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Student Achievement and Teacher Efficacy In Multiage Team-Taught versus Single-age Classrooms

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Student Achievement and Teacher Efficacy
In Multiage Team-Taught versus Single-age Classrooms

by

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Declaration of Originality

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

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Abstract

This study was conducted to compare the effects of classroom setting on student performance and teachers' sense of efficacy. In this study, student performance on the Missouri Assessment Program grade-level assessments at the third and fourth-grade levels was utilized to compare the multiage team-taught classroom setting versus single-age classroom setting. The teachers' sense of efficacy on the Teachers' Sense of Efficacy Scale (TSES) survey was also analyzed to compare multiage team-taught classroom setting and single-age classroom setting. The data were interpreted to support that students in multiage team-taught classroom settings outperformed similar age students in single-age classroom settings on the MAP assessment at the third and fourth-grade levels in both English language arts and mathematics. The third-grade students showed a significant difference in assessment scores in favor of the multiage team-taught classroom setting. The fourth-grade students showed a difference in favor of the multiage team-taught classroom setting, but not at a significant level. The results from the teacher survey could be interpreted to establish that teachers in the multiage team-taught classroom setting rated themselves higher on the TSES than teachers in a single-age classroom setting. The teachers in a multiage team-taught setting rated their beliefs significantly higher on all three subscale scores of the TSES compared to the teachers in the single-age classroom setting. The results from this study supported the use of the multiage team-taught classroom setting at the third and fourth-grade levels.

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Chapter One: Introduction

This study was designed in two parts. The first part was designed to investigate the performance level of students on the Missouri Assessment Program (MAP). The second part was designed to measure teachers' sense of efficacy. Specifically, the students' performance and teachers' sense of efficacy will be compared to the traditional single-age classroom setting versus a modern multiage classroom setting.

The first part of the study was designed to compare the students' academic performance while enrolled in a traditional single-age classroom versus a modernized multiage classroom that combined 3rd and 4th grades, while focused on the MAP assessment in the areas of language arts and mathematics. Prior research had suggested that student performance should be slightly higher in the multiage classroom; however, statistically, the results proved no significant effect on student performance in language arts/reading (Barbetta, Sorrenti, & Turati, 2018; Eames, 1989; Gorrell, 1998; Leuven & Ronning, 2014; Veenman, 1995). Luvisi and Miller (2001) determined there was a decrease in academic performance for students in the multiage classroom, which had been due to the lack of the full implementation of the modernized multiage classroom program. Mason and Burns (1996) also determined that students in the single-age classroom, with all factors being considered, performed higher academically when compared to students in the multiage classrooms, but not significantly more than the multiage. Overall, the majority of studies have shown that students perform slightly better in both reading and math in the modernized multiage classroom setting, compared to the traditional single-age classroom setting.

The second part was designed to measure teachers' sense of efficacy in the traditional single-age classroom setting versus the modernized multiage team-taught classroom setting. Sezgin and Erdogan (2015) concluded the higher the teacher efficacy, the more likely the teacher was to have a zest for the work, student success, and overall academic optimism. Teacher self-efficacy motivated teachers to create a rich and stimulating academic environment and increased the teaching process for student success (Bandura, 1993). Increased teacher efficacy in a school could increase the likelihood of teachers setting challenging goals for the students while keeping the persistence of the teachers on track to meet those goals for student success (Skaalvik & Skaalvik, 2007).

Mixed-Grade vs. Multiage

Based on the researcher's analysis of studies, there were two ideologically different versions of multiage classroom settings that have been studied together (Veenman, 1995). For this study, the two versions, mixed-grade and multiage settings, needed to be separated. The combination of these terms can lead to confusion when looking at the results of studies which becomes more confusing because multiage was also used as an all-encompassing term for all types of mixed-age classes (Cornish, 2006).

Mixed-grade. In many places throughout the world, students were grouped into mixed-grade classrooms (Saqlain, 2015). In a briefing paper from the Northern Ireland Assembly, Perry, Love, and McKay (2017) studied the effects of mixed-grade classes and found they were "…prevalent internationally, with around 30% of the world's primary school children estimated to study in them" (p. 2). Checchi and Paola (2017) found that 37% of primary schools in France utilized mixed-grade, and 28% of schools in the United States did as well (p. 2). Blease and Condy (2015) also reported that 30% of the students

in South Africa were educated in mixed-grade schools (p. 1). The mixed-grade classrooms were prevalent in rural areas and provided adequate means to overcome lower enrollment and lower financial resources (Checchi & Paola, 2017; Taole, 2017). A single classroom teacher, in a small rural school district, could teach students of various ages combined for instructional purposes (Blease & Condy, 2015). Combining multiage students allowed for decreased numbers of teachers within the school (Blease & Condy, 2015). Decreased staffing allowed for lower costs while still providing positive effects on the educational process (Blease & Condy, 2015; Moeini, Moradian, & Khoroshi, 2016).

Mixed-grade settings were those typical of rural areas (Blease & Condy, 2015). These have also been referred to as multi-grade classrooms (Cornish, 2006). The use of this term multi-grade can be referred to as small schools that combined more than two grades from a single-age classroom setting to multiage. The multi-grade classroom had permanent connotations due to implementation in small schools as an administrative necessity (Blease & Condy, 2015). The implementation typically led to a lower quality of education for the students, which according to Checchi and Paola (2017), led to lower performance scores.

Multiage. While mixed-grade was prevalent throughout the world, the main focus of this study was on the multiage team-taught classroom setting, which had been combined with mixed-grade in prior studies (Veenman, 1995). The multiage team-taught classroom setting could be separated from mixed-grade based on philosophical reasoning due to the implementation of the classroom environment (H. Johnson, 2014). The multiage team-taught classroom was generally formed by administrative choice and

typically occurred for students' learning in developmentally appropriate groups (Cornish, 2006).

Multiage classrooms were further separated from the mixed-grade for this study when the concept of team teaching had been incorporated. The researcher was specifically looking at multiage classrooms that were team-taught with two teachers working together, which according to Cornish (2006), were often part of the whole-school structure.

Background of Study

The multiage classroom setting has a deep history in the United States (Pratt, 1986). During the early 1990s', legislative influences changed the educational climates for schools at the federal and state levels (Gaustad, 1994). The background will detail how the multiage classroom has changed over time, as well as how the legislative processes have influenced classrooms throughout the United States and Missouri.

History of multiage in the United States. In early American history in the scope of education, the multiage/mixed-grade classrooms started in one-room schoolhouses (Pratt, 1986). The one-room schoolhouse was predominant throughout the country as local public schools were formed to educate students (Pratt, 1986). Educational institutions transitioned from one-room schoolhouses to larger schools as populations shifted from rural areas to cities during the Industrial Revolution from 1790 to the 1830s (Domenech, 2015). To combat the growing numbers of students in the urban setting, graded classroom settings were created to educate the ever-increasing numbers of students (Domenech, 2015).

Horace Mann (1855), served as the first Secretary of the Massachusetts Board of Education. Mann supported the use of public schools and advocated for teacher training (Mann, 1855). Mann was instrumental in increasing the number of public schools in Massachusetts as well as how the local communities looked at instruction within the schools (Sherry-Wagner, 2016). While serving as the secretary, Mann convinced the state board to allow him to tour European countries to observe how students were educated (Mann, 1844). After the tour of Europe, Mann (1844) advocated during his Seventh Annual Report to the State Board that the Prussian system of graded classes was most effective at meeting the needs of the larger schools and needed to be implemented:

> The children are divided according to ages and attainments; and a single teacher has the charge only of a single class. . . all difficulties are at once avoided by a suitable classification,--by such a classification as enables the teacher to address his instructions at the same time. . . to the introduction, at once, of this mode of dividing and classifying scholars, in all our large towns. (p. 84)

The graded structure Mann saw in Prussia met the needs of the schools in Massachusetts that were looking for a system to educate the large influx of students (Sherry-Wagner, 2016). The graded system was accepted throughout the United States within the next decade as school administrators saw it as a successful strategy that aligned with the manufacturing practices of the time (Pratt, 1986).

The concept of the multiage classroom shifted from a required setup for small rural schools to a learning environment (Sherry-Wagner, 2016). In 1907 Dr. Maria Montessori, an Italian physician, started a school for impoverished children in the slums of Rome (Whitescarver & Cossentino, 2008). The Montessori School, as it was called,

started and was pushed in America after the publication of a series of articles in *McClure's* in 1911 (Whitescarver & Cossentino, 2008). The first in the series of articles by Tozier (1911) described the teaching methods utilized in the Montesorri School and the impacts the teaching was having on the students in the school (Tozier, 1911). One of the examples used was that of an American child, who at three years old had been trained to read and write in both English and Italian by the methods outlined by Montessori (Tozier, 1911). With the success stories outlined in the magazine, the Montessori School was sold to the elite class in America as an innovative new approach to education that pushed students further than current practices (Whitescarver & Cossentino, 2008). The Montessori Schools in the United States grew to a high of 104 schools in 1916-1917 (Whitescarver & Cossentino, 2008). This movement eventually faded after it was denounced by Kilpatrick in a critique in 1914. Kilpatrick (1914) concluded that Montessori's methods were "some fifty years behind the present development of educational theory" (p. 63). This critique halted the development of Montessori education in America until the 1960s when it moved back into favor as an alternative educational model for private secular schools (Whitescarver & Cossentino, 2008).

The concept of the multiage classroom setting started to return as an effective alternative to the traditional single graded classroom in public schools when, in 1959, the book *The Nongraded Elementary School* by Goodlad and Anderson was published (Pratt, 1986). In the book, the concept of removing grade levels was discussed so that students could develop at their own rates (Goodlad & Anderson, 1959). The researchers championed the nongraded program as a formidable option to better instruct students' educational plans (Goodlad & Anderson, 1959). Howard (1959) reviewed the book and

pointed out that all school personnel needed to read the book, as it provided the necessary steps for the improvement at the elementary school level.

According to McCowan (2009), the next big push for the multiage setting in public schools occurred in Kentucky with the Kentucky Education Reform Act (KERA) of 1990. Clark (2003) summarized that the KERA was written to equalize the educational systems in Kentucky because of schools' finances as well as curricular standards. The KERA created the ungraded primary program where all K-3 students would be enrolled in multiage classroom programs (Clark, 2003). Students were allowed to "progress at their own pace, without the threat of failure in their first four years of school" (Clark, 2003, p. 9-10). This program demonstrated effective practices and the use of mixed-grade levels, which required participation throughout Kentucky, not just in rural settings (McCowan, 2009). The requirements of the legislation continued until 2003 when the program was disbanded due to a lack of funding (Song, Spradlin, & Plucker, 2009).

Multiage programs, similar to Kentucky's, were started during the 1990s in Oregon and Michigan (Sherry-Wagner, 2016; Vincent & Ley, 1999). According to Gaustad (1994), in 1991, the Oregon legislature passed the Oregon Educational Act for the 21st Century. As part of this legislation, Oregon's Department of Education had recommended models for schools to implement non-graded primary programs (Gaustad, 1994). The recommendation of these models for the elementary programs did not pass for legislation and no formal program was started (Gaustad, 1994). Sherry-Wagner (2016) highlighted that the State Board of Education in Michigan announced a grant for programs for multiage classrooms in 1994. The grant program started, and within four

years, the implementation of the multiage program granted more than half of the districts in Michigan to initiate or expand the multiage classrooms (Song et al., 2009). The funding for the Michigan grant program was eliminated due to the multiage classrooms' lack of compatibility within the grade-level content and annual testing requirements (Song et al., 2009). The movement to multiage classrooms slowed down due to the changes implemented during the era of the No Child Left Behind Act (NCLB) in 2002, which established high stakes testing requirements for schools and essentially started to deter innovative practices (Pardini, 2005).

Federal legislative influences. According to Russo (2015), the educational systems in the United States of America were established as part of the states by the Tenth Amendment to the United States Constitution. The General Welfare Clause of Article I established the authority for the federal government to enact laws that offered funds that were deemed to be part of the public good. Utilizing that authority, President Lyndon Johnson signed in 1965, The Elementary and Secondary Education Act (ESEA). As part of the legislation, the United States Department of Education started using federal funding allocations connected to performance levels (Tampio, 2016).

The ESEA continued from 1965 to 2002 without major changes (Russo, 2015). In 2002, Congress reenacted the legislation and entitled the legislation, the *No Child Left Behind Act* (NCLB) ("No Child Left Behind," 2013). Russo (2015) felt that the legislation "was the most controversial federal education statute ever" (p. 13). This far-reaching legislation set up mandates for states receiving federal financial assistance (Russo, 2015). Each state had to provide highly qualified teachers, improve academic achievement, impose standards for adequate yearly progress, and districts had to

implement highly enriched research-based teaching methods (Song et al., 2009). The requirements from this legislation changed the educational climate of schools and reduced the innovative programs that were in place prior to the NCLB (Pardini, 2005; Song et al., 2009).

The ESEA was reauthorized by Congress and signed into law on December 10, 2015, by President Barrack Obama ("Every Student," n.d.). The reauthorization was entitled to the "Every Student Succeeds Act" (ESSA) (Russo, 2015). The ESSA decreased the mandatory assessments established by the NCLB (Russo, 2015). This reauthorization allowed for the withholding of Title I funds from schools not meeting the requirements of the ESEA, which were used to supplement local budgets of schools serving disadvantaged and poor students (Tampio, 2016). Title I funds were important to schools, so schools were adopting the requirements of ESSA, but the freedom within the ESSA for states to create separate plans allowed states to utilize different methods for compliance ("Every Student," n.d.). The consolidated plans, which allowed states to demonstrate how students met standards through local interventions, were submitted to the United States Department of Education (MoDESE, 2018b). This action provided an opportunity for rethinking educational structures (MoDESE, 2018b).

Missouri legislative influences. The Missouri Department of Elementary and Secondary Education (MoDESE), was responsible for the submission of performance data from school districts in Missouri and the demonstration of how students had met the standards established by ESSA (MoDESE, 2018b). The Missouri Consolidated State Plan outlined how Missouri schools would meet the expectations of the ESSA (MoDESE, 2018b). The plan provided a means for schools to be aligned with the Missouri School

Improvement Plan's (MSIP) five essential principles to the Federal requirements (MoDESE, 2018a). Each district utilizing a local comprehensive school improvement plan adopted goals and practices to demonstrate the principles (MoDESE, 2018a). The implementation of the multiage classroom by Missouri school leaders could provide an effective classroom practice to meet the essential principles and provided a learning environment to support students' academic needs (Broome, 2016; Kohn, 2015; Schweitzer, 2015).

Some small rural schools in Missouri, as well as in other parts of the United States, have struggled to meet standards from the NCLB due to the limited number of students per grade level as well as limited access to high-quality educators (Checci & Paola, 2017; Taole, 2017). For this reason, the typical mixed-grade classroom that was presented in some small schools had one teacher teaching two or three grade levels (Bailey, 2014). While this style of classroom provided many of the benefits of the multiage classroom, it also had limitations with only one teacher in the room (Sattari, 2016; Vincent & Ley, 1999). For all students to be fully served and individual educational needs met, there needed to be two teachers in the classroom team teaching (Bardaglio, Marasso, Magno, Rabaglietti, & Ciarano, 2015). Two teachers working together allowed for increased self-efficacy for the teachers which in turn helped to establish the proper learning environments (Sezgin & Erdogan, 2015). Team teaching also provided the support necessary to group students for academic success (Barbetta et al., 2018; Canter, 2017; Kohn, 2015; Moeini et al., 2016; Van Tassel-Baska & Hubbard, 2016). Team teaching also provided an environment for increased development of

teacher job satisfaction which ultimately helped students learn (Bandura, 2019; Karabiyik & Korumaz, 2014; Shaughnessy, 2004; Tschannen-Moran & Woolfolk Hoy, 2001).

