming, 2012A). These changing demands have created confusion and have left the purpose and the future of magnet schools in question. This is especially true with the increased push for charter schools. Even though magnet schools account for the largest

system of school choice in the United States, political and financial support has focused on the rapidly expanding charter school sector. This is despite the research which suggests that charter schools are not performing better than regular public schools (Siegel-Hawley & Frankenberg, 2012).

This is a pivotal time for school districts and education leaders to clearly define the role of magnet schools. The future of magnet schools will depend upon which policy values and priorities school leaders embrace and whether the federal role will emphasize racial diversity as an educational goal or place the highest value instead on accountability and innovation exclusively, at the expense of diversity. (Fleming, 2012B, p.2)

The diversity of some magnet schools has declined in districts where court-ordered desegregation mandates have been lifted (Fleming, 2012). According to Siegel-Hawley & Frankenberg, the 2007 Supreme Court decision in *Parents Involved in Community Schools vs the Seattle School District* placed restrictions on how school districts can use race when assigning students to schools, stating that the individual race of a student cannot be the sole determining factor in the student's school assignment (2012). The decision to outlaw race as a sole factor in admission decisions, changed the original goal of magnet schools. Throughout the country, districts are responding in one of two ways. "They are either adopting a race-blind system of admissions, thus converting the magnet to a themed school of choice, or they are constructing a system whereby race is only one of several factors considered in admission" (Rossell, 2005, p. 48).

One of the greatest challenges magnet schools face is the lack of funding at the state level (Fleming, 2012A). Magnet schools are often the target for cuts when funds are tight since funding for magnet schools by school districts is financed in the same way as other public

schools. While some magnet schools receive state desegregation funds, most funding comes from the local school district. On average, districts spend 200 dollars more per student in magnet schools compared to non-magnet school students. In an effort to conserve money during trying economic times, districts may choose to not support magnet schools due to the higher costs usually associated with them (Chen, 2007).

Despite the financial challenges, advocates for magnet schools believe they play an important role in providing choice within the public school setting. One such advocate is Robert Brooks, the Executive Director of Magnet Schools of America which is a non-profit advocacy organization. Brooks feels that there has not been a decline in interest in magnet schools but “magnet schools are now included as part of school districts’ broadening portfolio of options for parents” (Fleming, 2012, para. 7). While the magnet school concept has moved away from its initial intent, districts are recognizing that it is important for parents to be offered choices when it comes to selecting the best school for their child (Hon, 2012).

School choice policies, such as magnet schools, have given parents the ability to choose the right school for their children and allow school leaders the flexibility to create a successful learning environment for students (Cook, 2009). When schools compete to attract students, they must seek to improve their services. To help address the number of students who are leaving high school lacking necessary skills to pursue STEM education in college or the workplace, expanding school choice is a promising strategy to ensure students receive a quality education (The Heritage Foundation, 2008).

In this era of educational reform, magnet schools continue to provide parents a choice within the public school system. Even with declining state budgets and the removal of race quotas, magnet schools continue to remain an educational option. Rossell (2005) contends,

“Magnets have thus developed strong constituencies locally and nationally and, for the foreseeable future, remain an important, if less often noticed, feature of the American education landscape” (p. 49).

Professional Development

“A culture committed to student learning must be equally committed to the learning of teachers” (Fisher, Frey, & Pumpian, 2012, p. 163). In order to have students who are fully engaged in their learning, technology tools and resources are necessary, coupled with prepared educators who acquire new skills along with their students. Adequately preparing educators for an increasingly technological world requires training. Professional development is a way to better prepare teachers for the 21st Century. (Grunwald Associates, LLC, 2010).

Professional development can be defined as “a comprehensive, sustained and intensive approach to improving teachers’ and principals’ effectiveness in raising student achievement” (National Staff Development Council website, n.d., figure 34). Professional development includes continuing education to succeed and/or advance in one’s career. However, in the education profession, professional development not only affects the educator but it has an impact on students as well. Professional development can also be viewed as “learning opportunities that can be found in collegial conversations, coaching episodes, shared decision-making groups, reflective journals, and parent forums” (Lambert, 2003, p. 22). Other names are also associated with professional development such as professional learning, in-service, training, or continued education. No matter what the term, the goal is all the same- to improve learning for educators and students.

Need for high quality professional development for teachers.

The No Child Left Behind (NCLB) Act of 2001 made high-quality professional development a priority for school districts by requiring districts to hire, train, and maintain highly qualified teachers. Although high quality does not equate to being highly effective, rather it is the ability of the teacher to pass a test and acquire a set number of hours in the content area in which they teach. Under Title II of NCLB, the goal is to increase the academic achievement of all students by helping schools improve teacher and principal quality by ensuring teachers and principals are highly qualified (www.schev.edu). Professional development programs should be grounded in research. Systems to measure the effectiveness of professional development programs must be in place along with strategies used to document gains in student academic achievement. Improvement in teacher mastery of the academic subjects the teachers teach should also be documented (No Child Left Behind, 2002).

A crucial step to transform our schools and improve student achievement is to improve professional learning for educators (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). In the Department of Education's report, *Creating and Sustaining Successful K-8 Magnet Schools* (2008), professional development was seen as a critical tool to improve student learning. Three areas of professional development seen as the most valuable include on-going data analysis, learning and adapting teaching strategies for diverse learners, and curriculum planning to deepen content knowledge based on the schools' theme.

Teachers themselves understand the need for professional development as an important factor in affecting school success (McElroy, 2005). Continuous growth and development of teachers' knowledge and skills results in increased levels of student learning. Teachers' understandings of their subject matter is important as well as the awareness and implementation

of best practices needed to effectively impart their knowledge to the students. Both educators and their students benefit from successful professional development (Schwartz, 2001).

“Of all of the variables that influence student achievement, the two that have the most profound influence are teacher quality and leadership quality” (Reeves, 2009, p. 67). Both teacher and leadership quality can be improved through effective professional development practice. However, effective professional development is not a simple process or one that occurs rapidly. In order to transform schools to increase teacher effectiveness and improve student learning, a clear, sustained, systematic approach is required (Fullan, 2001).

According to the National Staff Development Council, high-quality professional development is different than the typical one day workshop or conference (National Staff Development Council website, n.d.) DuFour (1991) concludes, “The research is quite clear that little growth occurs as a result of a single training session” (p. 60). High-quality professional development is more continuous, more rigorous, and is classroom centered. It is ongoing and embedded into the school day (Wilkinson, 2006). Simply attending professional development does not ensure its effectiveness. When professional development is effective, it allows educators to increase their knowledge and develop skills to meet the diverse needs of their students.

Professional Development and STEM Schools.

The Obama administration has called for increasing STEM education with the *Educate to Innovate* initiative. A by-product of this effort is the *Change the Equation* initiative. Change the Equation (CTEq) is a nonprofit organization led by business leaders. It was created to address the lack of STEM careers and lack of education for these professions. Change the Equation has three primary goals. (1) *Improving philanthropy*. Create high quality corporate sponsored

programs to offer students a broader understanding of the STEM disciplines. (2) *Inspire youth.* Ignite a passion for STEM fields and provide a solid STEM education. (3) *Advocate for change.* Support research-based strategies to increase STEM learning (Nadelson, Seifert, Moll, & Coats, 2012).

There is also a need to enhance teacher's ability to teach STEM. "Enhancing the quality and quantity of K-12 STEM education is inextricably linked to the continued professional development of K-12 teachers" (Nadelson et al., 2012, p. 69). However, there is a lack of preparation for teachers to teach science, technology, engineering, and mathematic disciplines. Providing teachers with professional development will help them gain confidence in this area. "The link between teachers' comfort, their motivation to teach, and student learning in STEM provides good reason for attending to comfort and related variables in professional development directed at enhancing teacher capacity to teach STEM content and curriculum" (Nadelson et al., 2012, p. 70).

According to the National Science Board (2010), elementary classrooms should offer rich, inquiry based science instruction. However, science is all but ignored in the elementary grades. Fulp, (2002) reported that science was taught for less than twenty-five minutes a day and of that time students were reading about science rather than engaging in hands-on science. Not only has science instructional time decreased, but few elementary teachers engage in professional development activities to improve their science instruction (Cotabish, Dailey, Hughes, & Robinson, 2011). High stakes testing, mandated by NCLB, may be a contributing factor in the decrease of science instruction. With accountability being measured on communication arts and mathematics achievement, science and social studies have become a

lessened focus. In an effort to increase science instruction in schools, the National Science Foundation calls for policy to:

support rigorous, research-based STEM preparation for teachers, particularly general education teacher, who have the most contact with potential STEM innovators at young ages. Attention should be given to training teachers in the most effective methods of teaching STEM content, including hands-on and unstructured problem solving and inquiry-based learning. (National Science Board, 2010, p. 17)

Planning high quality professional development for educators.

While policymakers and educators alike recognize the importance of providing high quality professional development for educators, research conducted by the National Staff Development Council (NSDC) found that “well-designed professional development is still relatively rare, and few of the nation’s teachers have regular opportunities for intensive learning” (Darling-Hammond et al., 2009, p. 19). To be considered effective, professional development requires

thoughtful planning followed by careful implementation with feedback to ensure it responds to educators’ learning needs...professional development is not effective unless it causes teachers to improve their instruction or causes administrators to become better school leaders. (Mizell, 2010, p. 10)

The National Staff Development Council outlines basic principles for designing professional learning for educators. Professional development should (1) be intensive, ongoing, and connected to practice (2) focus on student learning and address the teaching of specific curriculum content (3) align with school improvement priorities and goals and (4) build strong working relationships among teachers (Darling-Hammond et al., 2009).

In 1994, the NSDC developed the first set of nationally accepted Standards for Professional Development. Many professional organizations contributed to the development of these standards which became a “unique set of materials- staff development standards- which provide a framework for thinking about professional development” (Roy & Hord, 2003, p. 6). In 2001, the Standards were condensed from standards outlined for three separate school levels to a single set appropriate for all the K-12 levels. The revision consisted of 12 standards and provided a guide to implementing high quality staff development. The 12 standards of high quality professional development include the following: Learning Communities, Leadership, Resources, Data-Driven, Evaluation, Research-Based, Design, Learning, Collaboration, Equity, Quality Teaching, and Family Involvement.

The Standards can be categorized into three distinct areas- context standards, process standards, and content standards (National Staff Development Council website, n.d.). Context standards support professional development and the changes it is intended to bring about and are characterized by a shared sense of a need for change. Content standards, focused on proven instructional strategies, deepen teachers’ subject matter knowledge and sharpen classroom skills. They contribute new knowledge to the profession, increase the ability to monitor student work, and address identified gaps in student achievement. Process standards are researched based and based upon sound educational practice such as contextual teaching. They support interaction among master teachers, take place over extended time periods, and provide opportunities for teachers to try new behaviors in safe environments and receive feedback from peers (Harwell, 2003).

Professional development to professional learning.

In 2011, in an effort to keep up with the rigorous demands and increased accountability faced by educators, the standards were revised again. As part of this revision, the term professional development was changed to professional learning.

The decision to call these Standards for Professional Learning rather than Standards for Professional Development signals the importance of educators taking an active role in their continuous improvement and places emphasis on the learning. By making learning the focus, those who are responsible for professional learning will concentrate their efforts on assuring that learning for educators leads to learning for students. (Crow, 2011, p. 13)

Just prior to the 2011 revision, the NSDC changed its name to Learning Forward to reflect the changing landscape of professional learning. No longer was it a national organization but a global one whose new name offered a call to action with the goal of every student receiving instruction by effective educators (www.learningforward.org).

The latest revision of the Standards also identifies four prerequisites for effective professional learning. These must be in place for effective professional learning to occur. They include:

- 1) Educator's commitment to students, all students is the foundation to effective professional learning
- 2) Each educator involved in the professional learning comes to the experience ready to learn

- 3) Because there are disparate experience levels and use of practice among educators, professional learning can foster collaborative inquiry and learning that enhances individual and collective performance
- 4) Like all learners, educators learn in different ways and at different rates (Crow, 2011, p. 22-23)

Establishing the four prerequisites to set the foundation for professional learning to occur contributed to the narrowed focus of the standards. Learning Forward's standards center on seven standards focused on educator learning in relation to successful student learning. "The standards require professional learning that is interactive, relevant, sustained, and embedded in everyday practice" (Crow, 2011, p. 30).

- 1) *Learning Communities*- Professional learning that increases educator effectiveness and results for all students occurs within learning communities committed to continuous improvement, collective responsibility, and goal alignment.
- 2) *Leadership*- Professional learning that increases educator effectiveness and results for all students requires skillful leaders who develop capacity, advocate, and create support systems for professional learning.
- 3) *Resources*- Professional learning that increases educator effectiveness and results for all students requires prioritizing, monitoring, and coordinating resources for educator learning.
- 4) *Data*- Professional learning that increases educator effectiveness and results for all students uses a variety of sources and types of student, educator, and system data to plan, assess, and evaluate professional learning.

5) *Learning Designs*- Professional learning that increases educator effectiveness and results for all students uses a variety of sources and types of student, educator, and system data to plan, assess, and evaluate professional learning.

6) *Implementation* -Professional learning that increases educator effectiveness and results for all students applies research on change and sustains support for implementation of professional learning for long-term change.