Conceptual Framework

To fully investigate the mixed-grade classroom, the researcher chose to look at social and learning theories as a framework. The researcher had to identify the learning theorists; Dewey, Vygotsky, Piaget, and Bandura, as related to the social and emotional development of children. These theorists supported the improvement of the academic performance of students based on the development of children's learning abilities which was based on academic growth versus age (Bailey, 2014; Canter, 2017; Harding, 2015; Taole, 2017). Teachers also were able to grow and learn through the social development theory and the increased sense of self-efficacy that occurred when collaborating with other professionals (Bandura, 1997, Goddard, Hoy, & Hoy, 2000; Tschannen-Moran, Hoy, & Hoy, 1998).

A teacher in a single-age classroom could lose focus due to narrow educational goals which could lead to losses in group learning, development of empathy, cooperation, and an appreciation in the diversity of learning (Sherry-Wagner, 2016). Dewey felt that traditional schools increased the narrow focus and traditional schools had a large number of passive students due to the school centering all activities on the "teacher, in the textbook, anywhere and everywhere except in the immediate instincts and activities of the child himself" (Leshkovska & Spaseva, 2016 p. 57). White (2015) supported Dewey's beliefs in engaging students in collaborative experiences. The collaborative experiences could be enhanced through student interactions in the mixed-grade classroom (Sherry-Wagner, 2016).

The mixed-grade classroom aligned with the developmental learning theories of Vygotsky, Piaget, and Bandura (Kreide, 2011). Vygotsky supported the mixed-grade classroom structure through social development (Bailey, 2014). Vygotsky's social development theory postulated that students would push themselves academically as a desire to socialize (Bailey, 2014). Vygotsky's social development theory aligned with Piagetian research, positing that the interaction of individuals of varying maturity levels would stimulate cognitive growth in less mature individuals (Pratt, 1986). Piaget's theory aligned with Bandura's social learning theory (Harding, 2015). Bandura's social learning theory postulated learning was reinforced through observations of others and individuals learned via active engagement (Harding, 2015). These theories along with Dewey's ideology established the developmental basis and supported the multiage classroom as a means to educate the whole child and supported the full development of students (Bailey, 2014; Harding, 2015; Kreide, 2011; Leshkovska & Spaseva, 2016; Pratt, 1986; Sherry-Wagner, 2016; White, 2015).

When analyzing the academic performance of students, the primary source since 2009 has been Hattie (2009). Hattie analyzed over 800 meta-analyses related to influences on achievement in school-aged students. Hattie's (2009) research provided insight into what works in classrooms and schools. The analysis was ongoing and led to a new book by Hattie (2012) on how teachers could use the information to inform practice. The books from Hattie (2009; 2012) guided the researcher on influences that were present in the multiage setting. The data present in the books led the researcher to choose teacher-student relationships, student-centered classrooms, co/team teaching, and the multi-grade/age classroom for further study (Hattie, 2009; 2012). These four

influences discussed by Hattie (2009; 2012), were present in the multiage team-taught classroom setting and could have a direct effect on student academic performance, which in turn could influence the outcome of the study.

Statement of the Problem

During the 1990s, schools across the United States were starting to move forward with innovative ways to meet students' needs (Pavan, 1992). One of these ways was the multiage classroom (Pavan, 1992). The multiage classroom was an innovative practice, which legislatures at the state level in Kentucky, Oregon, and Michigan, felt could help students be successful (Sherry-Wagner, 2016; Vincent & Ley, 1999). Kentucky implemented the strongest legislation, going as far as to require all primary schools in the state to be non-graded (Clark, 2003; McCowan, 2009; Song et al., 2009; Stone, 2009; Vincent & Ley, 1999). These innovative programs allowed for schools to meet students' needs (Stone, 2009).

The educational climate changed under President Bush when in 2002, the Elementary and Secondary Education Act was reenacted and titled the *No Child Left Behind Act* (NCLB) ("No Child Left Behind," 2013). Due to the new requirements of accountability and high stakes testing, many schools and states backed away from these innovations (Song et al., 2009). Some small rural schools in Missouri, as well as in other parts of the United States struggled to meet standards from the NCLB Act due to the limited number of students per grade level as well as limited access to high-quality educators (Checci & Paola, 2017; Taole, 2017). The typical mixed-grade classroom that was present in some small schools had one teacher teaching two or three grade levels (Bailey, 2014). While this style of classroom provided many of the benefits of the

multiage classroom, it also had limitations with only one teacher in the room (Sattari, 2016; Vincent & Ley, 1999).

Since the enactment of the NCLB Act, the United States faced what has been called the Great Recession (Bandyopadhyay & Guerrero, 2015). The Great Recession was the period from December of 2007 to June of 2009; it was one of the largest national and global trade collapses of all time (Bandyopadhyay & Guerrero, 2015). During the Great Recession, the United States' exports dropped by 17.9% and in Missouri exports dropped by 25.4% (Bandyopadhyay & Guerrero, 2015). The Great Recession decreased revenue for school districts in Missouri by decreasing the funds available for the Proposition C Sales Tax ("School Finance," 2018). The sales tax revenues from Proposition C went from $784,900,800 in the 2007 fiscal year to $695,120,132 in the 2010 fiscal year ("School Finance," 2018, p. 3). Even though the Great Recession ended in 2009, the revenues from sales tax in Missouri did not increase over the funding level of 2006-2007 until 2013-2014 ("School Finance," 2018, p. 3). The loss of revenue forced schools to consider ways to save money without closing schools; multiage classrooms provided an option for schools to consider while still being innovative (Currie, 2018).

With the reauthorization of the ESEA in 2015 states could submit, through consolidated plans, alternative ways that school districts could demonstrate local innovations to meet the requirements of ESEA and provided an opportunity for rethinking educational structures ("Every Student," n.d.). School district leaders started to see more funding as the impacts of the Great Recession lessened and revenues increased ("School Finance," 2018). The Proposition C revenue in Missouri increased from a low in 2009-2010 of $695,120,132 to an estimate in the 2017-2018 fiscal year of

$901,600,000 ("School Finance," 2018, p. 3). The relaxation of the requirements in the ESSA and the increased revenues allowed school district leaders in Missouri to seek out innovative ways to meet the standards and requirements (Currie, 2018).

The problem for rural schools was how to continue to provide innovative practices while maintaining adequate funds (Carey, Carroll, Snow, & York, 2014). Rural schools have received increased funds, but due to the discrepancy between rural and urban funding, rural schools have not received as much as larger districts (Carey et al., 2014). The rural schools had to seek out innovations that did not increase expenditures (Carey et al., 2014). In other words, the multiage team-taught classroom could provide innovative practice without increasing budgeting (Currie, 2018).

When combining grades into a multiage team-taught classroom, all students would have to be fully served and all individual educational needs met (Bardaglio et al., 2015). To accomplish this task would require that there remain two teachers in the classroom team teaching (Bardaglio et al., 2015). The team-teaching aspect provided the support necessary to group students for academic success (Barbetta et al., 2018; Canter, 2017; Kohn, 2015; Moeini et al., 2016; Van Tassel-Baska & Hubbard, 2016). Team teaching also provided an environment that could increase the development of the teachers' level of job satisfaction (Karabiyik & Korumaz, 2014). An increased level of job satisfaction, in turn, could develop a higher sense of efficacy for the teachers, which could ultimately help students learn (Ashton, Webb, & Doda, 1983; Bandura, 1997; Karabiyik & Korumaz, 2014; Shaughnessy, 2004; Tschannen-Moran & Hoy, 2001).

Purpose of the Study

The primary purpose of this study will be to investigate the differences in academic performance between students enrolled in a single-age classroom and students in a team-taught multiage classroom. The difference in academic performance will be derived using the data from the Missouri Assessment Program (MAP) which was the standardized grade-level test required of public school districts in Missouri. This study will focus on the school districts in Missouri that have implemented both team-taught multiage classroom settings and single-age classrooms within the same elementary building. The study will focus on the third and fourth-grade individual English language arts and mathematics MAP scores of students. The individual student scores will allow comparability of student academic performance on the MAP assessment of students during the first two years in the assessment program.

The effects of the Great Recession have created budget shortfalls for some schools in Missouri (Carey et al., 2014). These budget shortfalls could have created concerns for some rural school superintendents related to their school districts' ability to save funds while also meeting students' academic needs (Carey et al., 2014). To meet the academic needs of students in their districts, some of the small rural school district administrators have offered mixed-grade classes due to the limited number of students in some grade levels (Carey et al., 2014; Currie, 2018). In most of the small rural schools with mixed-grade classes, the typical classroom had one teacher per class with multiple grade levels (Jenkins, Taylor, & Reitano, 2015). As a result, some teachers could struggle in the mixed-grade level setting due to a lack of peer support, a lack of understanding of the culture of the community, personal conflicts with students, and a

lack of experience (Jenkins et al., 2015). The lack of self-efficacy of these teachers could lead to lower job satisfaction and an increased risk of burnout (Karabiyik & Korumaz, 2014; Skaalvik & Skaalvik, 2007). To eliminate the concerns within the mixed-grade level setting, this study centered on elementary schools that implemented multiage programs that utilized team teaching in the classrooms.

To measure the effectiveness of the multiage team-taught setting based on students' academic performance on the MAP tests, a quantitative study comparing the results of students in a single-age classroom versus the students' results in the multiage team-taught classroom in the same building and district was completed. The results of the study will attempt to provide a relevant data source for small schools to consider when looking at an innovative practice to meet the students' academic needs, as well as to meet the requirements of the Every Student Succeeds Act (ESSA).

The secondary purpose of the study will be to investigate the relationship between teachers' sense of self-efficacy in the multiage team-taught classroom and the single-age classroom. According to Skaalvik and Skaalvik (2007) teachers who perceived a higher collective teacher efficacy for a school and a building were more likely to have higher self-efficacy and as a result, should have better student achievement. High collective self-efficacy could lead to more challenging goals and could increase teachers' persistence to meet those goals (Hoy, Sweetland, & Smith, 2002; Skaalvik & Skaalvik, 2007). Goddard, Hoy, and Woolfolk Hoy (2000) supported the effects on achievement, "collective teacher efficacy is a significant predictor of student achievement in both mathematics and reading achievement" (p.500). Ashton, Webb, and Doda (1983), found that teachers' sense of self-efficacy was related to school organizational structures.

Schools that had a team organization and multiage grouping of students had a higher sense of efficacy which should lead to a higher collective teacher efficacy (Ashton et al., 1983).

School districts that have been operating with a mixed-grade classroom or traditional single-age program, with only one teacher per class, could use the combined results of this study to consider combining classes with two teachers. Two teachers in the classroom working together could allow for stronger academic instruction for students and increased teacher efficacy. Increasing collective teacher efficacy could subsequently lead to increased academic performance on state assessments for the students.

Research Questions

The following research questions guided the study:

Research Question One (RQ1): What is the difference in student performance levels on the MAP English language arts grade-level assessment between students enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

Research Question Two (RQ2): What is the difference in student performance levels on the MAP mathematics grade-level assessment between students who are enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

Research Question Three (RQ3): What is the difference in teachers' sense of efficacy between teachers who teach in multiage team-taught classrooms and single-age classrooms?

Hypotheses

Alternate hypothesis one ($H1_a$): Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP English language arts assessments than students enrolled in single-age classrooms.

Alternate hypothesis two ($H2_a$): Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP mathematics assessments than students enrolled in single-age classrooms.

Alternate hypothesis three ($H3_a$): Teachers who teach in multiage team-taught classrooms will have a significantly higher sense of efficacy than those that teach in single-age classrooms.

Null Hypotheses

Null hypothesis one ($H1_0$): Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP English language arts assessments as students enrolled in single-age classrooms.

Null hypothesis two ($H2_0$): Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP mathematics assessments as students enrolled in single-age classrooms.

Null hypothesis three ($H3_0$): Teachers who teach in multiage team-taught classrooms will have the same or lower sense of efficacy as teachers who teach in single-age classrooms.

Significance of the Study

In a review of the available literature related to the effects of the multiage team-teaching approach, a gap was discovered in information connecting this approach to

students' academic performance. Specifically, there was a lack of studies found during the review of existing literature that related measured academic performance on standardized assessments in team-taught multiage classrooms versus single-age classrooms. Song, Spradlin, and Rucker (2009) supported that research was dated and stated, "High-quality research on the effects of multiage education is needed…" (p. 6). While lacking specific studies on the team-taught multiage classrooms, Hoffman (2003) recommended that future research should examine the impact of team teaching in the multiage as it "…seems to have potential benefits for both teachers and students." (p. 16). According to Hattie (2009), prior research was lacking in studies that involved the analysis of team teaching in general. The lack of meta-analyses of team teaching was described as "…a dearth of literature on the effects of team teaching" (Hattie, 2009, p. 219). Of the 800 meta-analyses analyzed by Hattie (2009), only two studied the effects of team teaching on students' learning. These findings supported the gap in the literature and the need for further research.

The results from this study could be used to address this gap by examining the effects of a team-taught multiage setting on students' MAP test performance in English language arts and mathematics for third and fourth-grade students in Missouri schools. The results of this study would provide relevant data for administrators in small rural schools. The data could be a pertinent source of information to consider when looking at multiage team teaching as an innovative practice that meets the students' academic needs, increases teachers' sense of self-efficacy, and meets the requirements of the ESSA. Furthermore, this study will help administrators in all school districts, make informed

decisions about the continued use of the single-age classroom or consider implementing the multiage team-taught classroom setting.

Limitations and Assumptions

The following limitations were identified in this study:

Sample. The number of schools that could be drawn upon for students' scores was the most notable limitation of the study. The schools included in the study for comparing student performance were in districts that had both multiage team-taught classroom settings and single-age classroom settings in the same building. The limitation helped to isolate the classroom setting as a key factor in student performance as the curricular focus, professional development opportunities, and administrative supports were similar in the comparison groups. The sampling was done as a purposive sample as the students' scores were collected from the districts that identified as having both classroom settings in the same building. This method eliminated the randomness of the sampling, but efforts were made to ensure reasonable representative samples were obtained.

The Teachers' Sense of Efficacy Scale survey was limited to the elementary schools in Missouri which had both classroom settings and had participated in the study, specifically to the third and fourth-grade teachers only. The third and fourth-grade teachers were selected to take the survey since those were the grades being utilized for the academic performance analysis. The sample was limited based on the selection criteria and those teachers who responded to the requests.

Measure of student performance. To measure the students' performance, a standardized test of academic performance on mathematics and English language arts

was selected. In Missouri, the students in grades three through eight have taken a spring assessment in English language arts and mathematics (MoDESE, n.d.a). The assessment was part of the MAP. The assessment was administered in all public school districts throughout the state in the spring. The student performance data was collected and archived by the MoDESE and was accessible via a secured website (MoDESE, n.d.b). The assessment was designed to analyze student learning toward the Missouri Learning Standards and as such, would limit the generalization of results to any other state.

Measure of teachers' sense of efficacy. To measure the level of teachers' sense of efficacy, the Teachers' Sense of Efficacy Scale (short form) developed by Tschannen-Moran and Woolfolk Hoy (2001) was selected. The instrument was found to be a valid and reliable instrument as a measure of individual efficacy (Tschannen-Moran & Woolfolk Hoy, 2001). The Teachers' Sense of Efficacy Scale (TSES) was designed in the context of teacher behavior and as such could not be used as a predictor of student performance (Heneman, Kimball, & Milanowski, 2006). The TSES was not designed to measure collective teacher efficacy which had a direct effect on student performance (Bandura, 1993). Based upon these factors, the TSES limited the ability to correlate the results from the TSES directly to student performance.

The following assumptions were accepted:

Student enrollment. The students enrolled in the multiage team-taught classroom were of the same or similar characteristics of students enrolled in the single-age classrooms. To help with this assumption, buildings within the same districts and regions within the State of Missouri were selected to participate in the study. The buildings had to have both classroom settings at the third and fourth-grade level. Data

were not collected for individual student demographics. The assumption established the independent variables as the classroom setting in which the students were enrolled, single-age or multiage.

Teacher selection. The teachers teaching in the multiage program were equitable to the teachers teaching in the single-age classrooms based on experience and ability levels. The teacher's years of experience were collected as part of the survey for the Teachers' Sense of Efficacy Scale survey, but the study of student performance was done ex post facto, so the teachers who responded to the survey might not be the same teachers from the previous year when the students took the assessment. The assumption allowed the results to be analyzed and compared based on classroom setting only and did not allow for comparability toward the student performance results.

Student data. The data that was received was accurate and placed into the correct classroom settings based upon the examiners' names. Additionally, the student performance data were sent and separated based upon the examiners' names. The collection of data relied upon a person within each school district to submit the data. The examiners' names were provided which allowed for data to be separated into single-age classrooms and multiage team-taught classrooms. The examiners were appropriately identified and the students were appropriately assigned in the classrooms when they took the assessment in the spring of 2018.

Teacher efficacy. The teachers who completed the Teachers' Sense of Efficacy Scale survey were honest in their responses. The surveys were sent to teachers in the buildings who taught third and fourth grade. The teachers selected the classroom settings in which they taught, either single-age or multiage. The teachers then responded to the

12 items on the Teachers' Sense of Efficacy Scale. The assumption was that the teachers who took the survey taught third or fourth grade in the buildings selected and filled out the 12 items honestly.

Definitions

The following definitions were used for the study:

Collective teacher efficacy. Collective teacher efficacy was "the perceptions of teachers in a school that the efforts of the faculty as a whole will have a positive effect on students" (Goddard et al., 2000, p. 480).

Co-teaching. Co-teaching occurred "when two professional educators collaborate to meet general and special education students' unique learning styles and needs in the inclusive classroom" (Petrick, 2015, p. 1).

ESEA. ESEA was an acronym for the Elementary and Secondary Education Act of 1965 (Russo, 2015). The ESEA provided the framework for federal funding support to states and schools throughout the United States (Russo, 2015).

ESSA. ESSA was an acronym for Every Student Succeeds Act, the 2015 reauthorization of the Elementary and Secondary Education Act of 1965 ("Every Student," n.d.). The ESSA provided the option to states to meet the requirements of the act and provided more freedom for states than NCLB ("Every Student," n.d.)

Looping. A looping classroom was one in which "the teacher keeps the same group of students for two or more consecutive years" (Guadiz, 2009, p. 8).

MAP. MAP was an acronym for the Missouri Assessment Program grade-level assessments administered by school districts in the spring of each year (MoDESE, n.d.a).

MCDS. MCDS was an acronym for the Missouri Comprehensive Data System portal on the MoDESE website (MoDESE, n.d.b).

Mixed-grade classroom. Mixed-grade classrooms were classrooms that contained a "…group of students with an age span of at least two or three years." (Bailey, 2014, p. 10).

MoDESE. MoDESE was an acronym for the Missouri Department of Elementary and Secondary Education (MoDESE, n.d.a)

Multiage classroom. Multiage classrooms contained students of different ages and grade levels that were combined to realize academic and social benefits (Canter, 2017; Harding, 2015).

Multi-grade classroom. Multi-grade classrooms were "classes in which students from two or more grades are taught by one teacher in one room at the same time" (Veenman, 1995, p. 319).

NCLB. NCLB was an acronym for No Child Left Behind, the reauthorization in 2002, of the Elementary and Secondary Education Act of 1965 (Russo, 2015). The NCLB legislation provided more stringent requirements on states to receive federal funding, which hampered individual school freedoms (Russo, 2015).

Nongraded classroom. A nongraded classroom was a classroom situation that occurred "anytime when students are not grouped by age based grade levels" (Kahn, 2016, p. 12).

Self-efficacy. Self-efficacy was a person's judgment about whether he/she could complete future actions (Bandura, 1977).

Single-age classroom. A single-age classroom was a room in which students were placed in a single grade for one year with an age-specific curriculum (Bailey, 2014).

Student-centered learning/teaching. Student-centered learning was the implementation of a classroom teaching model in which students were active in their learning and sought out resources, while teachers facilitated and employed teaching methods that encouraged the use of the resources (Bradford, Mowder, & Bohte, 2016).

Teacher efficacy. Teacher efficacy was a teacher's "judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (Tschannen-Moran & Woolfolk Hoy, 2001, p. 783).

Teacher-student relationship. Teacher-student relationships were the positive interactions characterized by warmth, open communication, and support from teachers who displayed tolerance, empathy, interest, and respect for students (Krane, Ness, Holter-Sorensen, Karlsson, & Binder, 2017).

Team teaching. Team teaching was a classroom situation in which two or more teachers shared a classroom and the responsibility for meeting student learning needs, while also learning from each other (Murphy & Martin**,** 2015).

Summary

Throughout the world, mixed-grade classrooms were prevalent in rural areas due to the ability of this type of classroom to save money while still providing an education for students (Blease & Condy, 2015; Checchi & Paola, 2017; Hyry-Beihammer & Hascher, 2015; Perry et al., 2017; Saqlain, 2015; Taole, 2017). The mixed-grade classroom was not always perceived as an ideal setup and could be considered a

necessary evil (H. Johnson, 2014). The difference between the mixed-grade classroom and the multiage team-taught classroom was evident in both the simple philosophical difference of why the classrooms exist as well as the number of teachers involved with instruction and support. The multiage team-taught classroom was set up for students to have both academic and social success (Canter, 2017; Harding, 2015; Veenman, 1995).

The benefits of the multiage team-taught classroom were supported by the theorists Vygotsky, Piaget, Bandura, and Dewey (Bailey, 2014; Canter, 2017; Harding, 2015; Taole, 2017). The theorists supported the development of a child's social behaviors through grouping that was utilized in the multiage team-taught classroom (Bailey et al., 2016). A student who attended school in the multiage team-taught classroom would learn and develop positive social and academic behaviors (Bailey, 2014; Bailey, Werth, Allen, & Sutherland, 2016; Farrant, 2017). The teachers in the multiage team-taught classroom also could benefit from increased self-efficacy, which would lead to increased student performance (Goddard et al., 2000). The study was designed to compare the academic performance of students and the teachers' sense of efficacy in multiage team-taught classroom settings and single-age classroom settings for third and fourth grades.

Chapter Two will provide further detail into the review of existing literature related to the multiage team-taught classroom. The supporting literature provided relevant data about the developmental growth of students. The theories of Bandura, Dewey, Piaget, and Vygotsky supported the growth of students as well as the teachers in the multiage team-taught classroom. Hattie (2009, 2012) supported several learning outcomes that were present in the multiage team-taught classroom.

Chapter Two: Review of Literature

Many small schools throughout the United States have struggled with meeting the demands of the Every Student Succeeds Act, while still providing innovative practices to enhance student learning and engage students (Currie, 2018). With limited funding and resources, the small schools have had to seek out innovative practices without making drastic changes to the budgets (Carey et al., 2014; Currie, 2018). One innovative practice that has been implemented in some small schools was the use of the multiage team-taught classroom. The team-taught multiage classroom provided the opportunity for developing the influences discussed by Hattie (2009) that had an impact on student learning. The multiage team-taught classroom further enhanced teachers' sense of self-efficacy, which led to increased student achievement (Bandura, 1993). The purpose of this study was to measure the effects the multiage team-taught classroom had on the performance of third and fourth-grade students' achievement on the Missouri Assessment Program (MAP) grade-level assessments and their teachers' sense of efficacy in comparison to students and teachers in a single-age classroom.

The chapter was separated into the theoretical frameworks that supported the implementation of the multiage team-taught classroom. Within the theoretical framework, the review centered upon the learning theories of John Dewey and Jean Piaget as well as the social development theories of Lev Vygotsky and Albert Bandura. The theories were analyzed for the impact that each had on developing the concepts within the multiage team-taught classroom as well as how they supported the implementation of the multiage program.

The meta-analyses performed by Hattie (2009, 2012) isolated influences on student achievement. Some of the influences that were discussed by Hattie were related to the multiage team-taught classrooms and were further researched. The influences related to multiage were teacher-student relationships, student-centered learning, team teaching, and the multiage/grade setting (Hattie, 2009, 2012). These influences individually had an impact, but when combined in a team-taught multiage classroom could have a greater overall effect on students' academic performance (Weaver, 2015). The individual influences were supportive of the multiage team-taught classroom setting and will be discussed in further detail in this chapter. One influence that was not part of Hattie's meta-analyses was looping. Looping incorporated multiple influences discussed by Hattie (2009) and was a component in the multiage team-taught classroom (Weaver, 2015). Looping was supportive of academic growth and achievement (Moore, 2015; Pickett, 2016; Riley, 2014; Wang et al., 2017; Washington, 2015; Weaver, 2015).

The review of literature was guided by the search for studies that measured the effects of the multiage team-taught classroom setting on academic performance. The research was lacking studies that measured the effects of a team-taught multiage classroom. The lack of studies shifted the focus to what influences occurred within the classroom that were supportive of the team-taught multiage classroom design. The lack of studies did not guide the design of the study but did shift the research that was utilized as part of the review.

Conceptual Framework

There were four major theorists who, when analyzed were connected to the multiage team-taught classroom setting. The ideologies of the theorists were separated

into learning theories and social development theories. The learning theories of Dewey and Piaget were discussed as to how their beliefs on learning supported the multiage team-taught classroom. The multiage team-taught classroom was further supported by the social development theories of Bandura and Vygotsky. The four theories were combined to support the multiage team-taught classroom.

John Dewey. Leshkovska and Spaseva (2016) classified John Dewey as a pioneer of modern education. As a pioneer in education, Dewey along with others supported an educational model that opposed uniformity and predominantly verbal teaching. Dewey (1920) felt that the student "…is the starting-point, the center, and the end" (p.13). Dewey sharply criticized the model of teaching where the student was not the focus of education. In the traditional classroom that Dewey opposed, students were presented information and memorized and recited the information in a factory-like atmosphere (Sherry-Wagner, 2015). The atmosphere limited the individual growth of the students (Leshkovska & Spaseva, 2016). Contrary to the methods used in the factory-like atmosphere, the learning process needed continuous change and an individual's experiences to be enhanced (Dewey, 1920). To enhance individual experiences required the curriculum to be realigned (Dewey, 1920). The realignment allowed for the child's experiences to be incorporated which provided proper learning environments (Dewey, 1920).

White (2015) supported Dewey in that the curriculum had to contain both academic content and character content. Leshkovska and Spaseva (2016) wrote the academic content was not only related to the subject matter, but also the child. The child's experiences and the subject matter had to come together to form the learning

environment (Leshkovska & Spaseva, 2016). Dewey believed the students not only utilized individual experiences in the environment, but they also had to work together as a collaborative group (White, 2015). The students had to learn the subject matter, as well as "how to behave, how to get along, how to discipline themselves for the sake of the common good" (White, 2015, p. 134). Many students thrived in an environment where they interacted with the curriculum (Goldman, 2017).

The teacher was a vital piece of the Dewey ideology (White, 2015). The role of the teacher was in facilitating the learning and development of the child's powers and interests (Leshkovska & Spaseva, 2016). The teacher was responsible for developing the dawning capacities of the student (Leshvokska & Spaseva, 2016; White, 2015). For the development of the capacities within each student, the teacher had to consider the strengths and weaknesses of the child and integrate personal experiences (Leshkovska & Spaseva, 2016). The students' personal experiences enhanced learning by stimulating natural active tendencies to develop a constructive imagination (White, 2015). The students' imaginations could be further enhanced through structured small-group activities (White, 2015). The small group activities supported the improvement of student academics and behavior (White, 2015).

The multiage setting was the ideal environment for the development of an interactive curriculum, which would inherently make students more active and engaged with the curriculum and in-class (Goldman, 2017). White (2015) found the interactions were enhanced by the small group activities in the multiage setting. The multiage setting provided opportunities for student-centered learning built on social development and

shared experiences that aligned with Dewey's theory (Bradford, Mowder, & Bohte, 2016; Goldman, 2017).

Jean Piaget. Piaget was considered one of the forefathers and helped found the field of cognitive development (Bailey, 2014; Bjorklund & Causey, 2018). Bjorklund and Causey (2018) supported that Piaget's cognitive development theory was able to provide a relative picture of how children's thoughts and learning developed. Piaget (1964) wrote there were four levels of cognitive development of a child: (1) sensorimotor, (2) preoperational, (3) concrete operational and (4) formal operational. The preoperational, concrete operational, and formal operational stages developed primarily during the school-age years of children (Piaget, 1964).

The sensorimotor stage was characterized by external growth and development and lasted approximately the first 18 months of life (Piaget, 1964; van Geert, 2017). The child's first stages of internal growth and development occurred at the beginning phases of the preoperational stage (Kofa, 2017; van Geert, 2017). Bjorklund and Causey (2018) supported that the preoperational stage was primarily present in preschool-age children.

Van Geert (2017) interpreted the concrete operational stage started to transition around the age of seven and ended around age eleven for most children. This would place the concrete operational stage as the primary developmental stage for elementary-aged students. Piaget (1964) postulated the developmental stage was called the concrete operational stage because the operations, "operate on objects, and not yet on verbally expressed hypotheses" (p. 177). The foundation of the stage was based on classifications and elementary logic.

The final stage of development was when a person developed abstract thinking abilities. According to Bjorklund and Causey (2018), the formal operational stage started between the ages of 11 and 16. The formal operational stage was not fully developed until the age of early to middle twenties (Bjorklund & Causey, 2018; Piaget, 1964; van Geert, 2017).