7) *Outcomes*- Professional learning that increases educator effectiveness and results for all students aligns its outcomes with educator performance and student curriculum standards (Crow, 2011, p. 43)

Leadership plays a critical role in student learning. “The work of leadership is to create the conditions that support continuous professional learning that results in improved classroom practices such that students engage and learn at high levels” (Wahlstrom & York-Barr, 2011, p. 25). Learning Forward’s Leadership standard identifies three key areas- building capacity, providing support, and distributing responsibility. When leaders build capacity they help others recognize the influence he or she has to affect student learning. They encourage personal growth and help others build self-efficacy. Leaders also provide support for professional learning. Whether it is finding time in the schedule for collaboration or the allocation of scarce resources, leaders create a supportive environment for learning to occur. Distributing responsibility creates an environment of shared accountability. It increases collaboration among all stakeholders and encourages shared responsibility in improving student achievement (Wahlstrom & York-Barr, 2011).

When school leaders become instructional leaders, an effective professional learning system ensues.

In an effective professional learning system, school leaders learn from experts, mentors, and their peers about how to become true instructional leaders. They work with staff members to create the culture, structures, and dispositions for continuous professional learning and create pressure and support to help teachers continuously improve by better understanding students' learning needs, making data- driven decisions regarding content and pedagogy, and assessing students' learning within a framework of high expectations. (Darling-Hammond et al., 2009, p. 3)

Meeting the needs of today's learners will require more than the traditional one teacher, one classroom. Instead, classrooms will "have to give way to a culture in which teachers continuously develop their content knowledge and pedagogical skills through collaborative practice that is embedded in the daily fabric of their work" (Fulton & Britton, 2011, p. 5). Collaborative professional learning experiences are designed to allow teacher input and perspectives into developing professional learning activities connected to increased student learning (Guskey & Huberman, 1995).

The Change Process

While science, technology, engineering, and mathematics initiatives to improve student learning are numerous, any educational reform would benefit from an understanding of the change process (Fullan, 1993). Having an understanding of the change process and the outcomes of the change is essential for the change to be effective. The failure of school reform is not in the ideas, but instead is the result of ineffective implementation of those ideas (Speck, 1996). Implementing curricular advancements in public schools, such as STEM and STEAM education, requires those implementing the change to study the change process so they can help those involved with the change cope with the change. "Understanding the dynamics and implications

of change becomes a powerful means for the successful implementation of an educational innovation (Speck, 1996, p. 71).

Peter Senge, during his lecture at the Massachusetts Institute of Technology explained the need for change in our schools by asking the following question. “How has the world of a child changed in the last 150 years? And the answer is, ‘It’s hard to imagine any way in which it hasn’t changed.’... yet if you look at schools today verses 100 years ago, they are more similar than dissimilar” (Partnership for 21st Century Skills, n.d., p. 6). In an effort to keep up with the technological advancements of society, change has become a constant variable within public education. “Any change will meet resistance, because change is loss” (Reeves, 2009, p. 45). The process of change requires individuals to change their beliefs and behaviors. Change also requires organizations to change their existing policies, established practices, and basic core principles for success and failure (Tanner, 2004).

Researcher Michael Fullan, has lead the educational community to understand that change is not an “event that occurred in such a way that a ‘before’ and ‘after’ could be recognized and managed but instead defined change as a process” (Fullan, 1982, p. 41). Since change is inevitable, it is important to study the change process in order to better understand it and determine the most effective methods of implementation.

Systemic change involves a cyclical process. Taking into consideration the impact the change has on all parts of the organization and their relationships to one another is at the center of systemic change (<http://www.nsba.org/sbot/toolkit/whatsc.html>). When a system desires to implement a systemic change, the entire organization needs to be considered. If one part of the organization changes, the other parts will also be changed because of the interrelationships among the parts are interconnected (Zera, 2002).

A successful change in an organization depends upon the clarity of purpose and the activities and outcomes expressed by the individuals involved in the change process (Spencer & Winn, 2005). Often times in the change process, the ones responsible for promoting and affecting the change process are overlooked (Bolman & Deal, 2008). Kotter (2002) states, “too many change initiatives fail because they rely too much on data gathering, analysis, report writing, and presentation instead of a more creative approach aimed at grabbing the feelings that motivate useful action” (p. 8).

While there are many ways to implement change, planned change is the most commonly used. Planned change is a “purposeful, calculated and collaborative effort to bring about improvements with the assistance of a change agent” (Mitchell, 2013, p. 32). When studying the process used to plan, implement, and sustain systemic change, it is important to identify models of change used to guide the process. Models can provide an explanation as to why change occurs, how change will occur, and what the outcomes may be. Models also offer varying assumptions about the nature of humans and organization. Prominent researchers in the change literature include John Kotter, Michael Fullan, and Peter Senge.

One model is Kotter’s Eight Step Change Model. The model lists eight stages and is a step by step tool for addressing the need for effective communication at all levels of the organization throughout the change process. Kotter believes if any change initiative is going to be effective and sustained, the initiative must evolve through these eight steps (Reeves, 2009; Kotter, 2007). The model was designed to be followed sequentially and without skipping any steps. The first step in implementing change is to create a sense of urgency, convincing the employees that change is necessary. Next you need to enlist a team of respected employees/stakeholders and construct the vision which will show clearly how the change will

have a positive impact on the future of the organization. Communicating that vision to all stakeholders is essential so everyone understands the vision. The next step is to empower the employees to execute the change and then create and accomplish short term goals so progress is evident. The final steps include being persistent while continuously monitoring progress. After short term goals have been met, create additional goals therefore keeping the momentum of the change process going. To complete the change process, the change needs to become permanent and part of the culture of the organization (Kotter, 2007).

Senge (1990) offers another model for implementing effective change within an organization. He suggests five disciplines in which employees must engage for an organization to learn and be efficient. He lists those disciplines as Personal Mastery, Mental Models, Shared Vision, Team Learning, and Systems Thinking. *Personal mastery* is the act of clarifying and deepening personal vision and developing focus, patterns, and objectivity. *Mental models* refer to addressing ingrained assumptions and generalizations that influence perceptions of the world. *Shared vision* is working with others to create future success of the organization that is mutually beneficial. *Team learning* is the creation of an educational environment when team members work together to learn without preconceptions. *Systems thinking* is the integration of all of the disciplines. Applying systems thinking creates an organization where the whole becomes greater than the sum of its parts.

Incorporating all of the disciplines is the key to transforming traditional organizations into learning organizations. “In a learning organization, leaders are designers, teachers, and stewards” (Senge, 1990, p. 351). A learning organization is able to adapt to change by incorporating new knowledge, is reflective, and is continuously striving to improve (Allison et al., 2011). While it would seem that schools are by nature learning organizations, “there is no

tradition or organization that supports carefully supervised learning of this kind” (Levin, 2008, p. 80). When leaders themselves become learners, they model the importance of continuous growth for others within the organization. Applying systems thinking fosters a learning environment where teams consistently strive to improve (Allison et al., 2011). “Building learning-centered cultures is hard work in any setting...Building learning-oriented cultures is demanding because learning stretches us personally, and it is always easier to stay in our comfort zone” (Senge, 1990, p. 299).

Fullan (2008) offers another model to assist leaders with the difficult process of implementing change. He outlines six conditions he feels organizations must have if a change is going to be successful and sustained over time. The six conditions and descriptions of each condition are 1) *Love Your Employees*. Invest in the development and well-being of your employees. (2) *Connect Peers with Purpose*. Foster continuous and purposeful peer interaction. (3) *Capacity Building Prevails*. Invest in the development of individual and collaborative efficacy of a whole group or system to accomplish significant improvements. (4) *Learning Is the Work*. View working and learning to work better as one and the same. (5) *Transparency Rules*. Clearly and continuously share results and the practices that led to the results. (6) *Systems Learn*. The system learns from itself on a continuous basis. People in the system learn new things all the time (Reeves, 2009).

The six conditions, or secrets, are not meant to be kept but shared with others. When you practice the secrets, you model the benefits of them for others to see (Fullan, 2008). Leadership is also about growing and developing other leaders (Allison et al., 2011). “Implementing the six secrets and developing other leaders become one and the same. Once you have a culture of

leaders at all levels operating this way, they reinforce each other as they go” (Fullan, 2008, p. 126).

Fullan, Senge, and Kotter emphasize the importance of capacity building throughout the change process as well as addressing the culture of the organization. These models also give much attention to the importance of the individuals within an organization. Leaders can use these models as guides as they attempt to navigate the change process.

Change leaders.

To a certain degree, the words leadership and change have become synonymous (Allison et al., 2011). Landale (2004) in his assessment of leadership theory and the change process, stated that, “If management is typically about maintaining the status quo, then leadership, in contrast, is all about motivation, direction, and delivering change” (p. 18). Successful leadership therefore requires an ability to understand the ways to effectively implement change.

Effective leaders are effective change agents.

Change leaders in schools know that we are engaged not only in the work of education but also in a complex enterprise of people, with all the human drama that accompanies personal pride and identity. The best change leaders use the primacy of people as a strategy, not an obstacle (Reeves, 2009, p. 87).

True change leaders realize that change within an organization will not truly change without changing individual behavior. If individual behavior is going to change, the leader must affirm the people behind the behavior (Fullan, 2008).

Effective change leaders also understand that affecting change requires collaboration (Allison et al., 2011). When working collaboratively with all stakeholders, leaders share the

message that in order to be the best we can be we must make the mission a joint responsibility (Reeves, 2009). “Taking the time to hear people’s ideas and concerns and to make sure that all involved have the talent, confidence and expertise necessary to carry out their new responsibilities is a requisite of successful innovation” (Bolman & Deal, 2008, p. 382).

Knowing that accountability pressures schools and districts into school improvement initiatives, having the right leader with the right style to be effective is critical. Leadership style is how a leader approaches all that they must do to bring about improvement (Hersey & Blanchard, 1982). Fullan (2001) stated “that leaders will increase their effectiveness if they continually work on the five components of leadership- if they pursue moral purpose, understand the change process, develop relationships, foster knowledge building, and strive for coherence- with energy, enthusiasm, and hopefulness” (p.11).

Change leaders know the importance of creating a clearly defined vision (Allison et al., 2011; Fullan, 2001; Reeves, 2009). The mission and vision of an organization should cause employees to be committed and engaged in the organization. When employees feel connected both socially and emotionally to the mission, vision, and purpose of an organization they are more engaged in the change process (Allison et al., 2011). That is why Fullan (2008) encourages leaders to love their employees and engage them at every level.

Secret one is not just about caring for employees. It is also about what works to get results. It is about sound strategies linked to impressive outcomes. One of the ways you love your employees is by creating conditions for them to succeed. It is helping all employees find meaning, increased skill development, and personal satisfaction in making contributions that simultaneously fulfill their own goal of the organization. (p. 174)

To help the change leader be more effective, Fullan (2011) describes the change leader framework. These seven elements of the change leader framework are easily understood one at a time. The challenge occurs and real change happens when the change leader learns to apply them in combination with each other. The seven elements are:

1) *Practice Drives Theory*- An effective change leader actively participates as a learner to help the organization improve. They examine the practices of others and try new strategies themselves while reflecting on the outcomes.

2) *Sustain Simplicity*- Effective change leaders tackle seemingly complex problems without feeling overwhelmed. They learn through practice and remain in a progressive learning mode.

3) *Be Resolute* – Change leaders combine resolute moral purpose with impressive empathy. Being resolute involves having a growth mindset. Change leaders understand that situations are not fixed but rather experiences from which to grow and learn. Impressive empathy is the ability to understand others who disagree with your point of view. Having this ability allows the change leader to understand where people who disagree are coming from and then decide how to best relate with them.

4) *Motivate the Masses* – Change leaders understand that forcing people to change does not work. People change when they are intrinsically motivated. Change leaders create conditions for others to learn, grow, and experience new things. Realized effectiveness is what encourages and motivates people to do more. Change leaders provide the initial spark to ignite change but know that real change will not occur unless there is a collective ownership to bring about change within the organization.

4) *Collaborate to Compete*- Working together to achieve a common goal is collaboration. Change leaders foster a collaborative culture by focusing on a small number of goals, forming a guiding coalition, encouraging capacity building both for individuals and collectively, and reaping the benefits of collaborative competition.

5) *Learn Confidently* – Change leaders display confidence knowing that failure is not an option and that through problem solving, they can figure out any difficult situation. Change leaders gain knowledge through reflective experience. They use their brain, they cultivate a growth mindset for themselves and others, they are indispensable in the right way, and maintain a high level of confidence.

6) *Know your Impact*- Effective change leaders use and integrate data, allowing them to monitor progress and reflect on practice. They know themselves and continuously work on personal mastery. Change leaders are humble and admit mistakes, establish a climate that fosters openness and reflective feedback, and celebrate success after it occurs-not before (Fullan, 2011).

The change leader framework is not a step by step guide to be followed. It is a collaborative process and a tool to foster deliberate practice: apply, learn, get feedback on results, do more, and so on. Being resolute is the driving force that flows throughout several of the other elements: empathetic relationship building, collaborative focus, becoming a confident learner; and continuously measuring and learning from the impact you and others are having. The qualities that hold this all together are deliberate practice and sustained simplicity. (Fullan, 2011, p. 43)

Leaders seem to either be initiating a change, involved in a change, or working to overcome the results of a previous change initiative. Wherever one is on the change continuum,

Kotter (2005) suggests two aspects that will help. When one thinks differently and feels differently, behavior changes therefore leading to improved results. The way one views things affects their actions and behaviors. More attention needs to be paid to the values and beliefs a leader possess (Allison et al., 2011).