Bjorklund and Causey (2018) relied on some assumptions within Piaget's theory to explain the transition from one stage to another: (1) Children behaved and grew within the system and relied upon biological concepts of organization and adaptation, (2) Organization occurred through the development of an organism's inherent ability to integrate structures in higher-order thinking, (3) The adaptation of an organism occurred through the interactions within the environment where the child had to learn to assimilate or accommodate learning within the environment. Piaget (1964) postulated the growth and transition from one stage to another occurred to obtain an equilibrium or "self-regulation" (p. 178). An imbalance started when new information was learned that did not fit into an existing structure (Bjorklund & Causey, 2018). The new information had to be placed into an organizational structure, so a change of stage had to occur to start the development of equilibrium. This transition continued from stage to stage until the final equilibrium was created in the formal operational stage (van Geert, 2017).

Piaget (1964) suggested that the stages of development were universal and constant in all societies, but the chronological ages could vary. Bjorklund and Causey (2018) found, since Piaget's time, culture has been shown to play a major part. Children who grew up in cultures without formal schooling had a slower rate of development through the stages (Bjorklund & Causey, 2018). The multiage team-taught classroom

helped to develop the growth of students through the stages as the students were able to work in collaborative groups (Bailey, 2014). The collaborative grouping could be established based on ability within the multiage team-taught classroom and could have provided a safe learning environment for growth (Simonson, 2015). The multiage team-taught classroom had allowed for students who were in a period of transition from one developmental stage to the next developmental stage to adjust at an individual pace within the student-centered learning environment (Goldman, 2017; Nave, 2015). Piaget's theory focused on the environment but did not take into account student learning, which could be explained utilizing Bandura's social cognitive theory (Bailey, 2014).

Social cognitive theory. Bandura developed the social cognitive theory which emphasized the students' learning within the social environment (Bailey, 2014; Bandura, 1969; Canter, 2017; Guo, Tompkins, Justice, & Petscher, 2016; Harding, 2015; A. Johnson, 2014). Bandura and McDonald (1963) contradicted prior learning theorists who established stages and considered learning to be a "function of changes in reinforcement contingencies and other learning variables rather than an unfolding of genetically programed response dispositions" (p. 274). Bandura (1969) established that people acquired behavioral characteristics through the process of identification. Identification was "a process in which a person patterns his thoughts, feelings, or actions after another person who serves as a model" (Bandura, 1969, p. 214). The model directly influenced the learning of another person based on cues for matching responses (Bandura, 1969). The matching responses were more frequent when the model was a person who was considered, an expert, a celebrity, or was considered successful (Bandura, 1969). The

model could be another student, or adult, who matched the characteristics that were desired by the student (Bandura, 1969).

Guo, Tompkins, Justice, and Petscher (2016) discovered the models for students in the classroom setting were typically older students and teachers. The younger students observed and imitated the actions of the models. Harding (2015) wrote the students then engaged in the learning process and emulated the actions of the older students. A. Johnson (2014) supported Bandura and felt that for the full development of learning, four conditions were required. The four conditions were: (1) attention, (2) retention, (3) production, and (4) motivation (A. Johnson, 2014). For attention to be effective, the child had to actively pay attention to the desired behavior (A. Johnson, 2014). Retention required that the child remembered the desired behavior (A. Johnson, 2014). Production had to be effectively demonstrated when the child reproduced the desired behavior (A. Johnson, 2014). The child should be firmly motivated to perform the desired behavior for the learning to be reinforced and repeated effectively (A. Johnson, 2014). When all of these factors have been met and combined the students learning was enhanced exponentially (A. Johnson, 2014).

Bandura's social learning theory lent support for the use of the multiage team-taught classroom (Bailey, 2014; Canter, 2017; Guo et al., 2016; Harding, 2015; A. Johnson, 2014). Harding (2015) wrote Bandura's theories supported the multiage team-taught classroom as "…learning through observation are natural elements of multiage learning and provided a rationale for examining the practice through this lens" (p. 12). Furthermore, this theory offered that children learned in the multiage team-taught classroom, by observing the older students in the classroom as well as the teachers

(Harding, 2015; A. Johnson, 2014). The observations of older students and adults provided examples on how to make balanced decisions, which led to higher motivation to complete schoolwork (Bandura, 1969; Canter, 2017). While Bandura's theory connected to observational learning for students, it did not develop into greater detail of how peers' interactions in the multiage team-taught classroom were related to learning, which was supported by Vygotsky (Bailey, 2014).

Zone of proximal development. Lev Vygotsky had developed the idea of how the nature of relationships between peers could influence social development (Vinogradova, 2016). The foundations of Vygotsky's theory of social development were centered on the idea that humans are social creatures and their development is determined by social conditions (Bjorklund & Causey, 2018; Vinogradova, 2016). Vygotsky believed the social aspect started from birth, "a child is born into a social situation…with all the inherent potential, and develops further as a social and communal being" (Rubtsov, 2015, p. 5). In other words, learning was stimulated in the presence and through social interactions with peers and adults (Bjorklund & Causey, 2018; Ogunnaike, 2015; Taole, 2017). The social connection to learning was developed further through Vygotsky's postulate called the Zone of Proximal Development (ZPD) (Kreide, 2011; Murphy, Scantlebury, & Milne, 2015; Ogunnaike, 2015; Rubtsov, 2016; Vinogradova, 2016).

The Zone of Proximal Development was a two-way learning process where all participants learned through social interactions with each other (Ogunnaike, 2015). The child had to learn from another person through a social interaction before individual development or learning occurred (Murphy et al., 2015; Rubtsov, 2015; Vinogradova,

2016). The gap that existed between what the children knew and what the children could do in the future was the ZPD (Murphy et al., 2015; Ogunnaike, 2015; Rubtsov, 2016; Vinogradova, 2016). It was the job of the teacher to recognize the gap and create learning situations that supported and facilitated the children's performance (Ogunnaike, 2015). Once the children closed the gap, a new ZPD was developed from newly learned experiences (Vinogradova, 2016).

Teachers who led multiage team-taught classrooms developed learning strategies for all students that aligned with the development of the students (Taole, 2017). The learning environment had to be active to engage the students and the interactions had to be adjusted based on students' social development (Vinogradova, 2016). Ogunnaike (2015) supported that for early childhood students, active role-playing increased the potential development of students' learning by utilizing roles at different levels that enhanced the ZPD. The traditional role of the teacher was replaced within the multiage team-taught classroom and a new role emerged where the view of learning was described as a process of co-action, co-operation, and joint activity (Rubtsov, 2015). This activity was enhanced within the multiage team-taught classroom based on the individual's social interactions with peers and the teacher's interactions with the students (Taole, 2017).

The learning theories from Bandura and Vygotsky were developed to explain the social development of children in learning environments (Harding, 2015; Murphy et al., 2015). The multiage team-taught classroom environment allowed for the enhancement of the theories through social interaction between the students of varied ages (Bailey, 2014; Taole, 2017). The students were able to learn from the older students in the room and their teachers (Guo et al., 2016).

The theories from Bandura, Vygotsky, and Piaget were used as a predictor of the students' performance on the grade-level assessments. The social interactions within the classroom could strengthen the learning of the students and potentially enhance the learning environment (Guo et al., 2016). The alternate hypothesis that students in the multiage team-taught classroom would outperform the students from a single-age classroom on the mathematics and English language arts grade-level assessments for Research Question One and Research Question Two was selected due to the potential enhancement of student learning. In the next section, the influences within the multiage team-taught classroom on the academic performance of the students are discussed.

Influences on Academic Performance

John Hattie (2009) wrote about the effects of influences on the achievement of school-aged children. Hattie (2009) analyzed over 800 meta-analyses on the outcomes of student learning. The results were compiled to establish a list of influences and what the actual statistical effects of the influences were on students' achievement (Hattie, 2009). The influences were organized based upon the overall effectiveness which allowed for an interpretation of effective practices (Hattie, 2009). After this groundbreaking analysis, Hattie (2012) provided a new insight into what worked best in schools to maximize learning opportunities. The focus was on which influences were able to be directly controlled by teachers and which influences worked best in the classroom to help students (Hattie, 2012). The effect sizes were later adjusted based on additional results being added to the updated meta-analyses (Hattie, 2017).

Hattie (2012,) suggested there was an average point from which there was a measurable difference in the gains in learning; this point occurred at a 0.40 effect size (p.

12). Hattie (2012) suggested anything over a 0.00 effect size was a gain and resulted in student learning, it was the effect sizes over the .40 effect size that obtained a "worthwhile positive effect" (p. 13). The effects that directly influenced and were present in the multiage team-taught classroom were noted in Table 1.

Table 1

List of Influences on Student Achievement

Rank in 2012	Influence	Effect Size 2012	Effect Size 2017
Not Ranked	Collective teacher efficacy	--	1.57
12	Teacher-student relationship	0.71	0.52
37	Student-centered teaching	0.54	0.36
118	Co-/team teaching	0.19	0.19
143	Multi-grade/age classes	0.04	0.04

Note. The influences related to multi-grade/age classrooms. Data were obtained from (Hattie, 2012) and adjusted based on Hattie's 2017 updated list (Hattie, 2017).

Hattie (2012, 2017) interpreted the results shown in Table 1 and noted all the influences that were present in the multiage team-taught classroom had a positive effect, but it was teacher-student relationships that were above the 0.40 effect size in both 2012 and 2017. In both rankings, teacher-student relationships had the greatest impact of the classroom influences (Hattie, 2012, 2017). Collective teacher efficacy which was not in the top 150 influences in 2012 had the potential to considerably accelerate student achievement (Hattie, 2017). The review of the literature supported the use of these influences and their further development within the multiage team-taught classroom (Hattie, 2009, 2012, 2017).

Teacher-student relationship. Killian (2017) found teacher-student relationships, while dropping in effect size, still had the largest effect size of the influences that were directly connected to the multiage team-taught classrooms covered in Hattie's study when the 2012 results were compared to the 2017 results. The teacher-student relationships were powerful and influential parts of classroom management (Hattie, 2009). Marzano (2000) investigated effective classroom management techniques of teachers and separated the teacher-student relationships into high dominance relationships between the teacher and students and high cooperation relationships between the teacher and students. The high dominance relationship occurred when there was clarity to the purpose and strong teacher guidance for students and activities (Marzano, 2000). High cooperation relationships occurred when there was a desire to function as a team between the teacher and student and was demonstrated when students showed concern for the needs and opinions of others (Marzano, 2000). These relationships when incorporated correctly into the classroom could enhance the overall learning environment (Marzano, 2000).

Cornelius-White (2007) found while performing a meta-analysis, higher student achievement outcomes when there was a person-centered teacher in the classroom. Cornelius-White (2007) showed a person-centered teacher had more engagement, respect for self and others, and fewer behavior problems. The teacher in the classroom facilitated students' development, by caring for all students as persons (Cornelius-White, 2007). The teacher had to be able to see the students' perspective and empathize with the student (Cornelius-White, 2007). When all factors were implemented within this type of

environment there was an increase in critical thinking skills, math performance, and overall student grades (Cornelius-White, 2007).

Claessens et al. (2017) studied the perceptions of the teachers' interpersonal experiences on the teacher-student relationships. Claessens et al. (2017) described how the teacher-student relationship affected teachers. The teachers who felt they had a positive teacher-student relationship saw the teaching profession in an enjoyable light and were more motivated than teachers who had negative encounters (Claessens et al., 2017). The teachers who had a negative experience with a student would be less inclined in the next encounter to show friendly behavior toward the student (Claessens et al., 2017). On the other hand, teachers who had a positive encounter would carry a positive feeling into the future (Claessens et al, 2017). Students and teachers both preferred teachers who demonstrated immediacy, teacher empathy, and care while also maintaining authority and power in a supportive environment (Claessens et al., 2017). The teacher who was able to maintain the supportive conditions described the students in the classrooms as being more engaged in work and showed more interest in the teacher's opinion on classwork (Claessens et al., 2017).

Krane, Ness, Holter-Sorensen, Karlsson, and Binder (2017) interviewed students in the upper secondary school on their perceptions of teacher-student relationships. These students felt that the teacher-student relationship could be hindered or developed through mutual interaction (Krane et al., 2017). Krane et al. (2017) noted the students felt respect was a key to a positive or negative teacher-student relationship. The teacher-student relationship could be developed through casual conversations in which the teacher got to know the students and the teachers explained, "academic issues in informal

and practical ways" (Krane et al., 2017, p. 382). Another finding of this study was the students also appreciated teachers who adapted academics to meet the needs of the students even if there were only minor adjustments (Krane et al., 2017). All of the students interviewed felt the teacher-student relationship was developed further when the teachers cared about students and exhibited signs that they were happy at school like, smiling and showing humor (Krane et al., 2017).

In the meta-analyses of 57 studies Lei, Cui, and Chiu (2016) analyzed the results to compare the effects of teacher-student relationships on student externalizing behaviors. The student behaviors were separated into externalizing behavior (EBP) and internalizing behavior (IBP). The behaviors were separated based upon individual behavior, the "EBPs should be divided into hyperactivity, aggression, antagonistic behavior, property damage, and reputation infringement... and in contrast, IBPs are negative moods and emotions that lead to emotional disorder" (Lei et al., 2016 p. 2). Positive, affective teacher-student relationships were characterized by closeness, support, liking, warmth, and trust by the students (Lei et al., 2016). The results from the study were interpreted to show a significant correlation between the negative teacher-student relationships and externalizing behaviors as well as a significant correlation between the positive teacher-student relationships and externalizing behaviors (Lei et al., 2016). The researchers concluded that teachers who created a negative teacher-student relationship increased externalizing behaviors and teachers who created a positive teacher-student relationship decreased externalizing behaviors (Lei et al., 2016).

Hattie and Yates (2014) through their meta-analysis of research summarized the findings on the teacher-student relationship described the initial impact of the students'

reaction to teachers' body language and expression. As part of the study reviewed, the students would evaluate teacher expressions in a very short timeframe and make judgments (Hattie & Yates, 2014). The development of the teacher-student relationships were enhanced by positive open gestures when dealing with students, physically moving around the room, relaxed body orientation, smiling frequently, using a friendly tone of voice, and direct eye contact when dealing directly with a student (Hattie & Yates, 2014). An additional study analyzed by Hattie & Yates (2014) was of seven-year-olds. The analysis showed that the use of positive and warm characteristics increased the students' performance on standardized tests (Hattie & Yates, 2014).

Bailey (2014) rationalized that within the multiage team-taught classroom setting, the availability of two teachers enhanced the teacher-student relationship. The multiage setting allowed for the teacher and students to perceive an enhanced relationship through positive interactions in the classroom to enhance teacher motivations (Claessens et al., 2017). The students felt better in the classroom and the teacher-student relationships were enhanced when the teachers showed signs that they liked school, which could lead to better academic performance by the students (Krane et al., 2017). The positive teacher-student relationships also decreased misbehavior, which would increase instructional time (Lei et al., 2016). When considering all the factors, including the overall atmosphere within the multiage team-taught classroom the teacher-student relationship did not have an immediate effect on student performance (Hattie & Yates, 2014). Student performance did not show an immediate increase but was found to have a deferred effect on student learning and motivation (Hattie & Yates, 2014).