Effective change leaders are skilled at reframing the negative connotations associated with change (Reeves, 2009). Bolman and Deal (2008) further explain the process of reframing. These researchers identify four distinctive frames people use to view their world. “A frame is a mental model, a set of ideas and assumptions, that you carry in your head to help you understand and negotiate a particular territory” (Bolman & Deal, 2008, p. 11). When one has a good frame, it allows the person to understand the issue or situation at hand and ascertain the best way to address the issue or situation. The four frames include Structural, Human Resource, Political, and Symbolic.

1) *The Structural Frame*- The structural frame refers to the environment including its roles, rules, goals and policies. Metaphorically, the structural frame is a factory or a machine. Leaders who work within the structural frame have the image of a social architect and are challenged by attuning structure to task, technology, and the environment. Essential strategies for leaders include communicating, realigning, and renegotiating formal patterns and policies.

2) *The Human Resource Frame*- The human resource frame is like a family and centers upon the needs, skills, and relationships of the people within an organization. Leaders who embody this frame empower the people within the organization. Aligning organization and human needs can be a challenge for leaders and training to develop new skills is essential to the success of the organization.

3) *The Political Frame*- The political frame is like a jungle. It includes the power, conflict, competition, and politics within an organization. When leaders create arenas where issues can be renegotiated and new coalitions can be formed are viewed as politically savvy and advocates for their organization. Managing conflict within the organization can be challenging for leaders.

4) *The Symbolic Frame*- The symbolic frame is like a temple or theater. Symbolic leaders use culture, meaning, rituals, and stories to inspire the people within the organization. The leaders create faith, beauty and meaning but during times of change, leaders must help individuals with the feeling of loss and purpose as they cling to the past. To help, leaders can create transition rituals, mourn the past, and celebrate the future. (Bolman & Deal, 2008, p. 18 & p. 379)

The Four Frames provide organizational leaders with multiple perspectives. Being able to see a problem or an issue within the organization from different vantage points helps the leader know how to respond appropriately. This multi-frame thinking helps the leader realize there are a myriad of ways to solve problems.

Because so many change initiatives are unsuccessful for affecting real change, taking an alternate path to the change process may prove beneficial. Before initiating any change on an organization, Senge (1999) suggests leaders stop and take in to account the culture of the organization and anticipate reactions to the proposed change. Reeves (2009) expands upon this concept with his Change Readiness Assessment. The assessment includes taking the proposed change and rating it in several areas such as planning, sense of urgency, stakeholder support, leadership focus, and effect on results. Each area has a potential score of one to ten, with ten being the most evidence that the characteristic is occurring. After the assessment is complete,

the scores are compiled and indicate the appropriate quadrant of the Change Readiness Matrix. The matrix identifies four areas based on the leader's capacity to bring about effective change and the organization's readiness for change. The four areas include: Ready for Resistance, Ready for Frustration, Ready for Learning, and Ready for Change. By taking time to assess how ready the organization is for change, a leader can save a lot of time and frustration implementing something that is destined to fail. "Only when you meet your colleagues' needs for stability will you be able to challenge them for successful change" (Reeves, 2009, p. 35).

Planning, implementing, and monitoring change.

It is necessary to monitor not only student results or effect data, but also the adult actions or cause data (Allison et al., 2011). As Reeves (2006) states, "Only by evaluating both causes and effects...can leaders, teachers, and policymakers understand the complexities of student achievement and the efficacy of teaching and leadership practices" (Reeves, 2006, p. 132).

One way school leaders can plan, implement, and monitor change is to create a district-wide plan for accountability. A Comprehensive Accountability Framework includes "research-grounded components that are captured in a written document and involve all system-wide stakeholders in a mutual and dynamic exchange of ideas" (Allison et al., 2011, p. 226). To ensure multiple points of views, the comprehensive accountability framework is led by a design team comprised of district officials including administrators, school board members and teachers as well as community leaders, parents and other stakeholders. The diverse design team establishes guiding principles to assist them throughout the creation of the framework. According to Allison et al., (2011), the following components are most commonly used by school districts to guide system-wide improvement:

1. System-wide vision and strategic goal statements

2. Multiple indicators of student learning
3. School and district improvement protocols and templates grounded in The Leadership and Learning Center's Planning, Implementation, and Monitoring research
4. Thorough Data Team guidelines ensuring district-wide implementation
5. Evaluation protocols for educators that are supportive, are based on clear standards, and include professional growth plans
6. Clearly stated requirements for research-based professional development practices
7. Vital internal and external district and school communication requirements
8. Specific guidelines for resource management that support the achievement of strategic goals
9. Meaningful reward and support structures that uphold the framework
10. Precise timelines that pace the implementation of the components contained in the accountability framework (p. 230-231)

The Comprehensive Accountability Framework encourages continuous improvement through shared leadership practices that foster a collaborative culture. Every staff member is involved in the implementation of action plans as well as the frequent monitoring of data to determine if their efforts result in increased student achievement (Allison et al., 2011).

The Leadership and Learning Institute developed the Planning, Implementation, and Monitoring or PIM Model to serve as a guide for school districts as they create improvement plans (Leadership and Learning Center, The, 2005). The *Planning* process requires conducting a comprehensive needs assessment to discover the needs of the organization. Through inquiry, cause and effect relationships are prioritized and identified. Smart Goals that are specific, measurable, achievable, relevant, and timely are developed and goals around the priorities are

established. *Implementation* requires the development of targeted research-based strategies grounded in research and demonstrate how they will support achievement. Action steps are created and provide clear guidance for planning, implementation, and monitoring. Professional development strategies are aligned with improvement goals to build capacity among faculty. Strategies clearly describe who will do what, when, and why to guide and ensure deep implementation--one that requires very explicit planning and delineation of protocols and priorities over a timeframe. Professional development should focus on coaching, feedback, and refinement needed to achieve mastery. *Monitoring* is the final step in the PIM model. Incorporating an evaluation process to determine the effectiveness of the improvement plan will allow the school to know if the goals are being met (Reeves, 2010, Allison et al., 2011).

Culture and the change process.

There are many different meanings of the word culture, especially as it pertains to a school. Schein (2010) suggests culture to be

A pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 18)

Another definition of culture can be simply defined as “the way we do things around here” (Reeves, 2009, p. 37). The culture of a school or district can be seen in the behavior, attitudes, and beliefs of the individuals and groups within the organization.

Effective leaders take into account how a proposed change would impact the culture of their organization and realize that if a change is going to be meaningful it must begin with a

cultural change (Allison et al., 2011). In fact, Reeves (2009) shares that “policy change without cultural change is an exercise in futility and frustration (p. 37).

Organizations who communicate throughout the change process help prepare their people for the change. “High-performing organizations go the extra mile to create cultures where people are prepared for and expect change. The culture supports risk taking, expects mistakes during the learning phase and supports individual growth and development” (Allison et al., 2011, p. 58).

While most school improvement plans focus on academics and student achievement, few plans include an intentional regard to the culture of the school. “An effective culture is the primary tool with which a leader fosters change” (Marzano et al., 2005, p. 48). Both developing school culture and creating academic success are essential, but neither one is sufficient by itself. Fisher et al., (2012) states, “no school improvement effort will be effective, maintained, or enhanced unless school culture and academic press are both addressed and aligned” (p.5). Schools have recognized leaders and traditions established by staff members who have been together for several years. These factors do not have to hinder principals in their quest to change a school, but they are areas that a principal must understand before moving forward aggressively with a change agenda.

When leaders disregard the organization’s culture, they face many challenges. Leaders need to not only be learners but also culture managers (Schein, 2010). The culture of innovation is a reflection of the school’s participatory leadership style, “where every stakeholder in the school is involved in the design, execution and sustainability of the school, its story and its future” (Ray, 2010, para. 6). Effective leaders recognize that there are norms, beliefs, and attitudes that characterize a school. This so-called “way of doing things” is important to

understand because if properly interpreted, it can be a tremendous force to harness for school improvement and change. “A culture that integrates action and reflection arrives at better decisions to which people can genuinely commit. And its people have a more prepared mental state” (Senge, 1990, p. 317).

Effective leaders are planners. They have a clear vision of what issues, problems, and demands that their schools will face in the future. As a statement of the future, the vision is clear and concise but flexible enough to allow for changes. With staff, effective principals foster and encourage change that focused on student achievement as the primary goal. Teachers are encouraged to develop new strategies and approaches to deal with the new challenges facing schools. “An effective leader builds a culture that positively influences teachers, who, in turn, positively influence students” (Marzano, Waters, & McNulty, 2005, p. 47). Marzano (2005) identifies four behaviors associated with leaders who foster a positive culture. Leaders 1) promote cohesion among staff 2) promote a sense of well-being among staff 3) develop an understanding of purpose among staff and 4) develop a shared vision of what the school could be like (p. 48).

Good leaders have the power to change organizations, while better leaders have power to change people. Human beings are at the heart of organizations. Simply changing people can create a positive culture in terms of the development and growth of the organization, especially in schools. (Turan & Bekas, 2013, p. 157)

Sustaining the innovation within the organization is the end goal of educational reforms. Curricular innovations such as STEM and STEAM, like any change initiative, requires planning. “Deliberate planning for change with the individuals involved will make the difference in the implementation of the change and will help sustain the efforts” (Speck, 1996, p. 78). Studying

the change process provides leaders a guide to use as they implement change within their organization.

Summary

The literature reviewed acutely informed the researcher's study. The first part provided a definition of magnet schools and explained the recent push for schools to provide an integration of science, technology, engineering, and mathematics into the curriculum. In order to enhance the effectiveness of a STEAM magnet school, professional development of its teachers was seen as the key factor. The review of literature concluded with research on the change process as to better understand the effects of change on an organization.

Chapter three details the research design and methodology as they relate to data collection and analysis. Also provided in chapter three is an explanation of the sample selection procedures, the data collection procedures, and a description of the data analysis.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter describes the methodology used for this study. Included in this chapter are the research questions for this study, the design of the study as well as a rationale for the case study approach. Additionally, sampling strategies and the data collection process are described. Attention is also given to the role of the researcher with emphasis on validity and accuracy of the study.

Description of Methodology

This study focused on a school district's implementation of a magnet school and the changes the school district experienced as a result. The purpose of this qualitative case study was to document the change process the Nixa Public Schools underwent with the implementation of a STEAM magnet school. In a qualitative study, "the design is emergent and flexible, responsive to changing conditions of the study in progress" (Merriam, 1998, p. 8). Qualitative research utilizing the case study methodology is appropriate for the study of the implementation of a magnet school and systemic change. A case study is defined as an "in-depth study of instances of a phenomenon in its natural context and from the perspective of the participants involved in the phenomenon" (Gall, Gall, & Borg, 2003, p. 436).

To fully understand the change process, interviews of various stakeholders were conducted. By interviewing those directly impacted by the change process, the researcher was able to gather their perceptions regarding the implementation of a STEAM magnet school within

the district. Those interviewed also had an opportunity to share their insights on the process, both positively and negatively, and share any lessons learned during the process.

Multiple data sources are necessary to tell the complete story of this change process. The researcher examined artifacts and documents from the Nixa School District which included but not limited to news articles, past surveys, emails, and district memos. Creswell (2003) and Yin (2009) concur that triangulation, or converging all data sources, is necessary to ensure reliability. Creswell (2003 p. 196) advises researchers to, “Triangulate different data sources of information by examining evidence from the sources and using it to build a coherent justification for themes.”

This study attempts to examine the effects of the implementation of a magnet school within a suburban school district, as it is understood by those directly involved in the change process. Additionally, this study interprets and analyzes essential themes involved in the change process and examines how these elements influence the systemic change process.

Research Questions

The following is a primary question applicable to this study on the implementation of a magnet school in the Nixa Public School system:

What were the effects of the implementation of a STEAM magnet school on students, parents, administration, and community members within the Nixa Public School District?

In an effort to narrow the focus of this case study, the primary question will be expanded upon with the following series of sub-questions:

Sub-Questions:

1. What opportunities and threats to the change process did the teachers, administrators, and school board encounter with the implementation of the magnet school?
2. What effect did the implementation of the magnet school have on parent and teacher attitudes both at John Thomas School of Discovery and in the other elementary schools within the Nixa School district?
3. From the teachers' perspective, what effect has the magnet school had on student engagement?
4. What professional learning did teachers receive to prepare them for teaching in a magnet school with a STEAM focus?
5. From the parents' perspective, what effect has the magnet school had on their child's attitude towards school?
6. From the administrators' perspective, what effect has the magnet school had on teacher attitudes and student engagement?

Participants

Participants of this case study included district level administrators, building administrators, teachers, and parents of the Nixa Public Schools. The researcher obtained permission to conduct research involved with this study from Dr. Stephen Kleinsmith, Superintendent of the Nixa Public School district.

Selection/Sampling

This study used two types of purposeful sampling to select participants. According to Merriam (1998), purposeful sampling is “based on the assumption that the investigator wants to

discover, understand, and gain insight and therefore must select a sample from which the most can be learned (p. 61). The typical case sampling method was used for determining what parents, teachers, administrators and board members would be interviewed. This method was used because it “reflects the average person, situation, or interest of the phenomenon of interest” (Merriam, 1998, p. 62). However, the snowball sampling method was used for subsequent samples of board members and parents. Also referred to as a chain or network, this type of sampling is the most common form of purposeful sampling. In snowball sampling, the researcher asks the participants to suggest other knowledgeable subjects who may add to the study therefore providing the researcher with a broader cross-section of participants. Initially, the researcher conducted focus group and individual interviews with the district administrators, the building administrators, and parent and teacher organizations. Participants were asked to suggest others to interview who are knowledgeable with this topic.

Research Design

Interviews and focus group sessions served as the primary data source for this study which is often the case in qualitative research (Merriam, 1998). Prior to conducting any interviews or observations, the researcher gained informed consent of the participants from the Research Review Board (RRB) in accordance to their guidelines. After receiving approval from the Nixa Superintendent, the researcher contacted participants selected for interviews. Interviews and focus group sessions were conducted at a time and place convenient for the participants. The researcher utilized an interview protocol with specific questions for each group- administrator, teacher, parent, board member. Each question in the protocol was coded to correlate to one or more of the sub-questions. The interview transcripts are found in the

appendix. To ensure accuracy, a digital recording of the interview was transcribed by a third party.

The researcher determined that a descriptive qualitative single case study (Yin, 2003) was appropriate for telling the story of the implementation of John Thomas School of Discovery within the Nixa School District. A single case study allowed the researcher to investigate the various aspects of the change process which would include the perceptions of the board members, administrators, teachers, and the parents.

Table 1: Summary of Research Design

Data Source	Data Collection	Data Analysis
Phase I Focus Group Interviews	Interviews	Review Documents Search for emergent themes
Phase II Individual Interviews; Districts documents, media	Interviews Review Documents	Code data Search for emergent themes
Phase III Second Interviews; School data and documents	Interviews Review documents	Review codes Search for emergent themes

The table above summarizes the research design the researcher used for this study.

Data Management Plan

The interview data was recorded on a handheld recording device. The recordings were uploaded and saved to the researcher’s password protected computer. A qualified third-party transcriptionist service was used to transcribe the taped interviews into Microsoft Word documents, a word-processing software. A copy of each transcript was emailed to the researcher from the transcriptionist and stored on the researcher’s personal computer. The computer had password and firewall protection. The author randomly checked the transcripts against the taped interviews to ensure accuracy. Additionally, each interview was saved and a backup file was created and stored on an external drive.

Data Analysis

The qualitative data analysis of this case study involved a “detailed description of the setting or individuals, followed by analysis of the data for themes or issues” (Creswell, 2003, p. 191). Focus group and individual interviews were the primary data source for this study. The researcher obtained consent before interviewing. The interviews were tape recorded and then later transcribed. A copy of the transcription was given to those being interviewed if they noted that on the consent form. Field notes were taken throughout the interviews to note the researchers’ observations and to help clarify responses.

The researcher followed the six steps of data analysis as described by Creswell (2003). Step One: *Organize and prepare* the data for analysis. The interviews were transcribed by an independent third party. The researcher utilized the online service provider REV.com for transcription. The service emailed the researcher a word document of each interview. The researcher printed the documents, placed them in a binder, and organized them into four categories- parent, administrator, teacher, and board member. Also included in the binder were field documents consisting of internal and external district communication and news articles. Before reading through the interview transcripts, the researcher created memos and recorded reactions to the interview experience. Step two: *Read through all of the data*. Reading through all of the data allowed the researcher to gain a general sense of the data and reflect on its overall meaning. Step three: *Coding process*. Coding is the process of “organizing the data into chunks before bringing meaning to those chunks” (Rossman & Rallis, 1998, p. 171). Each of the transcripts was reviewed and any significant statements were color coded. After various codes were identified, the researcher began collapsing the codes. Different colored highlighters to segment each code were collapsed by hand. All codes were entered into an excel sheet and then

collapsed several times subsequently to create sub-codes of the original codes to allow for manageability. Step four: *Description*. The data was coded to generate themes for analysis. The data was color coded with the different colored highlighters to indicate the different themes. A color was assigned to each theme. After the initial coding was completed by hand, the researcher utilized a qualitative data analysis software called QRS-Invivo10. Before using any computer assisted qualitative data analysis software (CAQDAS), the researcher must gain experience with hard-copy coding and become familiar with the basics of qualitative data analysis (Saldana, 2009). After the researcher developed an understanding of the coding process, the computer software was utilized to enhance the analysis process. “The software efficiently stores, manages, and reconfigures data to enable human analytic reflection” (Saldana, 2009, p. 22). All interview transcript word document files were uploaded to the software program. Based upon the hand coding analysis and CAQDAS, the researcher identified eight emerging themes. The transcripts were again coded for the themes. Upon further analysis, the eight themes were condensed into five themes. Step five: *Representation*. The researcher used narrative passages to describe the findings of the analysis. Each of the five themes included narrative passages as did the primary and six sub research questions. Step six: *Interpretation*. The researcher derived meaning from the data and shared her personal interpretations. (Creswell, 2003, p. 191-195)

Table 2: Detailed Process of Data Analysis

Step One: Organize and Prepare	<ul style="list-style-type: none"> • Sort and arrange the data • Transcribe the interviews
Step Two: General Sense	<ul style="list-style-type: none"> • Read through all data • Reflect on the overall meaning • Record general thoughts about the data
Step Three: Coding	<ul style="list-style-type: none"> • Create and label categories • Organize the material into “chunks”/categories
Step Four: Description	<ul style="list-style-type: none"> • Generate a description of the setting/people/categories/themes • Detail rendering of information • Generate small number of themes/categories • Display multiple perspectives
Step Five: Representation	<ul style="list-style-type: none"> • Narrative passage to convey the findings of the analysis • Detail discussion of themes • Discussion with interconnecting themes • Present a process model (grounded in theory)
Step Six: Interpretations	<ul style="list-style-type: none"> • Meaning of the data • Lessons learned • Researcher’s personal interpretation • Meaning derived from comparison of the findings to the literature/theories

Source: Creswell (2003)

The table above summarizes the appropriate steps the researcher took to analyze the data.

Validity

In an effort to enhance internal validity, the researcher utilized several basic strategies as suggested by Merriam (2003). First the researcher used multiple data sources to construct a holistic understanding of the implementation of a STEAM magnet school within the Nixa Public School District. The researcher interviewed 38 people involved with the implementation process and analyzed 25 documents associated with the magnet school. Next, the researcher conducted long-term observations and data collection taking place during the planning stages of the magnet school through the end of the first semester of the magnets school's second year of existence. The researcher also used involved participants in all phases of the research. Lastly, the researcher was keenly aware of any potential biases and used reflexivity as a key strategy to understand those biases. Reflexivity is the "means that the researcher actively engages in self-reflection about his or her potential biases and predispositions" (Johnson, 1997, p. 147). The researcher was self-aware of the proximity afforded as an employee of the Nixa Public School district and attempted to manage those biases throughout the data collection process and data analysis.

Summary

Chapter three presented the methodology pursuant to a case study. Included in this chapter were the research questions used for the study, the design of the study, and a rationale was provided for the use of the case study approach. Additionally, sampling strategies and the data collection process were described. Attention was also given to the role of the researcher with emphasis on validity and accuracy of the study.

Chapter four will provide a discussion of the findings from interviews, observational field notes, and archival documents. Findings and descriptions will be analyzed and presented in a narrative format.

CHAPTER FOUR

RESULTS

This chapter presents the results of a case study analysis describing the effects of the implementation of an elementary STEAM magnet school on the Nixa community. This study attempts to examine the effects of the implementation within a suburban school district, as it is understood by those directly involved in the change process. Additionally, this study interprets and analyzes essential themes involved in the change process and examines how these elements influenced the systemic change process within the school district.

The following is the primary question guiding this study on the implementation of a magnet school in the Nixa Public School District:

What were the effects of the implementation of a STEAM magnet school on students, parents, administration, and community members within the Nixa Public School District?

While this is the guiding research question for this study, the primary question was expanded into the following series of sub-questions:

1. What opportunities and threats to the change process did the teachers, administrators, and school board encounter with the implementation of the magnet school?
2. What effect did the implementation of the magnet school have on parent and teacher attitudes both at John Thomas School of Discovery and in the other elementary schools within the Nixa School district?
3. From the teachers' perspective, what effect has the magnet school had on student engagement?

4. What professional learning did teachers receive to prepare them for teaching in a magnet school with a STEAM focus?
5. From the parents' perspective, what effect has the magnet school had on their child's attitude towards school?
6. From the administrators' perspective, what effect has the magnet school had on teacher attitudes and student engagement?

The Nixa Public School District, located in southwest Missouri, served as the primary site for this case study. Nixa Public Schools is a preschool through twelfth grade district with almost 6000 students. The district has an early learning center, five elementary schools, two intermediate buildings, a junior high school, an alternative high school, and a nearly 1600 student High School.

Content analysis on focus group and individual interviews included transcription of the audio content by a third party. A line-by-line coding of the data was conducted to organize and identify the broad themes associated with the effects of the implementation of the STEAM magnet school. The codes were analyzed to create the characteristics to identify eight major themes. Upon further analysis of the data using additional hand coding and the qualitative software QSR NVivo10, the initial eight themes were condensed to five. The five themes include challenges, opportunities, student engagement, leadership, and collaboration.

Table 3: Characteristics of the Five Major Themes

Theme	Characteristics of the Theme
Major Theme #1: <i>Opportunities</i>	A favorable combination of circumstances; a chance to better oneself, chance for growth
Major Theme #2: <i>Challenges</i>	Difficulties; barriers to success; areas to overcome, problem solving
Major Theme #3: <i>Student Engagement</i>	Actively involved in learning; hands-on learning; inquiry driven; motivated learners
Major Theme #4: <i>Leadership</i>	Effective leadership qualities; communication; support; positive culture
Major Theme #5: <i>Collaboration</i>	Professional learning opportunities; teamwork; supportive learning environment

The five major themes and the characteristics comprising the foundation of the major themes are listed in the table above. The themes are listed in order of frequency.

Table 4: Number of times each of the five themes was mentioned in the interview transcripts
(16 transcripts)

Theme	Parent (5)	Teacher (5)	Admin (4)	BOE (2)	Total
Challenges	6	31	19	2	58
Opportunities	12	26	13	7	58
Student Engagement	18	29	3	3	53
Leadership	13	18	11	11	53
Collaboration	3	35	13	1	52

The table above describes the number of times each of the five themes was mentioned in the interview transcripts. Transcripts of parent interviews referenced student engagement comments more than any other theme. Teacher transcripts mentioned collaboration more than any other theme. Administrators referenced challenges while school board members cited leadership.

Participants in this qualitative case study included two school board members, ten parents of students who attend JTSD, four district and building level administrators, and 28 teachers at John Thomas School of Discovery. The president of the school board was interviewed along with a 30 year veteran of the board. The officers of the parent and teacher organization at JTSD were initially interviewed. The snowball sampling method was used to identify the other seven parents. Administrator interviews included the current building principal at JTSD, the former principal at John Thomas Elementary, the retired district administrator responsible for the initial

planning and research of the magnet school, and the science consultant. Teacher interviews were conducted in focus groups and included all kindergarten to sixth grade classroom teachers and the five enrichment teachers.

The researcher utilized an interview protocol with specific questions for each group-administrator, teacher, parent, and board member. Each question in the protocol was coded to correlate to one or more of the sub-questions. The interview transcripts are found in the appendix. A digital recording of the interview was transcribed by a third party and the transcripts were analyzed by the researcher.

Documents

The researcher reviewed and analyzed 25 documents, both paper and electronic forms, relating to the implementation of the magnet school. The document list consisted of administrative memos, district letters to parents, the Nixa CSIP document, district emails, transcripts of administrative focus group interviews conducted by doctoral students, JTSD 1st semester Progress Report, district and JTSD website, and fifteen news articles documenting the planning and implementation of JTSD. The documents were categorized into four areas- internal district communication, external district communication, media, and other focus group transcripts.

Major Findings

At the conclusion of the data analysis on all data sources, the researcher identified five major themes that describe the characteristics of the magnet school implementation process within the Nixa Public School district. The triangulation of all data sources resulted in the major findings.

In an effort to maintain confidentiality of those being interviewed, the quotes used in this chapter are not cited to a specific person instead the researcher referred to them as teacher, parent, board member or administrator.

Major Theme #1: Challenges

Within the interview transcripts, the theme challenges was discussed a total of 58 times. Teachers referenced challenges 31 times, administrators 19 times, and parents and board members mentioned challenges a total of eight times.

Both teachers and administrators discussed the challenge of time. There was so much to be accomplished from the time the administrator and teachers were chosen to the opening day of school. In an effort to get everything accomplished, one administrator shared that wanting to move too quickly became an obstacle. “We had to remind ourselves to go slow and steady” (Lawson, 2013, p. 9). In order to be ready for the first day of school, numerous man hours were necessary to get everything accomplished. The building was renovated during the summer which left little time for teachers to prepare their new classrooms. Renovations included painting throughout the building, cabinetry constructed and painted in all classrooms, installation of new interior doors, upgrades to wiring and lighting, as well as new classroom furniture for the entire building.

Throughout the summer, the district worked to prepare the school for opening day. While the building administrator coordinated the renovations with the district custodial and maintenance staff, the teachers worked to get their classrooms ready. Both the administrator and the teachers discussed the challenges faced with renovating the building. Teachers shared their frustrations regarding the condition of the classrooms and how the building was left for them.

I was disappointed with the way things were left for us. I think that took up so much time that could have been better used to really get our rooms ready, but instead we had to deal with so much stuff that they just dumped on us because they were upset. It just seems like there could have been a better way or more supervision. (Teachers C, p.1, November 4, 2013)

Another teacher said, “We didn’t have a complete anything. Not only were we faced with the challenges of a new school, a new philosophy of teaching, we didn’t have the resources” (Teachers C, p. 2, November 4, 2013). Additional teachers added, “There was trash left, things we would never use. We got the broken, the dirty” (Teachers C, p. 2, November 4, 2013). As one teacher expressed, “I think there were some feelings because you knew whose room, whose stuff you were getting and you were like, ‘really?’ I mean three broken umbrellas, a shelf full of coffee cups. That was purposeful and also hurtful” (Teachers C, p. 3, November 4, 2013).