Student-centered learning/teaching. Student-centered teaching was considered proficiency-based learning (Nave, 2015). The teacher had to incorporate specific teaching practices utilizing individual instruction, formative assessments, and active learning in the classroom (Nave, 2015). Hattie and Yates (2014) believed that to be considered a proficiency-based classroom, the role of the teacher required shifting to one of an adaptive learning expert. The teacher had to develop a trusting work environment that fostered the development of students with multiple strategies for learning, developed skills in deliberate practice, developed skills in how and when to concentrate, developed student confidence in learning, and gave and received feedback about learning (Hattie & Yates, 2014). The teacher who incorporated these practices would be considered as an adaptive learning expert and be utilizing a student-centered teaching model (Hattie & Yates, 2014).

One student-centered model was the Montessori model for elementary schools (Goldman, 2017; Rudge, 2016). The model was developed in 1907 by Maria Montessori (Ervin & Sacerdote, 2016). This model has been centered on multiage classrooms since its inception (Ervin & Sacerdote, 2016). As part of the Montessori model used for multiage classrooms, there was a three-year cycle for the development of students along a continuum in which the students garnered knowledge and advanced each year from the *newbie* phase to the experienced phase, and finally to the mentor (Breiman & Coe, 2016). The ultimate growth occurred when the students were working together with the teacher developing projects to demonstrate learning (Breiman & Coe, 2016; Goldman, 2017). The Montessori model could take different forms but had the foundational characteristics of classrooms organized into communities for learning based on students' developmental

needs, student teams were working on cooperative group assignments, teachers providing flexibility for students to work at their own pace, and trusting relationships which helped to develop student growth (Rudge, 2016).

Block (2015) studied the effects of high stakes testing on students who had attended school in a traditional Montessori model. State assessments that were required by mandates caused a slight shift in instructional strategies from the traditional practices of the Montessori classroom (Block, 2015). The shift occurred when the elementary teachers in the school took a few minutes out of the day to focus groups on grade level specific standards (Block, 2015). Making this small change to the Montessori model allowed the school to increase standardized test scores (Block, 2015). According to the results by Block (2015), the concentration on the standards for short times increased the assessment scores three points during the first year of the study, four additional points one year later, and two additional points two years after the start of the study (p. 50). By maintaining the student-centered focus with minor modifications to the Montessori model, this school was able to increase scores on the tests for three continuous years (Block, 2015).

Student-centered instruction could be enhanced in the multiage team-taught classroom and could further support incorporating the multiage team-taught classroom (Farrant, 2017). The students in the multiage team-taught classroom could be grouped based on ability level, which according to Farrant (2017) allowed students to learn and develop at an individual rate. The traditional classroom, which was typically not student-centered, did not take into account the learning ability of students (Gaustad, 1992). The multiage team-taught classroom with two teachers could further develop the student-

centered model with teachers working together for student outcomes (McCarthey et al., 1996).

Team teaching. According to Hattie (2009), team teaching was lacking the results in the meta-analyses which supported or dispelled the use of the practice. There were a greater number of studies analyzing the effects of co-teaching on students' academic performance than team teaching (Hattie, 2009). Co-teaching was related to team teaching and as part of this model required two certified teachers to work together to meet the academic needs of students (Petrick, 2015). Co-teaching was separated from team teaching, in that co-teaching occurred when a regular education teacher and a special education teacher worked together in a regular education classroom. This relationship was established to allow special education students' needs to be met by the special education teacher while participating in the regular classroom (Petrick, 2015). The environment allowed for a collaborative classroom that provided a supportive environment and allowed for the special education student to be in the general education classroom as the least restrictive environment. The data from the co-teaching studies were not analyzed for this review.

In a study of the effectiveness of team teaching in the physical education classroom, Bardaglio, Marasso, Magno, Rabaglietti, and Ciairano (2015) found the team teaching model to be effective in developing motor skills. This study focused on the use of team teaching regarding the development of students' motor skills within the game of dodgeball. The study used a control group with a single teacher and a team-taught group. The results of the study were analyzed and the students in the team group outperformed the students in the classroom taught by one instructor on the assessment of motor skills in

dodgeball (Bardaglio et al., 2015). The team instructed group scored a 6.5 mean, and the class instructed by one instructor had a mean score of 5.5 (Bardaglio et al., 2015, p. 277). Using an ANOVA, the researchers found a statistically significant improvement in the students' time in the game and the interactive effects within the game (Bardaglio et al., 2015).

Nilsson (2015) analyzed team teaching in a study of the professional development practices used to train preschool teachers who taught science using team teaching practices. In this aspect, the team teaching was meant to share expertise in what could be considered an uncomfortable subject area for some teachers. Based on the results of teacher interviews from this study, the teachers felt more confident in encouraging students' ideas and explaining scientific methodologies (Nilsson, 2015). According to Nilsson (2015), the teachers claimed that the "collaborative planning, teaching, and evaluation of the science teaching activities with a colleague made an important contribution to their individual learning process" (p. 302).

Team teaching while not strongly supported by Hattie's meta-analyses could have had a positive benefit on the multiage classroom (Hattie, 2009; Hattie, 2012). The co-planning, co-practice, and co-reflection within the multiage classroom with two teachers allowed for the development of effective teaching practices (Murphy & Martin, 2015; Nilsson, 2015). The multiage environment provided an ideal environment for teachers to work together collaboratively (Bailey et al., 2016). Bailey (2014) found through teamwork within the multiage team-taught classrooms, teachers were able to reduce the preparation time for lessons and increased time on enrichment strategies. Providing a team-teaching setting also allowed teachers to come together for a common cause and

which later benefited students with enhancements in reading and math scores (Bailey, 2014).

McCarthey et al. (1996) supported team teaching in the multiage classroom. McCarthey et al. (1996) determined the reasons were not only student-centered but also teacher-related. The concept of team teaching provided another adult in the room for support (McCarthey et al., 1996). Team teaching allowed for the development of cooperation and trust between the teachers (McCarthey et al., 1996). Team teaching allowed for the sharing of ideas and revision of plans to meet students' needs (McCarthey et al., 1996). Team teaching provided opportunities for specialization of certain subject matters (McCarthey et al., 1996). Finally, team teaching provided opportunities for sharing of ideas and conflict management strategies to be demonstrated when the teachers did not agree (McCarthey et al., 1996).

Looping. Looping was a strategy that was not analyzed by Hattie in his meta-analyses study but was influential on the support of the multiage team-taught classroom (Hattie, 2009; Hattie, 2012). Looping was a classroom arrangement in which teachers stayed with the same group of students for two or more consecutive years (Wang et al., 2017). Within the multiage team-taught classroom, looping had occurred for the older students in the classroom (Bailey, 2014). The older students had returned to the same classroom from the previous year with the same teacher, while the younger students were new to the classroom (Bailey, 2014). The older students had an understanding of the classroom procedures and expectations within the class and were able to teach the expectations to the younger students (Bailey, 2014). This familiarity with the teachers

allowed for increased instructional time due to the decreased transition time at the beginning of the school year for the teaching of procedures (Riley, 2014).

Riley (2014) felt that for some of the students, who had to transition each year in the traditional grade-level setting, there was a level of anxiety due to the newness of the classroom. The looping setting could reduce student anxiety and would reduce the time it took for the students to acclimate (Riley, 2014). The decreased time for acclimation could allow for further development of the teacher-student relationships (Lloyd, 2014; Weaver, 2015). This increased development of the teacher-student relationship decreased externalizing behaviors which would provide for a smoother transition (Lei et al., 2016).

Multiage classroom. The multiage classroom was specifically studied by Hattie (2009) utilizing only three separate studies. These studies ranked multi-grade/age at 143 out of 150 in terms of influences on student performance (Hattie, 2012, p. 254). Two of the three studies used by Hattie were from Veenman and were cited in multiple sources as foundational to supporting multiage classrooms (Bailey, 2014; Hyry-Beihammer & Hascher, 2015; Saqlain, 2015; Sherry-Wagner, 2016; Song, et al., 2009).

Veenman (1995), in his foundational article *Cognitive and Noncognitive Effects of Multigrade and Multi-Age Classes: A Best-Evidence Synthesis*, espoused that there was no difference between single-age and multi-grade classrooms as they related to student achievement. The multi-grade classroom, when compared to single-age classrooms, showed no significant difference (Veenman, 1995). The conclusion was "students in multi-grade classes learn as much as their counterparts in single-grade classes" (Veenman, 1995, p. 350).

Multiple studies supported Veenman's conclusion that there was no significant difference in student performance based on classroom setting (Bailey, 2014; Eames, 1989; Elmore et al., 1996; Gorrell, 1998; Gutierrez & Slavin, 1992; Nye, Cain, Zaharias, Tolett, & Fulton, 1995; Pratt, 1986). Bailey (2014) performed a quantitative study of scores on two standardized tests to compare classroom settings. The two assessments were analyzed, with no significant difference found between the multiage classroom setting and the single-age setting on either the Idaho Reading Indicator (IRI) or the Idaho Standardized Achievement Test (ISAT) (Bailey, 2014). The IRI results were from kindergarten to third grades while the ISAT assessment results were obtained from third to fifth grades.

Some studies revealed statistically significant results in favor of multiage classroom settings (Barbetta, Sorrenti, & Turrati, 2018; Fuller, Ronning, VanVoorhis, & Moore, 1993; Kinsey, 2001; Leuven & Ronning, 2014; Ong, Allison, & Haladyna, 2000). Leuven and Ronning (2014) performed an analysis of Norwegian junior high students in mixed-grade classrooms. During the analysis they found students performed better in mixed-grade classrooms (Leuven & Ronning, 2014). The results were supportive based on controlling for class size, school size, and family background characteristics (Leuven & Ronning, 2014). The mixed-grade students performed at approximately 7% of a standard deviation better on the end of junior high assessment than peers who were not in classes with one more grade level in their class (Leuven & Ronning, 2014, p. 1184).

A few studies showed a negative but non-significant effect on student performance (Checci & Paola, 2017; Luvisi & Miller, 2001; Mason & Burns, 1996; Quail & Smyth, 2014). Luvisi and Miller (2001) analyzed the achievement scores for third

graders who were enrolled in nongraded primary schools in Kentucky that were forced to switch due to a nongraded program by the Kentucky Education Reform Act in 1990. The researchers found students in the multiage programs had lower standardized achievement test scores (Luvisi & Miller, 2001). The results from this study were contradictive to Veenman's, but Luvisi and Miller (2001) also noted that the overall performance in Kentucky on the National Assessment of Educational Progress (NAEP) increased by two points in reading and five points for math during the same period (p. 33). The researchers concluded that the NAEP results demonstrated that the changes to the multiage nongraded program helped with the improvement and "the Primary Program has obviously been part of the growth" (Luvisi & Miller, 2001, p. 35).

Mason and Burns (1996); in a critique of Veenman's study, pulled out the students in the multiage/nongraded classes and concluded that the multi-grade classrooms have had a slight negative effect on student performance. The reason the multiage/nongraded students were pulled out for the comparison was because of the selection process utilized by schools (Mason & Burns, 1996). Mason and Burns (1996) felt that the selection process, which utilized an application for students to be enrolled in the multiage classroom, enhanced the learning environment. The enhanced environment, in turn, affected Veenman's conclusion and shifted the effects toward the single-age classroom (Mason & Burns, 1996).

Checci and Paola (2017) found a negative effect on students' performance on both literacy and numeracy for mixed-grade classes. The mixed-grade classes were taught in Italy with only a single teacher in the classrooms (Checci & Paola, 2017). The effects were not significant on the literacy scores, but the numeracy scores showed a significant

difference (Checci & Paola, 2017). The difference equated to about a half a standard deviation lower for students who attended a mixed-grade classroom compared to a single-age classroom, suggesting that the students in the mixed-grade classes did not do as well on numeracy as the single-age classroom peers (Checci & Paola, 2017).

Quail and Smyth (2014) conducted a large-scale longitudinal study of 9-year-olds in Ireland. The study focused on both academic and social outcomes. The results of the analysis showed that students in a single-age classroom had slightly higher reading scores than students who were in a multiage classroom (Quail & Smyth, 2014). The results for the math scores were interpreted and showed no significant difference between the two classroom settings (Quail & Smyth, 2014). Quail and Smyth (2014) concluded that students taught in a multiage classroom demonstrated little to no impact on academic outcomes.

A review of 57 studies by Pavan (1992) supported that students in the multi-grade setting performed better than or as well as the students in the graded classes in 91 % of the studies when comparing standardized test scores (p. 7). Similar results were found by Bailey (2014) after the implementation of a school-wide multiage program; the student test scores on a statewide assessment showed no significant difference. Gorrell (1998), utilizing the Stanford Achievement Test, compared fourth-grade students' performance in reading and math. The results from the analysis were interpreted to show no significant difference between multiage and single-age classrooms (Gorrell, 1998). Eames (1989) found no significant difference when comparing fourth and fifth graders in single-age and multiage classrooms on the Comprehensive Test of Basic Skills, but there was a slightly positive effect for students in the multiage classroom. Guttierez and Slavin (1992)

performed an analysis of 57 studies on the effectiveness of nongraded programs. The results were that 20 of the studies showed a significant positive effect on student performance, and 16 showed a positive non-significant effect (Guttierez & Slavin, 1992, p. 368). The researchers concluded that based on the prior studies, simple forms of the nongraded programs had more effectiveness and needed to be further studied (Guttierez & Slavin, 1992).

Barbetta, Sorrenti, and Turati (2018), found that the multigrade setting was significantly positive for younger students, but while the older students were positively influenced, the influence was not statistically significant. Nye, Cain, Zaharias, Tollett, and Fulton (1995) found positive results in a study of Tennessee elementary school students. The students' scores on the Tennessee state assessments showed that students who were enrolled in multiage classrooms significantly outscored students enrolled in single-age classrooms (Nye et al., 1995).

Mulryan-Kyne (2004) conducted a study of teachers' perceptions of the multiage setting. Mulryan-Kyne (2004) reported the teachers felt the multiage setting provided multiple advantages for students. The low-achieving students and younger students gained in multiage settings, due to the ability of teachers to group students based on abilities rather than age (Mulryan-Kyne, 2004). The teachers were able to develop a stronger relationship with students because of the looping nature of the classrooms (Mulryan-Kyne, 2004). The students learned from interacting with one another in a more social setting (Mulryan-Kyne, 2004). Mulryan-Kyne (2004) found the multiage classroom supported a stronger family-like environment which enriched the educational opportunities for students.

Teacher Efficacy

The concept of self-efficacy grew out of Bandura's (1977) work on phobia and the treatments to alleviate phobia. Bandura (2019) summarized the previous results from the testing of behavioral changes verified that self-efficacy operated as a mechanism toward change. Behavioral change opened the door for Bandura (1977) to postulate that "cognitive processes mediate change but that cognitive events are induced and altered most readily by experience of mastery arising from effective performance" (p. 191). This can be simplified down to an understanding that a person's past experiences toward mastery can influence their decision making toward their ability to do a task in the future (Bandura, 1977). Once routine activities occur frequently, a perceived efficacy was created which allowed for a person to handle routine activities without higher levels of cognitive control (Bandura, 1997). Bandura (1997) suggested perceived personal efficacy regulated a person's motivational level by shaping aspirations and outcomes expected based on effort. The concept of personal efficacy was further expanded by Bandura into specific fields, including education, beyond just cognitive psychology where it had been studied in the past (Bandura, 1997).

Teacher efficacy which was conceptualized by Bandura and has been expanded and measured to evaluate the effects on student learning (Goddard et al., 2000; Tschannen-Moran & Woolfolk Hoy, 2001; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Teacher efficacy has been shown to have powerful effects on both the teacher and student when a teacher believed that he or she could bring out desired outcomes amongst

all students (Tschannen-Moran & Woolfolk Hoy, 2001). The teacher's belief increased effort toward the goals that had been set by both the individual teacher and the school. According to Henemann, Kimball, and Milanowski (2006), effort alone by the teacher was not consistent or uniformed, it was task-centric. The task-centric nature of teacher efficacy made it more difficult to measure reliably, but work by Bandura and others has led to valid and reliable measurement tools (Heneman et al., 2006).

The advantages of high teacher efficacy were discussed by Edwards, Green, and Lyons (1996). The advantages for students were: (1) Higher reading achievement as well as increased achievement in mathematics, (2) Less stress on teachers, (3) Higher levels of cooperative learning, (4) An increased willingness to assume responsibility for student failures, as well as (5) An increased belief in the role of the teacher for students' success (Edwards et al., 1996). The research by Ashton, Webb, and Doda (1983) supported that the development of teacher efficacy could be enhanced through teaming and collegial decision making. Ashton et al. (1983) also concluded that multiage grouping was conducive to developing an increased level of teacher efficacy. Goddard et al. (2000) felt that schools should systematically develop teacher efficacy which in turn would show growth in student achievement as well as collective teacher efficacy.

Bandura (1997) contributed further to the literature on the effects of teacher efficacy by establishing the concept of collective organizational efficacy. In schools, collective teacher efficacy occurred when teachers collectively believed that the organization could work together to solve problems (Goddard et al., 2000). Collective teacher efficacy, like individual efficacy, required the group to believe that by working together with persistent effort, the group would succeed on difficult tasks (Goddard et al.,

2000). Groups of teachers could also learn and develop by listening to other teachers and schools on how to succeed in achieving highly enriched learning goals (Goddard et al., 2000). By attending learning opportunities and providing enriched feedback, the group would inherently be successful (Goddard et al., 2000). The more efficacious the organization the more likely it was to be able to survive and cope with negative influences (Goddard et al., 2000). These attributes of collective teacher efficacy when established were significant predictors of student achievement (Goddard et al., 2000). Bandura (1993) asserted that collective teacher efficacy had a greater effect on student performance than did socioeconomic status. Goddard et al. (2000) supported Bandura's assertion: "...the negative association between SES and achievement is more than offset by the positive association between collective teacher efficacy and student achievement" (p. 500).

Hoy, Sweetland, and Smith (2002) concluded that to develop collective teacher efficacy in schools, leaders needed to have adequate instructional resources and time to develop the skills for success. Teachers needed role models to demonstrate how to apply the skills for successful implementation (Hoy et al., 2002). Increasing personal efficacy promoted collective efficacy which in turn reinforced a greater sense of personal efficacy (Hoy et al., 2002). The higher the collective efficacy of a building the greater the chance of positively influencing teacher behaviors which could lead to increased student achievement (Hoy et al., 2002). The increased teacher efficacy could lead to a more conducive learning environment and in turn enhance the student-teacher relationship (Hoy et al., 2002). The enhanced student-teacher relationship was a strong contributor to student achievement (Hattie, 2009).

Summary

The learning and developmental theories of Dewey, Piaget, Bandura, and Vygotsky have been favorable toward the multiage team-taught classroom setting (Bailey, 2014; Bailey et al., 2016; Bandura, 1969; Bandura & McDonald, 1963; Bjorklund & Causey, 2018; Dewey, 1920; Lytle, 2003). The theories supported the learning and development of children (Bailey, 2014; Bandura, 1969; Taole, 2017). The social learning theory further guided the conceptual framework of the study and enhanced the development of the study. The work by Bandura and Vygotsky supported the academic growth of students within the multiage team-taught classroom and guided the research questions (Bandura, 1969, 1977, 1997; Murphy et al., 2015; Taole, 2017). Ultimately, the multiage team-taught classroom has allowed for students to grow and learn at developmentally appropriate rates (Fosco, Schleser, & Andal, 2004). The rates for learning were aided through social development by interactions with the older students (Lytle, 2003).

The outcomes based on student learning which were discussed by Hattie (2009, 2012) have had a direct impact on the multiage team-taught classroom environment. The students developed a stronger teacher-student relationship through looping in the multiage team-taught classroom (Bailey, 2014; Picket, 2016). The team teaching in the classroom allowed for students' growth and the teachers' recognition of students' needs as well as the enhancement of the student-centered environment (Murphy et al., 2015). Kinsey (2001) summarized the advantages of the multiage classrooms, students

"achieved greater academic outcomes in relation to their abilities and demonstrated greater increases in academic achievement than students of the same and higher abilities from single-age classrooms when all classrooms employed developmentally appropriate teaching practices" (p. 2). Based on the review of literature, the students in the multiage team-taught classrooms should outperform students from a single-age classroom on standardized achievement tests (Pavan, 1992). The students in the multiage team-taught classroom should have the enhanced effects from the teacher-student relationships, team teaching, a student-centered environment, as well as enhanced collective teacher efficacy (Bardaglio et al., 2015; Bradford et al., 2016; Claessens et al., 2017). Chapter Three included a discussion in greater detail the design and implementation of this study. The design included the processes for measuring the student performance and teacher efficacy.

Chapter Three: Methodology

The objective of the study was to provide a relevant analysis of students' performance and teachers' sense of efficacy in a multiage team-taught classroom versus a single-age classroom. The two independent variables; multiage team-taught classroom setting and single-age classroom setting, were compared to identify and signify variances in students' performance or teachers' sense of efficacy. Understanding the variances between the two variables on students' performance and teachers' sense of efficacy could help provide and support the multiage team-taught classroom as a viable option for elementary schools.

Problem and Purpose

The problem some rural schools have faced was how to provide innovative practices while still meeting state and federal requirements. Rural schools have struggled to provide innovative practices due to a lack of funds or other resources (Carey et al., 2014). The rural schools had to seek out innovations that did not increase expenditures (Carey et al., 2014). The multiage team-taught classroom could provide the innovative practice without increasing expenditures for staff members (Currie, 2018). Current teaching staff could be combined into teams to provide for more effective instruction for students as well as possibly increasing teachers' sense of efficacy (Ashton et al., 1983).

When combining grades into a multiage team-taught classroom, all students would be fully served and individual education plans met (Bardaglio et al., 2015). To accomplish this task required that two teachers remain in the classroom for team teaching to become effective (Barbetta et al., 2018). Team teaching in the multiage classroom has been shown to provide the support necessary for students to become academically

successful (Barbetta et al, 2018; Canter, 2017; Kohn, 2015; Moeini et al., 2016; Van Tassel-Baska & Hubbard, 2016) as well as leading to increased collective teacher efficacy which has been a significant predictor of student achievement in mathematics and reading (Goddard, Hoy, & Woolfolk Hoy, 2000)

The primary purpose of this study was to investigate the differences in academic performance between students enrolled in the single-age classroom versus students enrolled in the team-taught multiage classroom environment. The difference in academic performance between these two groups was derived using the data from the Missouri Assessment Program (MAP). The MAP assessment was the standardized grade-level test, which was required to be administered in grades three through eighth, by all public schools in Missouri. This study focused on the school districts in Missouri that have implemented both team-taught multiage classrooms and single-age classrooms within the same elementary building. The focus of the study was performance by students in third and fourth grades; these students have all individually taken the English language arts and mathematics MAP. The individual students' scores allowed comparability of student academic performance on the MAP assessment.

The secondary purpose of this study was to investigate the relationship of teachers' sense of self-efficacy in the multiage team-taught classroom settings and the single-age classroom settings which could contribute to the collective efficacy of the building. According to Skaalvik and Skaalvik, (2007), teachers who perceived a higher collective teacher efficacy for a school and building were more likely to have higher self-efficacy, which could have resulted in better student achievement. Higher levels of collective self-efficacy led to more challenging goals and increased teachers' persistence

to meet those goals (Hoy et al., 2002). According to Goddard, Hoy, and Woolfolk Hoy (2000), "...collective teacher efficacy is a significant predictor of student achievement in both mathematics and reading achievement" (p. 500). Ashton et al., (1983) found that teachers' sense of self-efficacy was related to school organizational structures. Schools that had a team organization and multiage grouping of students had a higher sense of efficacy which should lead to a higher collective teacher efficacy (Ashton et al., 1983). For this study, measuring the teachers' sense of efficacy provided a relevant data source for comparing the classroom settings.

Research Questions and Null Hypotheses

The following research questions guided the study:

Research Question One (RQ1): What is the difference in student performance levels on the MAP English language arts grade-level assessment between students enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

Research Question Two (RQ2): What is the difference in student performance levels on the MAP mathematics grade-level assessment between students who are enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

Research Question Three (RQ3): What is the difference in teachers' sense of efficacy between teachers who teach in multiage team-taught classrooms and single-age classrooms?

Hypotheses

Alternate hypothesis one ($H1_a$): Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP English language arts assessments than students enrolled in single-age classrooms.

Alternate hypothesis two ($H2_a$): Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP mathematics assessments than students enrolled in single-age classrooms.

Alternate hypothesis three ($H3_a$): Teachers who teach in multiage team-taught classrooms will have a significantly higher sense of efficacy than those that teach in single-age classrooms.

Null Hypotheses

Null hypothesis one ($H1_0$): Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP English language arts assessments as students enrolled in single-age classrooms.

Null hypothesis two ($H2_0$): Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP mathematics assessments as students enrolled in single-age classrooms.

Null hypothesis three ($H3_0$): Teachers who teach in multiage team-taught classrooms will have the same or lower sense of efficacy as teachers who teach in single-age classrooms.

Research Design

The study was designed as a two-part quantitative causal-comparative study. The first part of the study included students' performance on the Missouri Assessment

Program (MAP) grade-level assessments for third and fourth-grade students' in Missouri. The second part was a comparison of the teachers' beliefs in their respective efficacy based on the Teachers' Sense of Efficacy Scale Short Form developed by Tschannen-Moran and Woolfolk Hoy (2001) (See Appendix A). Fraenkel, Wallen, and Hyun (2015) suggested that a causal-comparative study would be an appropriate study when two or more groups were selected that differed on a given variable. The variables in question were the type of classroom environments, the students' performance on the MAP assessments, and teachers' sense of efficacy.

The two parts of the study utilized the same independent variables. The independent variables in the study were the classroom settings in which the students were enrolled. The study of classroom settings provided a categorical independent variable (Fraenkel et al., 2015). The independent variables were separated into single-age and multiage team-taught classroom settings.

The dependent variables studied were separated based on the two parts of the study. The first part required the students' performance on the Missouri Assessment Program (MAP). The specific assessments were the grade-level assessments in English language arts and mathematics. The second part of the study utilized a separate dependent variable. The dependent variable was data on the teachers' sense of efficacy.

The dependent variable data on student performance was obtained from the Missouri Comprehensive Data System (MCDS) secured website and was used as de-identified secondary data (MoDESE, n.d.b.). The separate assessments that were utilized as dependent variables included the MAP grade-level English language arts assessment and the mathematics assessment scores for students in grades three and four in the

participating school districts. The students' scores were initially sorted into the two classroom settings. Within the classroom settings, the results were sorted for comparison using the four achievement level categories: (1) Below basic, (2) Basic, (3) Proficient, and (4) Advanced (MoDESE, n.d.a.). The number of students in each category was analyzed. The analysis of the data provided a comparison of performance similar to the Annual Performance Report (APR) by the MoDESE (MoDESE, 2018a). The MoDESE utilized a percentage of students in the top two categories for the analysis of district performance (MoDESE, 2018a). This calculation was performed and provided a comparative analysis for Missouri school districts.

To perform the analysis of student performance, a variance of significance was required for proper calculation to determine mean scores. The data that was gathered for this analysis was the scale score. The scale score was gathered from the same report as the achievement level data. The scale score could be used to calculate the mean, standard deviation, and to ultimately perform the *t*-test, which in turn meant for the null hypothesis to be rejected or not rejected based on the results from the tests.

The dependent variable data on teachers' sense of efficacy was collected by sending the Teachers' Sense of Efficacy Scale Short Form (Tschannen-Moran & Woolfolk Hoy, 2001) to third and fourth-grade teachers in the selected school districts. The scores from the instrument were subjected to a factor analysis. The factor analysis allowed for the calculation of subscale scores. The subscale scores were computed by calculating the un-weighted means which allowed for comparison of the teachers from the two classroom settings.

According to Bluman (2015), to test the hypothesis, the data were gathered and analyzed with frequency polygons to determine the distributions of the independent variables. The variables were separated into the categories of achievement as identified by the MoDESE; (1) Below basic which demonstrated student had minimal understanding of standards, (2) Basic which demonstrated partial understanding, (3) Proficient which demonstrated adequate understanding, and (4) Advanced which demonstrated thorough understanding (Bowles, 2015). The results of the frequency distribution were not used to calculate the mean scores and standard deviations. The mean scores and standard deviations were calculated for each variable based on the scale scores, which allowed for a thorough analysis. The data were analyzed using the *t*-test of means to either support or reject the hypothesis based on calculated *P*-values at a 0.05 alpha level (Bluman, 2015).

Validity. Fraenkel et al. (2015) identified validity as a weakness for causal-comparative research. The validity of the results of student performance could be in question because the study would be considered an ex post facto study and as such, would not allow for random assignment to the categories. The other major threat to validity for any causal-comparative research was the inability of the researcher to manipulate the independent variable. These threats to validity do not exist for the teacher efficacy results as the results were obtained directly from the teachers and as such were not ex post facto.

The MAP assessments in English language arts and mathematics were provided throughout Missouri to all public elementary and secondary students enrolled in grades 3-8. The assessments “yield information on academic achievement at the student, class,

school, district and state levels" (MoDESE, n.d.a, p. 1). The assessment was created by Data Recognition Corporation (DRC) with the first operational test given in the spring of 2016 (MoDESE, 2017). The Wisconsin Center for Education and Research at the University of Wisconsin-Madison (WCER) was contracted to study the alignment of the assessment to the Missouri Learning Standards. The results from the study indicated that the MAP English language arts and mathematics summative tests "… met or exceeded the average degree of alignment the WCER has found across the many assessments they have analyzed." (MoDESE, 2017, p. 22). These assessments provided reliable and valid results to allow for a comparison of student performance in the identified categorical groups.

The assessment utilized for this study was the Missouri grade-level assessment for grades 3-8 in English language arts and mathematics. The session was administered in the spring of 2018. According to the Grade-level Assessment Technical Report (MoDESE, 2019), the validity of the test was supported by the test specifications and blueprints for the Missouri Grades 3-8 assessments. DRC created the test form from the Missouri pool of items written by Missouri educators, and these were aligned to the Missouri Learning Standards (MoDESE, 2019).