When asked why they felt the Thomas teachers left the building as they did, one teacher hypothesized, “I think they were mad that they had to leave what they felt comfortable with. I think they felt like they were being kicked out of what may be their home” (Teachers C, p. 2, November 4, 2013). Another commented that they felt the other teachers were jealous because the building was in need of renovations for a long time and they were upset that just as they were leaving the school, the updates were finally being done (Teachers D, November 4, 2013).

Aside from the challenges faced with occupying the building, teachers and administrators cited challenges in providing enough time for professional learning. Since the district did not receive the anticipated grant that would help fund two weeks of professional learning for teachers, the science consultant had only two days before the school year began to work with JTSD teachers. Money was cited as the primary reason professional learning was limited to two

days from the desired two weeks since the grant proposal was not accepted. However, time was also seen as a contributing factor. The building renovations took longer than expected which delayed teachers from moving in to their classrooms. With parent orientation night and the opening day of school quickly approaching, getting the building ready for the students became the priority. Teachers noted that professional learning instead took place during their planning times, during faculty meetings and collaboration, and on their own time doing their own learning (Teachers A, November 4, 2013).

Communication was seen by administrators as a challenge and they shared that communication with all stakeholders was one of the biggest obstacles.

We communicated in every way we knew and as often as we thought possible, but still a few people were not informed correctly. If we heard of someone speaking up against the idea, we contacted them and asked them to come and have a sit down visit and let us answer the questions personally. We did this with a couple of people. (Administrator C, p. 1, November 6, 2013)

From the beginning, JTSD was described as a unique school yet misconceptions, despite the amount of communication, were still evident. Comments such as ‘the favored school’ and ‘elite school’ were frequently heard among community members and teachers in other buildings which elicited responses from the JTSD staff (Administrator C, November 6, 2013). In reference to the at-risk student population, retired Nixa Public Schools Principal, Al Michels, commented, “I’m not sure I see the resources going to the students that need the help” (Bowling, 2011, para. 13). In an effort to combat the perceived attitude of elitism and the preconceived notion of JTSD being a school for the gifted, the district coined a specific talking point of ‘we are a unique

school' when interviewed by the media or in conversations with people who perceived the school in this manner.

When there is a challenge, as one board member (Board C, p. 2, December 4, 2013) shared, "We look and we say how can we make this an opportunity?" One example of this would be the transportation issue. During the initial planning, the parameters set forth from Kleinsmith did not include providing transportation due to the increased costs associated with transporting students from across the district to the central school location. However, through the comments expressed during the community conversations, the district researched options to provide limited transportation. The district utilized a shuttle style of transportation allowing an option to those who would otherwise be unable to attend the school due to transportation issues. Students ride the route they would if they attended their home school. A shuttle bus at each school then transports students to JTSD.

Major Theme #2: Opportunities

In all of the interview transcripts, there were a total of 58 references for opportunities. Teachers mentioned the theme 26 times, administrators had 13 references, parents shared 12, and board members made two references.

Those interviewed feel the magnet school has afforded many opportunities for the teachers, students, and administrators of the Nixa Public School district. Parents and teachers shared how students have the opportunity to use technology in a way not available at other schools. They have the opportunity to attend a school rich with hands-on, inquiry-based learning. Inquiry-based curriculum "that is what JTSD is all about. It's not sitting and doing, it's hands-on" (Parents C, p. 7, December 14, 2013). Administrators commented that students also have an extended school year to continue their learning without the usual regression in skills

occurring over the summer months (Administrator A, December 20, 2013; Administrator C, November 6, 2013).

For parents, becoming more involved in their children's school became an opportunity. As part of the enrollment process, parents committed to 20 volunteers hours per school year. These hours could be used in a myriad of ways including helping with a school or parent and teacher association (PTA) event, helping in the classroom, or even simply attending a school or PTA event. The reason for the volunteer requirement, as outlined by the design committee, was to encourage parents to take a more active role in their child's education.

Administrators shared how parents also have the opportunity to choose the school for their child which is not the norm in public education. They have the choice to send their child to the neighborhood school or to apply to the magnet school. If their child is selected through the lottery process for the magnet school, parents still have the choice to accept or decline the invitation. After the first semester of the school year, parents also have the opportunity to have their child stay at the magnet school or return to the neighborhood school.

Teachers viewed the implementation of the magnet school provided them with many opportunities. Teachers have the opportunity to use the technical skills they have acquired to teach in this STEAM environment. One teacher stated, "It's changed my whole way of thinking as a teacher. I can never imagine going back to just giving information. Our kids are unbelievable in their thinking" (Teachers C, p. 9, November 4, 2013). Another said that the STEAM focus is "making me rethink how I can teach this better, and what can I add to my lessons that I've done for 15 years and make it deeper for the students, which is a good thing" (Teachers D, p. 3, November 4, 2013).

Administrators discussed many opportunities the magnet school created for the community. Faced with the challenging process of redistricting, the magnet school was a “great way for us to do a redistricting as well as change some of our student population around and give our parents and our community a choice for which we did not have” (Administrator A, p.1, December 20, 2013). The magnet school also provided an opportunity to decrease the amount of transitions students have by creating a kindergarten through sixth grade school rather than the other schools who are kindergarten to fourth grade and then a fifth and sixth grade building.

Table 5: *Population and Free and Reduced Percentages at each K-6 School Pre/Post JTSD*

	Thomas	Espy	Matthews	Century	High Pointe	Summit	Inman
Pre JTSD	346/60	383/38	497/36	513/30	461/57	434/43	458/32
Post JTSD	457/28	434/41	467/39	436/38	449/59	497/38	383/38

The table 5 shows the populations and the free and reduced percentages at each of the elementary schools in the Nixa district before the implementation of JTSD (April, 2012) and their current numbers (February, 2014). The population at Thomas Elementary went from 346 to 457. Prior to the implementation of the magnet school, Thomas Elementary was a kindergarten to fourth grade building. After the implementation of the magnet school, JTSD became a kindergarten to sixth grade building. The free and reduced rate fell from 60 percent to 28 percent. Espy Elementary had a population increase of about 50 students and they experienced a three percent increase in their free and reduced rate. Matthews Elementary lost 30 students and increased their free and reduced rate by three percent. Prior to the implementation of JTSD, Century Elementary was a kindergarten to fourth grade building. Due to the building being at

capacity, the fourth graders who reside in the Century area were moved to Summit Intermediate School. Century Elementary experienced a decrease of nearly 80 students and the free and reduced rate increased by eight percent. The two intermediate buildings also experienced change since JTSD included fifth and sixth grade students from their residential area. Summit Intermediate increased by 63 students (which included the addition of Century's fourth grade) and their free and reduced rates fell by five percent. Inman Intermediate's student population decreased by 75 students and their free and reduced rates increased by six percent.

Board members and administrators view the magnet school as unique, not only to the Nixa community, but throughout the state as well. Being the first STEAM elementary school of its kind in the state of Missouri resulted in many visitors from across the state.

I think there isn't any other place doing this out there as we have. Other districts have come in to see us. They are all looking for a kit, a lesson plan book, something they could follow instead of doing the most authentic part of it, which is learning how to teach for our inquiry-lased curriculum and how to plan appropriately to teach those students.

(Administrator A, p. 4, December 20, 2013)

The uniqueness of the school, according to administrators and teachers, also afforded the opportunity to try new things, for example, the school researched standards based grading during its first year of existence and then implemented it during the second year. The school also was the first school in the Nixa district to use the Missouri Learning Standards as their curricular guide.

Major Theme # 3: Student Engagement

Analysis of the interview transcripts found that teachers viewed student engagement as an important by-product of the implementation of JTSD, referencing student engagement 29 times.

Parents shared examples of student engagement 18 times while administrators and board member each discussed this theme three times.

Parents and teachers shared how the STEAM focus at JTSD has contributed to high student engagement of the students. “Students are getting different hands-on opportunities. I think that helps stimulate all children, no matter what their learning style is, just being able to hold it, see it, and watch it. I think it is very effective” (Parents C, p. 5, December 4, 2013). While discussing the engagement level of students, parents shared, “They are just excited all the time” (Parents B, p. 2, November 4, 2013). A teacher stated, “I feel like I more effectively know my kids the year than I ever have” (Teachers B, p. 12, November 4, 2013). The inquiry style of learning and the science focus at JTSD has contributed to their excitement. (Teachers B, November 4, 2013). Teachers feel that science is a subject that should be taught daily and “there are qualities this school has that every elementary needs to eventually move to” (Teachers B, p. 15, November 4, 2013).

Administrators feel students at JTSD have the chance to do things that they would have never done at other elementary schools in the district. The fifth and sixth graders have the opportunity to choose from a variety of electives such as musical theater, computer programming, dance, comic book design, and media production. One teacher expressed,

I am able to weave more...thinking like a scientist, that’s kind of our mantra. So I’m able to weave that into the lessons even though we’re not talking science all the time, using the vocabulary, ‘What do you predict is going to happen?’ All of those things, and I think that it’s, in my experience, I can see more of the students engaged and more of them thinking on a higher level. (Teachers D, p. 10, November 4, 2013)

Going deeper in to the curriculum or even studying subjects not tested by grade level standardized tests was seen as an opportunity for students. One teacher stated,

In third grade it is easy to see science and social studies get pushed out of the curriculum. But, in putting science back in for us, and being able to devote a good chunk of our time to that, I think the engagement's not only gone up, but their overall knowledge. (Teachers E, p. 4, November 4, 2013)

Increased knowledge leads to additional questions from students about the content. One teacher expressed, "I would love to have more PD on the content (science) because I am finding out that when you teach this way and you let kids explore, then questions come up and I am realizing there is a lot of things I don't know" (Teachers B, p. 5, November 4, 2013).

Major Theme # 4: Leadership

This theme was frequented in all of the interviews but leadership was discussed the most in the teacher transcripts. Administrators and board members each discussed leadership a total of eleven times while parents mentioned leadership a total of 13 times. After initial coding, this theme was separated into two themes- leadership and communication. However, after further analysis, the researcher determined that the majority of the references to communication stemmed upon either building-level or district- level administration. To be an effective leader, communication is regarded as an essential quality (Marzano, Waters, & McNulty, 2005).

In planning for the magnet school, administrators noted the importance of effective communication. One administrator said, "We met this challenge with a lot of communication and over 40 meetings. I think the lesson learned is that communication has to be number one and that communication and planning has to be there" (Administrator C, p. 6, November 6, 2013). Another administrator shared,

Massive amounts of communication were necessary- communicate, communicate, communicate! There must be effective communication in multiple ways and on multiple fronts. Once we had the public's understanding of what we were trying to do, then we had to get them to buy in, which they did. (Kleinsmith, Lawson, & Chastain, 2012, p. 1)

Parents also expressed positive comments with regards to communication indicating that they had "plenty of information to make our decision to enter our child's name into the lottery" (Parents D, p. 1, December 20, 2013). One parent said that even though they did not attend any of the parent meetings, they "felt like the information sent home and the information provided on the district website was enough to make the decision" (Parents E, p. 1, December 20, 2013). One parent said the administration is easy to talk to also said that her child's teacher "communicated all the time so I was very aware of what was going on. The teachers over there (at JTSD) are amazing" (Parent D, p. 4, December 20, 2013).

John Thomas School of Discovery required the right type of leader. As one administrator shared,

Josh was strategically chosen for the job as principal. This was a big job. It had to be someone who understood teaching and learning very well. He was very good at this. He respected how kids learn and how teachers learn to teach. He was the perfect choice. He is a creative thinker-steady, calm, and encouraging to his teachers. (Lawson, 2013, p. 6)

Recognizing the experience level and the leadership qualities of the teachers selected to teach at JTSD required a leader who could

be respectful to those teacher leaders and be ready to lead by respecting their ability to lead and a leader that was able to work with that to where they can mold those leaders

into more of a participatory style of leadership. (Administrator C, p. 3, November 6, 2013)

Teacher leaders, according to one administrator, have difficulty pacing themselves. The JTSD principal was viewed as having a calming effect on the climate within the building. He was able to encourage teachers to take it one step at a time. “I think he kept their stress level down by telling them to move slowly and we have time but do what you can do well. I think he set the pace” (Administrator C, p. 5, November 6, 2013).

Dr. Chastain has done a tremendous job. He was the right person to be in charge because he was not an order taker. He was someone that could go out there and actually come up with new ideas and find ways to implement them. He was able to work with the existing employees and the new employees and say ‘how can we make all of this work together?’ He’s done a great job. (Board B, p. 4, December 4, 2013)

Teachers agree with the district administration regarding the effectiveness of their building leader. One remarked,

I think the key component to the school’s success is Dr. C. I cannot imagine anyone else doing this job because he is equally committed. I do think if he were to leave right now, with us still gaining traction, I don’t think it would be good for the school. I feel he is essential to the success of the school. (Teachers E, p. 8, November 4, 2013)

Teachers also commented on the curricular knowledge of the principal. One said, “He really knows how to teach reading, oh my” (Teachers C, p. 14, November 4, 2013). Another teacher expressed, “He is such an instructional leader” (Teachers C, p. 14, November 4, 2013). The leader was also viewed as creating a collaborative culture. One teacher said, “I know I can go to him for anything no matter what it is” (Teachers C, P. 14, November 4, 2013). Teachers also

expressed the building leader's ability to effectively communicate with all stakeholders. "I really think Josh did a lot of the footwork for us (in reference to standards-based grading). I think he is such a great communicator. He has really gotten the information out there to the community" (Teachers B, p. 12, November 4, 2013).

District administrators felt that having the right leader for JTSD was critical to its success, while board members expressed the need for strong district leadership to put all of the pieces together. As one school board member shared,

We (the board) have evolved to the point that we have complete trust in Dr. Kleinsmith's ability to do what needs to be done. He keeps us very well informed but it is hands off. If manage is a word that is coming to the board table then we shouldn't be doing it.

(Board A, p. 4, December 3, 2013)

Major Theme #5: Collaboration

Collaboration was the most frequent theme in the teacher interviews, occurring 35 separate times within the transcripts. Administrations commented on the theme 13 times while parents were three and board members once.

On first analysis, this theme was two separate themes- professional learning and collaboration. After further analysis of the data, merging the two themes became necessary as professional learning for teachers is no longer an isolated event but a more collaborative process.

Administrators shared the implementation of the magnet school required a tremendous amount of work by a lot of people. Each person involved this process shared the same vision. According to teachers and administrators, this common vision untied the faculty and staff at JTSD. Many teachers commented about the supportive climate experienced throughout the building noting the lack of competition among the teachers. "Everybody wants to be here"

(Teachers D, p. 5, November 4, 2013). “Everyone just shares freely” (Teacher November 4, 2013) and “I don’t feel any competition at all. We know nobody is going to take advantage of each other” (Teachers C, p. 5, November 4, 2013). In reference to the team aspect of the building, one teacher expressed, “We get along beautifully” (Teachers B, p. 14, 2013). “We were all in this together, really. Every single person was in it together” (Teachers C, p. 12, November 4, 2013). One said that, “Just being able to help each other through was great” (Teachers B, p. 13, November 4, 2013). “We are all learning from each other” (Teachers A, p. 7, 2013).

Administrators and teachers acknowledged how having a common theme for the school contributed to a collaborative climate both during the planning and implementation stages. As one teacher stated when asked why they had the desire to work at JTSD, the teacher said, “For me it was the STEAM focus and the chance to work somewhere where I knew the whole staff would be thinking the same way and that we could support one another in that journey” (Teachers C, p. 1, November 4, 2013).

Teachers at JTSD shared many comments about how they incorporated the STEAM focus into their teaching. They shared that one of the things that made such a difference was just simply collaborating with each other. Recognizing the great wealth of collective knowledge within the building, teachers discussed how they freely shared ideas with each other and knew that they could go to anyone in the building for assistance. “I do feel supported in where I am at and I am encouraged to step outside of my box...but everyone here is so supportive and everybody is here to help me grow as an educator” (Teachers A, p. 8, November 4, 2013). Teachers at JTSD are all learning from each other. “We are willing to take risks and not afraid to make mistakes” (Teachers A, p. 7, November 4, 2013).

During the planning of JTSD, administrators felt like large amounts of professional learning were needed to accomplish the goals of the school. However, one administrator realized what they really needed was “just ourselves with our science consultant and PD for people to see things differently and for us to just be together. That was the most important PD we could have. We had to be together” (Administrator A, p. 3, December 20, 2013). If the magnet school would have received the grant, administrators felt that the extra money could have added even more to the school. Although without the money, administrators hope the community recognizes that what they are doing is so powerful.

Just working and collaborating together with our science consultant-everyone wants a packaged program to reproduce what we do but our biggest goal here is working together, collaborating, planning, working together and a new way of thinking. (Lawson, 2013, p. 8)

Sub-Question #1

What opportunities and threats to the change process did the teachers, administrators, and school board encounter with the implementation of the magnet school?

The teachers at JTSD viewed the magnet school as an opportunity for personal growth and a chance to be a part of something new, something innovative. Teachers viewed the science and technology integration at the magnet school as an opportunity to utilize previously acquired skills and use the inquiry-based model of thinking incorporated with technology.

Administrators and board members saw the magnet school as a way for the district to do a redistricting as well as equalize the demographics at all of the elementary buildings. The magnet school gives parents and the community an educational choice within a public school

setting. Going from a traditional kindergarten through fourth grade building and expanding to a kindergarten to sixth grade building also became a positive development of JTSD.

Teachers and administrators expressed how the implementation of the magnet school not only created opportunities, but challenges as well. Time, or lack of time, was viewed as a challenge for teachers as was moving to a new building that was under construction. Building relationships was a challenge as one teacher said,

Even though we all wanted to be here and were all eager, we didn't know each other. We were coming from all different buildings. So not only were you learning the new building, the new curriculum, new schedules, you were also figuring out a new team which was a challenge. (Teachers C, p. 3, November 4, 2013)

Administrators and board members cited broader challenges such as, "Challenges coming in the form of communication, community involvement and overall planning so that it goes well with our district mission and making sure everyone has an opportunity to voice their opinion" (Administrator A, p. 1, December 20, 2013). One administrator likened the implementation of JTSD to building a plane in midair. "We asked teachers to make a quantum change in how they approach teaching and the school curriculum. You talk about a leap of faith? I was racing under trying to build a platform as they took the next step" (Administrator B, p. 1, November 5, 2013). The teachers, administrators, and parents expressed lofty ideas of what the magnet school would offer a but they felt time constraints created difficulties in getting everything accomplished that was desired.

Opening a new school and filling it with students and teachers from across the entire Nixa district was viewed as a challenge by administrators and teachers. For teachers, drawing new

personalities together and forming cohesive teams takes time. While team-building was cited as a challenge, teachers expressed this was actually one of the best parts of the new school.

Because everyone wanted to be here and I think a lot of it too is it is so hard to come into a building where there are already established relationships and bonds that are being formed. Sometimes it is very rigid, you feel like an outsider, but if you go to a building where everyone is new and everyone is nervous and overwhelmed, it is like oh, I'm not the only one. (Teachers D, p. 5, November 4, 2013)

Sub-Question #2

What effect did the implementation of the magnet school have on parent and teacher attitudes both at JTSD and in the other elementary schools within the Nixa School district?

When the decision was made to convert John Thomas Elementary to a magnet school, the faculty and staff were told before the rest of the NPS district. During the back to school faculty meeting in August of 2011, Kleinsmith and Lawson shared the news with the entire John Thomas faculty and staff. One teacher likened the announcement to a bomb going off. Another said she felt guilty for being excited about the potential opportunities when her fellow coworkers were so upset. Kleinsmith (2012), when asked about the initial conversation said,

My perception was that it was fully communicated to the teachers. The teachers really had an opportunity to choose their path. We could have given them no opportunity but we gave them several options. They had a chance to put in a transfer-school choice- it helped to give them a choice rather than being told. They were the first group we spoke to- the staff was first and then the PTA. Then we went district-wide. Would we do much differently next time? You know, I don't think so. I'm sure if we reflect long enough we would do something but as I look back I was very, very pleased. (p. 2)

Discussing the attitudes of the teachers at John Thomas Elementary School, Kleinsmith (2012) stated,

With regards to change, you've heard the old saying that change is inevitable but the pain is optional. We in public education need to be more progressive. Those that chose to approach this with a good attitude came out well. Those that wanted to stay could stay, those that wanted to go will go. How they handle their own choices and decisions is based on their own attitudes. I know you cannot go wrong at any of our schools so if they have passion for this profession then they have only themselves to congratulate. (p. 3)

The teachers at JTSD expressed an overall attitude of excitement about teaching at the school. One teacher even said, "I would be happy to work here for the next 20 years and retire here" (Teachers D, p. 15, November 4, 2013). Another teacher shared, "Everyone's excited and you can just feel the energy" (Teachers C, p. 14, November 4, 2013). There is a real sense of a collaborative team at JTSD, both observed by the researcher and expressed by the teachers. Teachers shared they feel they could go to anyone in the building to ask for help and help would be given. While many teachers mentioned there was not enough time to focus on team building, they contribute their sense of community to the centralized focus of learning at the school. "We are all in this together, learning new things, stretching out of our comfort zone" (Teachers C, p. 12, November 4, 2013).

Administrators described the teachers at JTSD as unique.

This could not have happened unless the teachers were willing to put in lots and lots of extra hours as well as recognize that it was not going to be an easy task. These teachers are the

ones that were the overachievers, the ones that were go-getters, the ones that are the risk takers. (Administrator A, p. 3, December 20, 2013)

Administrators also shared that like other teachers in the district, JTSD teachers are there to help students do their absolute best (Administrator C, November 6, 2013).

Sub-Question #3

From the teachers' perspective, what effect has the magnet school had on student engagement?

The magnet school, according to JTSD teachers, has helped students become more actively engaged in their learning. Teachers discussed how they assume the role of facilitators, taking a step back and asking students to think for themselves. When students realize their teacher is not just going to simply give them the answers, teachers said their students are forced to shift their thinking, and that is when they take off in their own learning. One teacher stated,

Their motivation has skyrocketed. A lot of what we do is hands on, and they are actively engaged. They are challenged through those engineering projects that we are not going to give them the answers to. We force them to think it through. I have seen students really blossom under that approach to learning. (Teachers E, p. 4, November 4, 2013)

Teachers expressed that the STEAM focus has had a positive impact on student engagement. “It’s changed my whole way of thinking as a teacher. I can never imagine going back to just giving information back and forth. Our students are unbelievable in their thinking” (Teachers C, p. 9, November 4, 2013). Teachers feel students are thinking for themselves, using technology to research and find the answers to their own questions about the world around them. An example one teacher shared about a student, to the untrained eye, could have been perceived as a child goofing off. Instead, the teacher said this student was actively thinking. The student took an Expo marker and used his eraser to try to make it into a balance scale. The student even used

other objects at his disposal to investigate which object was heavier. The student was really thinking about this and testing it. The teacher commented that even though the student was one of her lowest, “he can sit there and think his way through something like that and be excited about it and show it” (Teachers C, p. 10, November 4, 2013).

For the primary grades, even sharing time has changed. No longer do students bring in stuffed animals or other material things, their sharing things are mostly nature. They bring in feather, leaves, nuts, and seeds. Teachers commented how sharing then leads to more questions and more inquiry based discussions.

Teachers feel students have the desire to learn on their own. One teacher said in reference to the STEAM focus,

I think that it’s the culture throughout the building and across the whole day. I think that’s just how we do business. It’s our way of thinking- thinking like a scientist. So in reading and in math it’s ‘What’s your claim for that? What’s your evidence for it?’ (Teachers C, p. 9, November 4, 2013)

As a teacher, “I don’t have to activate learning the way I used to have to do to gain that interest. They just want to learn” (Teachers C, p. 10, November 4, 2013). Kids learn in different ways and teachers feel the STEAM focus offers them an opportunity to make connections and integration with other areas of the curriculum. For example, a teacher shared how one student was at recess playing with a yo-yo and was not just playing with it but studying it. He was trying to find out how it worked (Teachers A, November 4, 2013). Another teacher noticed the impact STEAM was having on students.

Boys especially had increased engagement level and they enjoyed science. They were reading and writing with a purpose that kept them focused and on task. There were

virtually no behaviors as the kids were so into what we were doing. (Teachers B, p. 4, November 4, 2013)

Sub-Question #4

What professional learning did teachers receive to prepare them for teaching in a magnet school with a STEAM focus?

During the planning stages of the magnet school, district administrators wrote several grants to assist with the costs associated with professional learning. One grant, for example, was written in collaboration with Missouri State University and outlined a partnership between the elementary school and the university. The district did not receive this grant but was able to secure a smaller grant from Burrell Heath Center in Springfield, Missouri to help defer the cost of the part time science specialist for the school.

As part of the JTSD teacher's contract, two professional learning days at the beginning of the school year were included. In addition to the professional learning days, teachers were expected to meet once a week during their collaborative planning time to meet with the science consultant. Additional weekly collaboration time, faculty meetings, and district offered professional learning were other ways teachers participated in job-embed professional learning. Several teachers also had the opportunity to attend the National STEM conference in St. Louis and share the knowledge gained with their team of teachers.

Administrators shared how professional learning for JTSD teachers started with a philosophical core of science and built the school around that focus. According to district administrators,

We received the PD that was necessary that allowed us to begin the process of inquiry-based learning and the way that we were going to plan. I think sometimes we thought if

we had more PD we would figure out exactly what we needed to do and that's not the case. We needed PD to start this off in the direction to do all the things that we know we can do. We can plan the lessons, the assessments but it's that specific way of teaching that we needed the instruction on and that is what we received. (Administrator A, p. 2, December 20, 2013)

Given the fact that most elementary teachers are not science majors, starting at the very beginning about the nature of science was the primary focus for professional learning. 'Seeing everything through the lens of science' became the mantra for the professional learning of JTSD teachers (Teachers B, November 4, 2013).