The Teachers' Sense of Efficacy Scale (TSES) was analyzed by Chang and Engelhard (2015) using the Rasch measurement theory. The purpose of the analysis was to examine the psychometric quality of the TSES (Chang & Engelhard, 2015). The results from the analysis were interpreted to show good separation in item ordering and the hierarchy used to define the TSES (Chang & Engelhard, 2015). The findings further supported that the TSES was "...invariant in terms of school locations and years of

experience because these two factors were not significant to differentiate teachers' levels of sense of efficacy" (Chang & Engelhard, 2015, p. 11). The measurement of the constructs using a model-based theory such as the Rasch measurement, "...strengthens the validity of the score interpretations" (Chang & Engelhard, 2015, p. 13).

Reliability. The study was setup to analyze the students' results on the State of Missouri grade-level standardized test which was part of the Missouri Assessment Program (MAP) (MoDESE, n.d.a). The MAP assessment was chosen to ensure the reliability of the comparison. Fraenkel et al. (2015) established the reliability of an instrument was determined by whether or not the instrument provided consistent results. According to MoDESE (n.d.a.), on the *History of the Missouri Assessment Program* website, the test was created to measure the students' knowledge on the Missouri Learning Standards. The Missouri Learning Standards were written in Missouri to establish grade-level expectations for students in core subjects (MoDESE, 2018c).

The MAP grade-level assessment that was administered in the spring of 2018 was found through reliability analysis to be reliable (MoDESE, 2019). The reliability "...was evaluated using Cronbach's (1951) coefficient alpha" (p. 176), the closer the coefficient score was to 1 the more consistent the scores (MoDESE, 2019). The Cronbach's coefficient alpha for third and fourth-grade ELA ranged from 0.89-0.91 and math ranged from 0.92 to 0.93 (MoDESE, 2019, p. 189). The MAP grade-level assessments produced results that "would be relatively stable if the test were administered repeatedly under similar conditions" (MoDESE, 2019, p. 3).

The Teachers' Sense of Efficacy Scale was chosen (Tschannen-Moran & Woolfolk Hoy, 2001) to measure the participating teachers' perceived level of efficacy.

This tool was created by Megan Tschannen-Moran and Anita Woolfolk Hoy as the Ohio State Teacher Efficacy Scale (OSTES) to provide a more reliable and valid instrument than previous measures (Henemann, Kimball, & Milanowski, 2006). The instrument consisted of two forms, a long form with 24 items and the short form with 12 items. The long and short forms were analyzed after its creation by Tschannen-Moran and Woolfolk Hoy (2001) and "could be considered reasonably valid and reliable" (p. 801). Using factor analysis and construct validity during three studies, the reliability of the short form was found to be reliable at .90 (Tschannen-Moran & Woolfolk Hoy, 2001, p. 801). The correlation of the OSTES to other teacher efficacy measures was also calculated (Tschannen-Moran & Woolfolk Hoy, 2001). There was a high level of correlation between the instruments, which was interpreted to support the use of the OSTES for measuring teacher efficacy (Tschannen-Moran & Woolfolk Hoy, 2001). The OSTES was later renamed the Teachers' Sense of Efficacy Scale and was analyzed by Henemann et al. (2006); from their results, the short form was found to be reliable and valid. The implications from the study went as far as to "suggest that the TSES should be the preferred measure of teachers' sense of efficacy in future research" (p. 13).

Population and Sample

All public and charter school districts in the state of Missouri had the potential to be included in this study if the districts in Missouri included students in the third and fourth grades. Based on the Missouri Comprehensive Data System (MCDS) public data obtained from the 2018 State Overall Achievement Level 4 Report, 139,211 combined third and fourth-grade students took the mathematics assessment and 139,159 took the English language arts assessment (MoDESE, n.d.a, p. 1). The independent variables in

the study were that of third and fourth-grade students enrolled in single-age classrooms and third and fourth-grade students enrolled in multiage team-taught classrooms. These units of analyses created a large population size based on the total number of students who took the assessments. A purposive sampling procedure was used by contacting public schools in the State of Missouri to determine which districts had both multiage team-taught classroom settings and single-age settings in the same building within the respective districts. The following criterion was used to select buildings for inclusion in the study: (1) had multiage classroom(s), (2) the multiage classroom(s) had both third and fourth grades with two teachers team teaching, and (3) had single-age classroom(s) at the third and fourth-grade levels in the same building. The schools that utilized both the multiage team-taught classroom setting and the single-age classroom setting at the third and fourth-grade levels were included in the study.

The number of scores obtained for third grade and fourth-grade single-age classrooms should be greater than the scores obtained for students enrolled in the multiage team-taught classrooms, as there should be more single-age classrooms in the school settings available for this study. This would establish the multiage team-taught classroom setting as the limiting factor for analysis (Bluman, 2015). Based on this assumption, there should be more scores obtained from the single-age settings for both English language arts and mathematics.

The G*Power application was created by the Institute for Digital Research & Education to calculate sample size and power effects (Bruin, 2019). The G*Power version 3.1.9, was utilized to determine that a minimum sample size of 104 participant scores allowed for a valid and reliable analysis. To support the reliability and validity of

the results, the sample size when analyzed using a *t*-test of means: Wilcoxon-Mann-Whitney test of two groups, gave a power effect of 0.8547. A power effect size greater than 0.85 decreased the probability of committing a Type I error to less than 15 % (Faul, Erdfelder, Buchner, & Lang, 2009). A Type I error according to Bluman (2015), would occur if the null hypothesis were rejected when it was true.

The a priori power analysis was utilized to provide an efficient method to control for power effect size before beginning the study (Faul, Erdfelder, Lang, & Buchner, 2007). Using this statistical method, the researcher determined a minimum sample size of 104 was required to maintain the reliability and validity of the study. The samples were split based on the independent variables; the researcher intended to obtain a minimum of 52 scores for students that were enrolled in a single-age classroom and a minimum of 52 scores for students enrolled in a multiage team-taught classroom for each of the subjects, English language arts, and mathematics. To ensure a less than 15% probability of committing the Type I error required a minimum of 52 scores for the multiage team-taught classroom setting.

Bluman (2015) designated a purposive sample as a potential sampling method. In this study, purposive sampling allowed for the selection of specific schools that had both multiage team-taught and single-age classrooms at the third and fourth-grade levels. This type of sampling reduced the generalizability of the study. To help increase generalizability, an email explaining the study as well as to request information was sent to the 519 public school district superintendents in Missouri (see Appendix B). Included with the email was a link to Qualtrics, version 8.2019 (2019) questionnaire that was

utilized to identify schools that met the criteria for the study and to gather information to collect the data for the study (see Appendix C).

An email and questionnaire was sent to all superintendents to find school districts that utilized both the multiage setting and the single-age setting within the same buildings. From the questionnaire, 77 superintendents responded, and there were three who had school buildings that contained both the multiage team-taught setting and the single-age setting within the same building and served third and fourth grades. Some of the responses could have had multiage team-taught classrooms that also contained grades other than third and fourth. These districts were asked to participate in the study to obtain the minimum of 52 students' scores for the multiage team-taught classroom and 52 students' scores for the single-age classroom for comparison. The samples for the single-age classroom setting included all the third and fourth graders enrolled in the school who took the grade-level assessment. The samples for the multiage team-taught classroom setting included all the third and fourth-grade students enrolled in a multiage team-taught classroom in the school. This sampling removed the randomness of selecting individual classrooms or random student results for comparison.

The number of teachers teaching in the multiage team-taught and single-age classrooms was unknown, so therefore the power effect analysis was unable to be performed. The superintendents in the school districts that had both the multiage team-taught classroom settings and the single-age classroom settings were asked to forward the informed consent letter to the third and fourth-grade teachers in the buildings that were selected to participate. After receiving the consent letter with the link to the Qualtrics, version 8.2019 (2019) survey instrument for teachers' sense of efficacy (see Appendix

D), teachers completed the survey. The results of their responses were analyzed to determine teachers' efficacy in various classroom settings.

Instrumentation

The student performance on the Missouri Assessment Program (MAP) grade level test in English language arts and mathematics was analyzed. The MAP was chosen as the standardized test to ensure the comparability of third and fourth-grade students' results. The students took the assessment in the spring of 2018. The testing window for the state was the end of March through the middle of May (MoDESE, n.d.a). Each school district assigned a specific timeframe for the administration of the assessment during the testing window (MoDESE, 2019). The assessments were taken online (MoDESE, 2019). The Missouri MAP Grade-Level Blueprints outlined the structure of the assessments and possible assessment items (MoDESE, n.d.c.). The assessment items contained possible selected-response items, evidence-based selected-response items, constructed-response items, writing tasks, performance events, and/or technology-enhanced items (MoDESE, 2019). Each item was aligned to the Missouri Learning Standards (MoDESE, 2018c). The MoDESE noted, "...the blueprint along with item specifications, performance-level descriptors and the practice and process documents provide strong content validity and reliability for the assessment system" (MoDESE, n.d.c., p. 1).

The comparison of teacher efficacy required the selection of a surveying instrument to perform a factor analysis of teachers' statements about personal beliefs toward a sense of efficacy. The tool selected was the Teachers' Sense of Efficacy Scale (TSES) Short Form, (Tschannen-Moran & Woolfolk Hoy, 2001). Permission to use the TSES was granted by Anita Woolfolk Hoy (See Appendix E). The un-weighted means

of the sub-scores were grouped to compare teacher beliefs on three subscales. The three subscales were: (1) efficacy in student engagement, (2) efficacy in instructional strategies, and (3) efficacy in classroom management (Tschannen-Moran & Woolfolk Hoy, 2001).

Data Collection

The schools that were offered programs in both multiage team-taught and single-age classroom settings for third and fourth grades were unknown. The MoDESE did not track classroom setting types. As a preliminary data gathering tool to determine the number of schools that utilized this type of programming, the questionnaire was sent to all school superintendents in Missouri via email. Qualtrics, version 8.2019 (2019) was chosen as the tool for the initial questionnaire of school superintendents in Missouri.

The results of the initial questionnaire were used to identify the participating schools that utilized both multiage team-taught classroom settings and single-age classroom settings for both third and fourth grades. Permission was obtained and the contact information gathered for the district staff member who was designated by the superintendent as a point of contact to run the necessary report of students' scores that contributed to the data for the study. The personnel designated by the district superintendent who could gather and disseminate district MAP data was sent the instructions on how to run the report (see Appendix F). The reports were created using the Missouri Comprehensive Data System (MCDS) portal on the MoDESE secured website (MoDESE, n.d.a.). The report was the MAP Scale Score Summary Report. The participating schools' MAP scores that were used for comparison of student performance were the results from spring assessments from the 2018 school year.

The reports provided the individual student performance results on the MAP grade-level assessment for third and fourth graders in English language arts and mathematics. The scores were separated into the categories of achievement identified by the Missouri Department of Elementary and Secondary Education: (1) below basic, which demonstrated student had minimal understanding of standards, (2) basic, which demonstrated partial understanding, (3) proficient, which demonstrated adequate understanding, and (4) advanced, which demonstrated thorough understanding (Bowles, 2015). The reports were redacted by removing students' names, date of birth, and state identification numbers before being sent to the researcher. The redacted information was separated into multiage team-taught and single-age for further analysis based on the examiners' names, which was used to identify the type of classroom setting. Once the data were received from the participating districts, the analysis began. The results of the student performance were used to analyze Research Questions One and Two.

The superintendents included in the initial email contact were asked to forward the informed consent letter to all third and fourth-grade teachers in the buildings selected for inclusion in the study. The survey also included the link to the informed consent letter to ensure the inclusion in the survey. The informed consent letter contained a link to the Qualtrics, Teachers' Sense of Efficacy Scale (TSES) survey (Tschannen-Moran & Woolfolk Hoy, 2001) (see Appendix G). The researcher chose the TSES to measure the teachers' perceived level of efficacy. The results from the TSES survey allowed for the analysis of Research Question Three.

The survey window was open for three weeks following the approval by the Lindenwood IRB. During the second week, a reminder email was sent out to the contact

personnel, reminding participants to complete the survey (see Appendix H). Once the survey window closed the data analysis began.

Data Analysis

The separate assessments that were utilized as dependent variables were the MAP grade-level English language arts assessment and the mathematics assessment. The students' scores were initially sorted based on their respective classroom settings, which were done using examiners' names. Within the classroom settings, the results were sorted for comparison using the four categories: (1) Below basic, (2) Basic, (3) Proficient, and (4) Advanced (MoDESE, n.d.a.). The number of students in each category was analyzed for comparability and analysis of performance. The frequency distribution allowed for the analysis of results comparable to the Annual Performance Report (APR) performed by MoDESE. The APR was utilized by the MoDESE to categorize schools based on multiple categories, one of which was the student performance on the MAP grade-level assessment.

The results from the scale scores allowed the mean and standard deviation to be calculated for each variable. The data were analyzed using the *t*-test of means to reject or not reject the hypothesis (Bluman, 2015). These tests were performed using Microsoft Excel (Microsoft Office Professional, Version 10). Bluman (2015) and Fraenkel et al. (2015) supported that a *t*-test and a one-tailed test for variance were appropriate tests to reject a null hypothesis based on either critical region. The results would be analyzed to either reject or not reject the null hypotheses $H1_0$ and $H2_0$ which ultimately was used to answer Research Questions One and Two.

The comparison of teacher efficacy required the selection of a surveying instrument to perform a factor analysis of teachers' statements about personal beliefs toward a sense of efficacy. The un-weighted means of the sub-scores were grouped to compare teachers' beliefs on three subscales. The three subscales were: (1) Efficacy in student engagement, (2) Efficacy in instructional strategies, and (3) Efficacy in classroom management (Tschannen-Moran & Woolfolk Hoy, 2001). The results from the teachers' surveys were analyzed to either reject or not reject the null hypothesis $H3_0$, which in turn allowed for the analysis to answer Research Question Three.

Ethical Considerations

To ensure confidentiality and anonymity of the participants, data that was obtained from the schools through the MCDS portal of the MoDESE secured website were redacted due to having student names, birth dates, and state identification numbers. All the personally identifiable information was removed before being sent to the researcher for analysis. The districts' names were not reported in the study to remove any chances of identifying students or classroom results. The results were separated into multiage team-taught classroom settings and single-age classroom settings based on the examiner's name for analysis. The examiners' names were not included in the study.

The data obtained from the Teachers' Sense of Efficacy Scale was separated based on classroom settings and contained no personally identifiable information. The demographic questions from the survey allowed for separation based on (1) Teachers' grade level, (2) Teachers' classroom setting, (3) Teachers' years of experience, and (4) District location. The demographics were used for comparison only and were not analyzed for influence on the results of the study.

Summary

This study was a two-part quantitative causal-comparative research study. The study was created to determine whether a variance existed on the MAP grade-level assessments between students enrolled in team-taught multiage classrooms and students enrolled in single-age classrooms. The researcher hypothesized that the students enrolled in the multiage team-taught classroom setting would perform better on mathematics and English language arts than students enrolled in the single-age classroom setting. This hypothesis was based on prior research that supported the multiage program (Bailey, 2014; Fosco et al., 2004; Kinsey, 2001; Leuven & Ronnig, 2014; Nye, et al., 1995; Pavan, 1992).

A minimum of 104 samples of student performance results were obtained on the mathematics and English language arts portion of the grade-level assessment for third and fourth-grade students. A minimum of 52 of the samples were students enrolled in the multiage team-taught classroom and 52 samples were students enrolled in a single-age classroom. The data were analyzed using statistical analysis for variance.