Administrators shared that the teachers at JTSD came to the school with much prerequisite knowledge. The majority of the teachers either were emints trained or were part of the district sponsored Tech Academy. Emints is a national non-profit training program focusing upon rich lesson plans, inquiry based instruction, and effectively integrating of technology into the curriculum. The Nixa Tech Academy is a tiered training provided by the district technology integration specialist. Teachers have the opportunity to progress through the three levels of certification. Both trainings align with the curricular foundation of JTSD. The teachers at JTSD expressed they were comfortable with technology, had the desire to be there, and the motivation to learning new things. Administrators believed this wealth of knowledge within the building led to teachers collaborating with one another and teachers expressed this collaborative culture has contributed to the success of the school. One teacher described the collaboration by saying, "I have such respect for every teacher in this building...every teacher in this building just blows me out of the water" (Teachers D, p. 6, November 4, 2013). Another shared, "I think what makes this building unique is that everybody is so willing to share. We are willing to take risks and not

afraid to make mistakes” (Teachers A, p. 7, November 4, 2013). Many teachers felt that while the professional learning was not enough, they felt the professional learning they received was high quality and helped them change their thinking about science.

Teachers expressed the positive effect the science consultant had on their teaching abilities.

Our science consultant has taught us to shift our way of thinking to a scientific inquiry way. Everything we do is this way. We sit together and do activities to learn how to drive that kind of instruction. We are talking like being scientists as a whole building all of the time. You do not have to buy things to change you way of thinking. She helped us grow as teachers. (Lawson, 2013, p. 9)

Sub-Question #5

From the parents’ perspective, what effect has the magnet school had on their child’s attitude towards school?

The two most prevalent words parents used to describe how their child was feeling about JTSD were happy and excited. While some parents mentioned that their child has less homework compared to other schools, the students were more inquisitive about things at home. Parents shared how their children asks to do science experiments, researches subjects on their iPads, and generally shares more with them about what they were learning in school. Parents said they were hearing more ‘why’ types of questions at home (Parents E, December 20, 2013). Parents stated they were seeing less behavior issues and contributed that to the inquiry-based model of instruction (Parents D, December 20, 2013). Students appeared to be learning to work as a team and listening to other people’s ideas (Parents B, November 4, 2013).

The lottery process called for 40 percent of the original Thomas student body to be selected for the magnet school. For these students, they experienced the change process first hand. Parents of those students expressed that some of the students did struggle because they could see the differences in the school. As one parent said, “He missed some of the teachers that he didn’t get to see every day, or the friends that he’s been in class with before he didn’t get to see anymore” (Parents A, p. 3, December 17, 2013). According to one parent, experiencing the changes from Thomas to JTSD was much was like a mourning process for a lot of the teachers and kids both (Parents C, December 4, 2013). However, parents of former John Thomas Elementary students expressed that their children, after the initial adjustment period, “love JTSD. It’s a completely different learning environment, from the staff being totally different to the way things are taught being totally different. It’s a totally different school. We love it” (Parents A, p. 3, December 17, 2013).

Sub-Question #6

From the administrators’ perspective, what effect has the magnet school had on teacher attitudes and student engagement?

Administrators view JTSD teachers as excited, enthusiastic, and committed to the mission of the magnet school. One administrator described them as unique.

This school could not have happened unless the teachers were willing to put in lots and lots of extra hours. These teachers are the ones that were the overachievers, the ones that were go-getters, the ones that even when it was really hard and we were all down, we all knew that we are in the same boat and we are a team.

Administrators discussed the changes in student engagement observed during classroom walkthroughs. Students are observed thinking for themselves, researching the answers to their own questions. As one administrator shared,

I've seen amazing changes and from an outside perspective being in the classroom I think I see it even more than the teachers do because they see those same students over and over so they just see the incremental growth. But as you see them at different weeks and months, these kids are truly thinking for themselves and sometimes we see in our teaching we give kids so many answers, so many things that we want them to absorb and take in. For a lot of the lessons that we teach, we are not telling kids the answers. They truly have to find and research and come up with what we want them to learn, because we want them to use that leaning capability that they have instead of just getting raw information. (Administrator A, p. 3, December 20, 2013)

Research Question

What were the effects of the implementation of a STEAM magnet school on students, parents, administrators, and the community members within the Nixa Public School District?

According to the parents, the implementation of the STEAM magnet school has provided choice in their child's education. Parents expressed how happy and excited their children are at the magnet school. Teachers discussed how the magnet school offered a unique learning environment enriched with technology and how they enjoy the collaborative culture of the school. Administrators and board members viewed the implementation of the magnet school as innovative, as a way to offer choice to families in public schools. They also expressed how they feel this is what the community wanted as shown by the over 1200 students who made application to the school.

The implementation of the magnet school, according to those interviewed, may have an effect on other schools in the district. With no discussion of having a magnet school at the middle school or high school level, the students who attend JTSD will take this thinking with them and push this type of thinking in the classrooms. Teacher and administrators hope the students will lead the way. A bond issue set for the April 2015 ballot calls for funding for one to one technology. According to administrators and teachers, the teachers and students at JTSD are the pioneers for this type of instruction and will serve as a resource for the entire district.

Summary

Chapter four provided the results of the data collection for the case study on the implementation of a STEAM magnet school in the Nixa Public school district. Focus group and individual interviews served as the primary source for data collection along with an analysis of 25 documents.

Chapter five provides a summary of the study and synopsis of the major findings. This chapter also includes a discussion of the relationship of the findings to current literature and the implications of the research conducted. Chapter five concludes with a discussion of the findings, recommendation for further research, and a summary.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, and RECOMMENDATIONS

The purpose for this case study is to document the change process the Nixa Public Schools underwent with the implementation of a STEAM magnet school. Research was conducted through interviews of administrators, board members, teachers, and parents of JTSD students. The theory presented studies the science, technology, engineering, arts, and mathematic, or STEAM, framework and its influence on teaching practices in an elementary magnet school.

This chapter reviews, analyzes, and discusses the findings of this case study. The first section will summarize the results of this study, including a review of the purpose of the research, research questions, methods, and procedures. The second section of Chapter V will present the conclusions, and the final section will include recommendations for future research.

Summary of the Major Findings

Nixa Public Schools (NPS) have been known for being a progressive, continuously improving district. When the idea of creating the first elementary magnet school in Southwest Missouri came up, it seemed unheard of and unconventional-even for NPS. Nixa Public Schools, the largest and fastest growing school district in Christian county (www.nixa.com), was experiencing steady and rapid student growth. As the community continued to create new residential developments, the populations among the five elementary schools, became inconsistent and unbalanced in both student enrollment and socio-economic status. Knowing the challenges faced with redistricting, the district wanted to give parents a potential choice for educational opportunity. Following a year of intense planning, including more than forty input

sessions, the transition from traditional to magnet school, was thought to be the best fit for the needs of the community. John Thomas School of Discovery, Nixa's magnet school, became a reality when its doors opened on August 17, 2012.

As the NPS website (2012) states, the mission of John Thomas School of Discovery (JTSD) is to prepare students for life in our culturally-diverse, technology-oriented, interdependent world of the 21st century. To accomplish this mission, students will work together as explorers in all areas of knowledge with special concentration on the following:

- 1) Science, Technology, Engineering, the Arts, and Mathematics (STEAM)
- 2) Exploring & Developing a Global Outlook
- 3) Problem Solving Through Cooperation
- 4) Nurturing Self-Esteem and Building Character.

John Thomas School of Discovery was chosen to bridge the old with the new. Transforming a traditional school into a STEAM school with focus on Science, Technology, Engineering, Arts, and Mathematics curriculum allowed an opportunity for new traditions to be set. With a new school focus, a change in faculty and staff was necessary. The district experienced significant staff mobility to accommodate the change. Every elementary and intermediate school was affected in some way. Teachers had an opportunity to choose their path, whether to stay at JTSD or transfer to another school.

The primary research question guiding this study on the implementation of a magnet school within the Nixa Public School system:

What were the effects of the implementation of a STEAM magnet school on students, parents, administration, and community members within the Nixa Public School District?

In an effort to narrow the focus of this case study, the primary research question was expanded upon with the following series of sub-questions:

Sub-questions:

1. What opportunities and threats to the change process did the teachers, administrators, and school board encounter with the implementation of the magnet school?
2. What effect did the implementation of the magnet school have on parent and teacher attitudes both at JTSD and in the other elementary schools within the Nixa School district?
3. From the teachers' perspective, what effect has the magnet school had on student engagement?
4. What professional learning did teachers receive to prepare them for teaching in a magnet school with a STEAM focus?
5. From the parents' perspective, what effect has the magnet school had on their child's attitude towards school?
6. From the administrators' perspective, what effect has the magnet school had on teacher attitudes and student engagement?

The research sub-questions stated above were answered by themes that emerged from the interview data, focus group data, and analysis of related documents. They were discussed in Chapter four.

Discussion of the Findings

Theme #1: Challenges.

From the beginning, the subject of Thomas Elementary becoming the new magnet school was tainted and the term ‘tired campus’ was used to describe Thomas Elementary (Kleinsmith, 2012). Many teachers at John Thomas Elementary indicated that they felt as though they were being defined as ‘tired’ or ‘poor’ teachers when one of the reasons for change was declining test scores. Broadcasting a greater sense of urgency to the John Thomas Elementary staff and community could have prevented this misconception however they were the first group to learn about the magnet school. Many staff members at John Thomas Elementary felt overwhelmed when the announcement that the magnet school was under consideration was delivered at the beginning of 2011-2012 school year. Teachers were preparing their classrooms for the start of a new year, when they were given the news by Kleinsmith and Lawson. According to Bolman and Deal (2008), uncertainty and anxiety is referenced in the human resource frame. To counteract their uncertainty, they were encouraged to take part in the entire design team process, including attending community meetings, and ultimately applying for a position at the school. The district offered many options to the Thomas staff. The placement of teachers is at the discretion of the superintendent, however he offered them the choice to remain at John Thomas Elementary or put in a transfer to one of the other schools. If they applied for a transfer, teachers were able to list their top two choices for placement. The district administrators were able to accommodate nearly all of the teachers’ first or second choices.

We really did it (placing teachers) as a team so the challenging part for me was I wanted to be able to please everybody because they were being uprooted from their home school and so I really, as their leader, wanted to give them what they wanted. Most everybody

got what they wanted. There were probably four or five who were placed elsewhere but they've done fine though. (Administrator D, p. 3, December 3, 2013)

Teachers from other Nixa schools had to consider whether they wanted to be part of the change and apply for a transfer or to stay in their current school building. With the dynamics of the changing school structure, some faculty and staff acknowledged a feeling of inequality within the district (Kleinsmith, 2012). As one interviewee stated in reference to JTSD, "It seems to be a school that gets what it wants" (Administrator D, p.6, December 3, 2013). To justify this feeling of inequality between JTSD and the other Nixa schools, teachers noted the variance in the school calendar, and the addition of 20 contract days, the promise of enhanced professional development opportunities, and additional instructional tools for JTSD faculty, staff and students. Throughout the process, administration kept an open line of communication with the staff relative to the new opportunities and ensured teachers felt ownership in the process of selection (Kleinsmith 2012).

The administration placed an emphasis on the unique qualities JTSD would bring to the district. The phrase, JTSD is a unique school and not an elite school was repeated throughout the community. Keeping the perception among teachers, students, and parents, that the students at JTSD would not be receiving a better education than students in other Nixa Schools, they would simply experience a different methodology. It was especially vital to those who applied and were not admitted to JTSD, to understand their educational opportunities had not been diminished (Kleinsmith, 2012).

It is to be expected, with the restructuring of district boundaries, a feeling of loss is inevitable within the community. Displaced students with established relationships within their schools must begin new relationships with new faces. This structural framework and human

resource change impact will be felt by students who elect to change as well as by those who are pushed to change to accommodate the new district design.

According to Fullan (2007), the characteristics of the change, the makeup of the local district, the character of individual schools and teachers, and the existence and form of external relationships interact to produce conditions for change or no change. It takes a fortunate combination of the right factors--a critical mass--to support and guide the process of relearning, which respects the immense needs of individuals and groups and at the same time facilitates, stimulates, and prods people to change throughout a process of incremental and detrimental fits and starts on the way to institutionalizing the change in question. (p. 27)

Theme #2: *Opportunities.*

The implementation of a STEAM magnet school created many opportunities for the parents, students, and teachers in the Nixa Public School district. Having a STEAM focus allowed for a different style of teaching as well as a different style of learning.

The implementation of a magnet school gave choice to parents, students, and teachers in the Nixa district. Having over 1200 students apply for the school's 437 spots showed the need for choice in the school district. As Kleinsmith remarked, "It's (magnet school) the sweet spot, the bull's eye. I think what parents, our customers, were looking for" (Kleinsmith et al., 2012, p. 1).

The implementation of the magnet school was an innovative way to accomplish the challenging process of redistricting. At the time of this study, the populations of the elementary schools in the district ranged from 434 to 467 and the free and reduced rates ranged from 28 percent to 59 percent (www.boarddocs.com/mo/nixa/Board.nsf/public). The redistricting

accomplished the goal of balancing the student populations at each building. The free and reduced percentages were balanced at all but one school which, while higher than what the district desired, was still lower than before the implementation of the magnet school.

Providing transportation for the magnet school was not part of the original plan due to the costs associated with it. However, through listening to community members during the planning stages of the magnet school, the district chose to incorporate a shuttle bus style of transportation. If transportation would not have been an option, many students who could not afford transportation, would not have been able to apply for the school. “Transportation has been an important provision of magnet schools, specifically to ensure that everyone, who chooses what might be out-of-neighborhood schools, is able to attend. When magnet schools provide free transportation, there is the opportunity for greater diversity (Frankenberg & Siegel-Hawley, 2008, p. 7).

The nature of magnet schools is to be creative. John Thomas School of Discovery became a testing ground for the district. The district’s long-range plans include putting a bond issue to the Nixa voters in April of 2015 to fund a one to one technology initiative for the entire district. If the district passes the bond issue, JTSD will have had four years of experience as a one to one technology school. This advantage would allow the administrator and the teachers to serve as trainers for one to one technology integration to the other administrators and teachers in the district.

John Thomas School of Discovery, since they had a STEAM curricular focus, became the first school in the Nixa district to use the Missouri Learning Standards as a guide. For the 2014-2015 school year, all schools in the district will use the Missouri Learning Standards as their curricular guide. With the rigor of the new standards, the JTSD administrator and teachers

believed that switching from a traditional grade card to a standards-based form of grading complimented the inquiry style of teaching and learning at JTSD. After a year of research and planning, JTSD switched to a standards-based grading system during the 2013-2014 school year. The teachers and the administrator created new grade cards for kindergarten through sixth grade and outlined the quarterly expectations for each grade level. Their groundwork has paved the way for the rest of the district to convert to this style of grading. At the time of this study, Nixa administrators and teachers are discussing the potential switch to standards-based grading for all elementary schools.

Theme #3: Student Engagement.

Administrators, teachers, and parents agreed that the STEAM magnet school has had a positive impact on student engagement. The researcher contributes the inquiry style of learning and instruction and the many learning opportunities found at JTSD for the high engagement level of the students.

Teaching everything through the lens of science contributed to the higher engagement level of JTSD students. Students discover answers for themselves while the teachers facilitate learning rather than simply delivering knowledge. This hands-on approach to learning created conditions to actively engaged students and contributed to their excitement of learning.

John Thomas School of Discovery offered choice to its students. The fifth and sixth graders who had the opportunity to choose the electives they took rather than simply attending the usual music, physical education, or art class. The students had their say in the classes they participated in and this ownership perhaps contributed to their engagement level.

Students at JTSD also had opportunities to enhance their classroom learning through after school clubs. Clubs such as Spanish, comic book, robotics, and drama contributed to their excitement of learning which was seen by teachers in the classroom. .

Theme #4: *Leadership.*

Implementing change requires effective leadership at all levels of the organization (Fullan, 2011). The NPS school board began the process of the idea of a magnet school and trusted the superintendent to successfully carryout their charge to implement a school that offered parents a choice in public education. The researcher concluded the district leadership used much of Kotter’s 8 steps for implementing the magnet school.

1) *Establishing a sense of urgency.* The district used the need for redistricting the elementary boundaries and the need to provide an avenue of choice to parents in public schools as their main reasons for the urgency of the magnet school.

2) *Forming a powerful guiding coalition.* Even before the design team was formed, the district utilized an even broader guiding coalition in strategic planning. Kleinsmith implemented the strategic planning process during the 2000-2001 school year. Strategic planning gives the community the opportunity to be very progressive in their thinking and to be involved in the planning process of the school district. According to Lawson, “I give credit to the genesis of the idea (of JTSD) through strategic planning.” (email September 28, 2013). When it came time to plan for the magnet school, a diverse design team created an implementation plan for the new school.

3) *Creating a vision.* Kleinsmith gave parameters for the design team and based upon that initial vision, the team outlined the design for the new school. The team developed a mission statement, outlined objectives, and created strategies for specific results.

4) *Communicating the vision.* The district used massive amounts of communication, in multiple ways and on multiple fronts. The district used over forty community conversations to get the message out regarding the magnet school. They listened their way to a solution and gave numerous opportunities for patrons and parents to learn about the magnet school.

5) *Empowering others to act on the vision.* “Participants in the planning process must have a sense of ownership of the process and the vision; they must feel empowered to contribute to the process and the outcomes” (Spencer & Winn, 2005, p. 19). Kleinsmith and Lawson, during the community conversations, asked for those interested in joining the design team. A team of nearly 100 affirmed the district of the need for this type of school choice within the district. Design group members divided into committees based on their area of interest and devoted numerous hours of their time to the planning process.

6) *Planning for and creating short-term wins.* The first win came when nearly 100 community members volunteered to become the design team for the new school. The second win came when the school board unanimously approved the implementation of the magnet school. A third win came when thousands of community members attended the open house to see what the school would offer. The final win came when the lottery enrollment process opened with over 1200 applications for only 436 spots.

7) *Consolidating improvements and producing still more change.* While change within an organization is not a quick process, Kotter (2008) advises leaders from declaring victory too quickly. Kleinsmith seemed keenly aware of this and instead communicated that full implementation of the design team’s plan could take up to five years.

8) *Institutionalizing new approaches.* “Institutionalizing new approaches can also be stated as anchoring change in the organizational culture” (Spencer & Winn, 2005, p. 21). The

NPS district's tagline is Excellence in Action. Incorporating a STEAM magnet school was strategically planned and seen as part of the culture of excellence created within the community.

Effective leadership skills were seen at all levels of the district. The superintendent was actively involved throughout the implementation of the magnet school and the successful implementation of the magnet school is due to his involvement. "Major change is impossible unless the head of the organization is an active supporter" (Kotter, 2007, p. 98). District level administrators lead the design team, encouraged two-way communication, and effectively communicated the vision of the change. The building administrator fostered a strong collaborative culture, served as an instructional leader, and supported the teachers during the implementation of the magnet school.

Theme# 5: Collaboration

The common vision experienced by the faculty and staff at JTSD contributed to the collaborative climate within the building. With everyone being new to the STEAM style of teaching, teachers collaborated on all aspects of teaching including scheduling, technology integration, lesson planning, and common assessments. John Thomas School of Discovery teachers were teacher leaders who were supportive of one another. They acknowledged the wealth of expertise of the teachers within the building and used the collective knowledge to create a strong collaborative culture.

Professional learning for the teachers was job-embedded and on-going. The science consultant provided the necessary foundation for the science focus of the school and continued to build from there. The weekly professional learning and collaborative culture of the school allowed teachers to learn from each other and share ideas. While the professional learning for

the JTSD staff could have been more, what teachers received was high quality and helped create a common, scientific focus of the school.

Research Question

What were the effects of the implementation of a STEAM magnet school on students, parents, administration, and community members within the Nixa Public School District?

The implementation of the STEAM magnet school has affected the students, parents, administrators, and community members of the Nixa Public School district. The magnet school provided a choice for parent, teachers, and students. Parents could choose to enter their child's name in the lottery process and teachers across the district had an opportunity to apply to teach at the magnet school. The magnet school provided a unique way to accomplish the redistricting needs of the district to balance student populations and free and reduced rates across the elementary buildings within the district. John Thomas School of Discovery also offered a unique learning environment enriched with technology. The STEAM focus and inquiry approach to learning contributed to students being actively engaged and excited about learning. The STEAM focus also contributed to the collaborative climate of the school.

Recommendations for Future Research

The ultimate goal of this case study was to discover the effects of the implementation of a STEAM elementary magnet school on the students, parents, teachers, and administrators within the Nixa Public School district. Since this case study was limited to the planning stages through the first year of the school, student achievement was not studied. Future research studies could study the impact that a STEAM magnet school has on student achievement.

For this study, the researcher used the qualitative case study method. Additional researchers could, in addition to interviews, use surveys of those impacted by the change initiative and conduct a mixed methods study.

This study did not include interviews of teachers in the other elementary schools. Future studies could interview teachers from across the district to gain their insights on the implementation of the magnet school.

Future research studies could focus solely on the teachers who were at John Thomas Elementary at the time the magnet school implementation was announced. The study could discover their perceptions of how the change was initiated and following them to their new school or JTSD to see how the implementation affected student data over a period of time.

Summary

Kleinsmith (2012) stated, “Change is inevitable, pain is optional. Change, even if it will result in a positive outcome, is difficult... there is a sense of loss” (p. 3). Doug Reeves suggests, “if a proposed change does not engender opposition, then you should question whether or not what you are proposing really represents meaningful change (2008, p.11).” Nixa Public Schools chose to move education in a progressive direction. Staff that chose to approach this way of thinking positively sailed through the change well. Those teachers who chose to stay at JTSD, applied to stay, those teachers who wanted to leave, had the option to apply to other NPS schools.

This study afforded opportunities to reflect on the implementation of the magnet school in the Nixa Public School district from the viewpoints of the people who directly experienced it. While barriers to change are inevitable, the researcher feels the Nixa Public Schools successfully planned and implemented this major, multifaceted change initiative.

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APPENDIX

Consent to Participate in a Research Study

-- A Case Study of the Implementation of a STEAM Elementary Magnet School in the Nixa, Missouri Public School District

Principal Investigator: Jennifer Chastain, Researcher, Southwest Baptist University Doctoral Student

You are invited to be a part of a research study that will examine the effects of a STEAM magnet school on students, parents, administration, and community members within the Nixa Public School District. The purpose of the study is to document the change process the Nixa Public Schools experienced with the implementation of a STEAM magnet school. I am asking you to participate because of your ties to the Nixa Public Schools and/or John Thomas School of Discovery.

If you agree to be part of the research study, you will be asked to participate in one face-to-face interview at the location of your choice. The interview should take about thirty minutes. I would like to audiotape the interview to make sure that our conversation is recorded accurately. You may still participate in the research even if you decide not to be taped.

While you may not receive a direct benefit from participating in this research, some people find sharing their stories to be a valuable experience. I hope this study will contribute to understanding the impact of the implementation of a STEAM magnet school on the Nixa community.

You may choose not to answer any interview question and you can stop your participation in the research at any time.

I plan to publish the results of this study, but will not include any information that would identify you. To keep your information safe, the recording of your interview will be stored on my password protected computer, transcribed by a qualified third party, and the transcription will be placed in a locked file cabinet. As soon as this process is complete, all recordings will be destroyed. I will enter study data on a computer that is password-protected and uses special coding of the data to protect the information. To protect confidentiality, your real name will not be used in the written copy of the discussion. I plan to keep this study data indefinitely for future research about implementing STEAM magnet schools.

If you have questions about this research, including questions about the scheduling of the interview, you can contact me at (417)818-0621 or Chastainjaca@gmail.com. You may also contact my faculty advisor, Dr. Robert Perry, Southwest Baptist University, Department of Educational Administration, at rperry@sbuniv.edu.

If you have any questions about your rights as a research participant, please contact Southwest Baptist University Research Review Board, Dr. Terry Cox, 1600 University Ave. Bolivar, MO 65613(417)328-1992; RRB@sbuniv.edu

By signing this document, you are agreeing to be part of the study. Participating in this research is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. If requested, you will be given a copy of this document for your records and one copy will be kept with the study records. Be sure any questions you have about the study have been answered and that you understand what you are being asked to do. Please contact me if you think of a question later.

Please circle YES or NO after each statement. You are giving your consent by signing and dating this form where provided below.

I agree to participate in the study. YES NO

I agree to be audiotaped as part of the study. YES NO

I would like a copy of transcription of this interview to review. YES NO

Signature

Date

Teacher Questions:

1. Why did you want to teach at JTSD? (B2)
2. What challenges did you face during your first year? (B1)
3. Do you feel the STEAM focus has had an impact on student engagement as it pertains to higher order thinking skills? Explain. (B3)
4. Explain the professional development you have received to prepare you for teaching in a STEAM magnet school? (B4)
5. Evaluate the delivery and content of the initial conversation with the faculty and staff at John Thomas Elementary. Describe the climate of the building and the attitudes of the Thomas faculty during the planning process.(B2)
6. Compare the attitudes of teachers at JTSD to other teachers in the district. (B6)
7. Is there anything else you would like to share with me about your teaching experiences at JTSD?

Administrative Questions:

1. Describe any challenges or opportunities the district faced during the planning process.
(B1)
2. Evaluate the delivery and content of the initial conversation with the faculty and staff at John Thomas Elementary. Describe the climate of the building and the attitudes of the Thomas faculty. (B2)
3. Describe the challenges with the JTSD staff selection process as well as the reassignment of Thomas teachers. (B2)
4. If you were to begin this process again, what if anything would you change?(B1)
5. There were nearly 1300 students who applied for 425 slots. In your opinion, why do you feel there was such a strong parental support for the magnet school? (A1)
6. Describe the professional development provided for JTSD teachers. (B4)
7. How has the STEAM focus at JTSD impacted student engagement as it pertains to higher order thinking experiences? (B6)
8. Compare the attitudes of teachers at JTSD to other teachers in the district. (B6)
9. JTSD is now starting its second year, evaluate/share your thoughts about the first year. Strengths? Struggles? (B1)
10. Is there anything else you would like to share with me?

School Board Member Questions:

1. Explain how the idea of a magnet school came to fruition. (B1)
2. Evaluate the delivery and content of the initial conversation with the faculty and staff at John Thomas Elementary. Describe the climate of the building and the attitudes of the Thomas faculty. (B2)
3. What, if any, concerns/comments were expressed to you regarding the change in faculty and staff at John Thomas Elementary? (A1)
4. Aside from one negative letter to the editor, were you aware of any opposition from the community regarding the magnet school? Please explain. (B1)
5. If you were to begin this process again, what if anything would you change? (B1)
6. Explain your thought about the STEAM focus and its impact on student engagement. (B6)
7. JTSD is now starting its second year, evaluate/share your thoughts about the first year. What do you see for the future of JTSD? (B1)
8. Is there anything else you would like to share with me about JTSD?

Script: Thank you for participating in this interview. If you have any questions after the interview, you may contact me at Chastainjjaca@gmail.com or (417)818-0621. Please remember that your answers are confidential. I will provide you (if you noted so on the consent form) a transcribed copy of this interview so you may review and make any necessary changes. I appreciate your time and comments.