The results from the Teachers' Sense of Efficacy Scale were collected to compare the beliefs of teachers who taught in a multiage team-taught classroom and those that taught in a single-age classroom. The researcher hypothesized that the teachers who taught in the multiage team-taught classroom had a higher sense of efficacy compared to those who taught in the single-age classroom. The hypothesis was based on prior research that concluded multiage programming and team teaching could develop a teacher's sense of efficacy (Edwards et al., 1996; Goddard et al., 2000). The results of the study were summarized in Chapter Four.

Chapter Four: Analysis of Data

The purpose of Chapter Four was to report the findings from the data that were collected and analyzed as part of this study. The data collected were used to analyze the relationship between the classroom setting and the students' performance on the Missouri Assessment Program (MAP) grade-level assessments as well as the level of teachers' sense of efficacy in multiage team-taught classrooms and single-age classroom settings. The study was a two-part causal-comparative study. In the first part of the study the historical student performance data on the MAP grade-level assessments of third and fourth graders from the spring of 2018 assessment was analyzed. The second part of the study included a survey of teachers' sense of efficacy to establish if there was a difference in the levels of efficacy between teachers who taught in a multiage team-taught classroom versus a single-age classroom.

To perform the data analysis in a causal-comparative study required two steps (Fraenkel et al., 2015). The first part of the analysis was a frequency polygon. The second part and most common test was a *t*-test for the difference of means. The student performance data were separated into categories by the MoDESE, which allowed for the frequency polygon to be performed based on the four achievement level categories of performance. The scale scores for students were collected, and these were used to calculate the descriptive statistics which were used for the *t*-test.

This chapter was presented in three sections: the descriptive analysis section for the variables of the study, the tested hypothesis section, and the summary.

Descriptive Analysis

The descriptive analysis section discussed the sampling utilized to gather the data and detailed the instruments used as measures to perform the study. The data gathered for the dependent variables were subjected to general statistical analysis before being tested for significance as part of the hypothesis testing.

Sample

The researcher initially contacted all 519 superintendents in Missouri public schools. The superintendents were asked to fill out a questionnaire emailed, which connected them to Qualtrics software, Version 8.2019 (2019) survey. The survey was created to gather information about classroom settings in the district. There were 77 district superintendents that responded to the questionnaire. Of the 77 school districts, only three offered multiage team-taught classroom settings while also offering the single-age setting at the third and fourth-grade levels within the same building. However, some of the multiage team-taught setting classrooms could have contained a broader range of grades other than just third or fourth. This determined the sample to be used in this study.

Even though this study did not elicit a random sampling, the three districts that responded were in various regions of Missouri and were of varying sizes. The three participating school districts had four school buildings which included both classroom settings for inclusion in the study. The buildings were selected as a purposive sample as these buildings were the only buildings that met the criterion for the study: (1) had multiage classroom(s), (2) the multiage classroom(s) had both third and fourth grades with two teacher's team teaching, and (3) had single-age classroom(s) at the third and

fourth-grade levels in the same building. The largest of the three participating school districts had two elementary buildings that met the criteria, and the other two participating school districts had one building each.

From the four elementary schools, the performance results contained 608 separate scores at the third-grade level of which 223 were from multiage team-taught classrooms and 385 from single-age classrooms, as well as 690 fourth-grade scores of which 190 were from multiage team-taught classrooms and 500 from single-age classroom settings. The initial calculations for power analysis utilizing the G*Power 3.1.9 application (Bruin, 2019) required a minimum sample size of 52 multiage and 52 single-age classrooms to establish the alpha-error probability of 15%. The study produced between 81 and 251 individual scores of student performance which was well above the required minimum samples for decreasing the risk of committing a Type-I error below 15%.

The informed consent letter was attached to the initial questionnaire sent to superintendents. The informed consent letter also was an invitation for teachers to participate in the Teachers' Sense of Efficacy Scale (TSES) survey. The superintendents were asked to forward the letter of intent to the third and fourth-grade teachers in the buildings that met the selection criteria. Based upon a review of the school district staff directories posted on the school district websites, 39 teachers in the three participating school districts met the criteria and were potential participants in the survey. There were 22 responses received on the survey. Of the 22 responses, eight were from teachers who taught in the multiage team-taught classroom setting and 14 were from teachers who taught in the single-age classroom setting. A power analysis was unable to be performed

on the data before the implementation of the study due to the unknown number of teachers at the third and fourth-grade levels in public school districts in Missouri.

Student Data Measures

The students' performance was measured utilizing the Missouri Assessment Program (MAP) scores from the spring of 2018 grade-level assessment. The teachers' sense of efficacy was measured using the Teachers' Sense of Efficacy Scale Short Form survey created by Tschannen-Moran and Woolfolk Hoy (2001). These instruments provided the data to analyze the research questions.

The MAP assessment data were collected through the MoDESE secured website (MoDESE, n.d.b). To gather the data required a registered user from each school district. The registered user accessed the Missouri Comprehensive Data System (MCDS) and ran the scale score summary report. The report was completed as a comma-delimited report which allowed for the removal of all identifying student information before being sent to the researcher. Once the reports were received, the data were placed into a Microsoft Excel spreadsheet for analysis. The scores were placed into third-grade columns (see Appendix I) and fourth-grade columns (see Appendix J) based on the subject, this allowed for the descriptive statistics to be calculated.

Descriptive statistics were calculated for the independent variables and separated into grade level and subject for comparison; the ranges, means, and standard deviations were shown in Table 2.

Table 2

Descriptive Statistics of Research Variables

Variable	N	Range	Min.	Max.	M	SD
Third grade single-age ELA	192	180	258	438	350.21	35.69
Third grade single-age math	193	267	185	452	343.34	50.51
Third grade multiage ELA	111	186	276	462	364.47	35.85
Third grade multiage math	112	194	242	436	354.23	40.40
Fourth grade single-age ELA	251	237	238	475	386.44	42.50
Fourth grade single-age math	249	285	210	495	371.47	54.34
Fourth grade multiage ELA	109	166	311	477	393.07	36.17
Fourth grade multiage math	81	259	210	469	374.59	41.71
ELA single-age	443	237	238	475	370.74	43.56
ELA multiage	220	201	276	477	377.08	39.97
Math single-Age	442	310	185	495	359.19	54.52
Math multiage	193	259	210	469	359.79	43.32

The calculation of means provided an average scale score based on the students' academic performance on the MAP assessments, along with the standard deviations which provided the central location of data to be analyzed. The analyses were performed using Excel Microsoft Office Professional Version 10. When comparing the means of scores for each grade level and each subject, the general observation was the multiage team-taught classroom setting had a higher mean score compared to the single-age classroom setting for both subjects at each grade level. To measure the significance of the variance required the performance of a *t*-test for testing the difference between two mean scores for the independent samples (Bluman, 2015). The *t*-test results were discussed in the hypothesis testing section of this chapter.

Teacher Data Measures

The Teachers' Sense of Efficacy Scale (TSES) data were collected by forwarding the informed consent letter to the teachers in the buildings selected to participate in the

study. The informed consent letter contained the link to the survey, which linked participants to Qualtrics software, Version 8.2019 (2019) to take the survey. Based upon a review of the staff directories within the buildings that were selected to participate in the study, 39 potential participants should have received the invitation. Participants were given a three-week window to complete the survey. During the second week of the study, a reminder email was sent out to the superintendent and contact person from the districts selected to participate. The survey results were collected at the end of the third week and tabulated in a Microsoft Excel spreadsheet for analysis (see Appendix K).

The results were analyzed using a factor analysis to determine how participants responded to the 12 statements. The statements could be broken down into three subscale categories: (1) Efficacy in student engagement, (2) Efficacy in instructional practices, and (3) Efficacy in classroom management (Tschannen-Moran & Woolfolk Hoy, 2001). The un-weighted mean scores were calculated for the subscales for comparison. The un-weighted means were determined by grouping the 12 statements of teacher beliefs according to (1) Student engagement, which included items two, three, four, and eleven; (2) Instructional strategies, which included items five, nine, ten, and twelve; and (3) Classroom management, which included items one, six, seven, and eight (Tschannen-Moran & Woolfolk Hoy, 2001). The un-weighted mean scores were shown in Table 3.

Table 3

Un-weighted Mean Scores on Teacher Efficacy Subscale

Subscale	Multiage	Single-age
Student Engagement	7.53	5.63
Instructional Strategies	8.25	7.45
Classroom Management	7.88	6.96

Note: The mean scores were calculated based upon the 14 responses from teachers who responded as a single-age teacher and the eight responses from multiage team-taught classroom teachers.

The un-weighted mean scores for variance were compared. The un-weighted means showed a clear variance, with the multiage team-taught classroom teachers scoring at a higher average on all three of the subscales.

Hypothesis Testing

This study was guided by three research questions. The questions were relevant to analyze the academic performance of students in the various classroom settings as well as the level of teachers' sense of efficacy. Hypotheses for each question were postulated. Within each hypothesis, the multiage team-taught classroom setting was chosen as the variable that would outperform the single-age group. A null hypothesis was developed for each of the questions. The null hypotheses were chosen to allow for statistical analysis. The data collected as well as the analysis of the data allowed for the rejection or non-rejection of the null hypotheses, which in turn could support or disprove the hypothesis.

To test the null hypotheses, the data had to be separated based on the two variables, multiage team-taught classroom setting, and single-age classroom setting. The

student performance data once separated was subjected to two separate tests. The first test was the frequency distribution which showed the scale scores separated based on cut scores into the four achievement categories established by MoDESE (MoDESE, 2018a). The achievement levels allowed for the comparison within grade levels and subjects but did not allow for a comparison of means.

As part of the Annual Performance Report (APR) in Missouri, districts were analyzed based on the percentage of students who scored in the top two categories, advanced and proficient (MoDESE, 2018a). The frequency distribution for achievement levels allowed for a quick comparison, similar to the manner in which districts were analyzed by MoDESE. The percentage of students in the top two achievement levels were calculated, which allowed for a similar comparison. The frequency distributions were not utilized in analyzing whether there was a significant difference in student performance. The level of significance was not necessary for this comparison.

The researcher performed a second analysis when the separated data were compared using a *t*-test of means. The *t*-test provided the *P*-value for the compared variables. The *P*-value, according to Bluman (2015), could be used to reject or not reject a null hypothesis when it was compared to the alpha level of the calculation.

Research Question One

What is the difference in student performance levels on the MAP English language arts grade-level assessment between students enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

***H*1$_a$.** Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP English language arts assessments than students enrolled in single-age classrooms.

***H*1$_0$.** Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP English language arts assessments as students enrolled in single-age classrooms.

The data were recorded and tabulated into the four categories using Excel, Microsoft Office Professional Version 10. A frequency distribution was performed utilizing the students' achievement level scores. The achievement levels were set by cut scores determined by the Missouri Department of Elementary and Secondary Education after the assessments were taken (MoDESE, 2019). The frequency distribution of achievement levels for English language arts was shown in Table 4.

Table 4

Frequency Distribution Achievement Levels ELA

		Achievement Level Individual Student's Scores			
Grade Level	Classroom Setting	Below Basic	Basic	Proficient	Advanced
Third	multiage	18	36	32	25
Third	single-age	55	69	47	21
Fourth	multiage	26	79	62	53
Fourth	single-age	86	153	124	80

The data were used to analyze the distribution of the scores based on achievement level (see Appendix L). It was difficult to compare the groups based on the distribution because the samples were not equal. There were 111 scores from third-grade students in multiage team-taught classrooms and 192 scores from third-grade students in single-age classrooms. The fourth-grade scores tabulated 251 from single-age classrooms and 109

from multiage team-taught classrooms. A comparison between grade levels was also not possible due to the differences in cut scores for each grade level (MoDESE, 2018a).

The results from the distribution were further analyzed to compare the percentage of students scoring in the top two categories, which in turn was similar to the APR results for districts in Missouri (MoDESE, 2018a). The results of the calculated percentages were shown in Table 5.

Table 5

Percentage of Scores in Top Two Categories ELA

Grade Level	Classroom setting	%
Third	multiage	51%
Third	single-age	35%
Fourth	multiage	52%
Fourth	single-age	46%

Note. The % listed was the percentage of students' scores in the proficient and advanced categories on the spring 2018 MAP grade-level assessment.

The percentages of students scoring in the top two categories showed a difference between the multiage team-taught classroom and single-age classroom in both the third and fourth-grade levels. The multiage team-taught classroom setting had a larger percentage of students score in the proficient and advanced categories. The difference was seemingly large with a 16% separation between the multiage team-taught and the single-age for both third and fourth-grade students. The level of significance was not calculated for this analysis to maintain similarity to the APR utilized in Missouri, as the level of significance was not performed by MoDESE.

The scale score was the overall score that a student received on the assessment, and it allowed for a more thorough comparison between those students in a multiage team-taught classroom setting and those in a single-age setting. The scale scores also

allowed for a comparison between the multiage team-taught and single-age classroom setting on the third-grade students' scores, the fourth-grade students' scores, as well as the combined third and fourth-grade scores. The scale scores were used to establish the mean and standard deviation shown in Table 3. The mean and standard deviation was used to calculate the *P*-value and t critical value for one tail using a *t*-test. The *t*-test was used when two means were being compared for independent samples (Bluman, 2015). The calculation of the *t*-test was performed using Excel Microsoft Office Professional Version 10. The results from the *t*-test were displayed in Table 6.

Table 6

ELA t-test Results

	Third grade	Fourth grade	Combined
t Statistic	3.3277	1.5087	2.3669
P-value (T<=t)	0.0005099	0.06634	0.009164
t Critical one-tail	1.6548	1.6512	1.6459

Note. The calculation was a one-tailed *t*-test based on .05 alpha level.

Based on the .05 alpha level, the *P*-values showed that there was a significant difference in the mean scores for the third-grade group and the combined third and fourth-grade group. Based on the suggested guidelines from Bluman (2015), the *P*-value for the third-grade group would suggest the difference was highly significant when less than .01. The fourth-grade results, while demonstrating a difference that favored the multiage team-taught classroom setting, were not at a statistically significant level.

To analyze the null hypothesis required looking at the means of the combined third and fourth-grade scores. The means for the combined grades also favored the multiage team-taught classroom setting. The *P*-value was less than the alpha value of .05, based on those results the differences between the groups were at a significant level.

The null hypothesis would be rejected in favor of the alternate hypothesis. The students' in the multiage team-taught classroom setting significantly outperformed the students' in the single-age classroom on the English Language Arts grade-level assessments at the third and fourth-grade levels.

Research Question Two

What is the difference in student performance levels on the MAP mathematics grade-level assessment between students who are enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

***H*2$_a$.** Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP mathematics assessments than students enrolled in single-age classrooms.

***H*2$_0$.** Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP mathematics assessments as students enrolled in single-age classrooms.

The data for this question were tabulated at the same time as research question one. The results were placed in the four categories of achievement level. The achievement levels were set by cut scores determined by the Missouri Department of Elementary and Secondary Education after the assessments were taken (MoDESE, 2019). The scores for this assessment were also from the spring of 2018. The achievement level scores were analyzed using frequency distribution and were presented in Table 7.

Table 7

Frequency Distribution Achievement Levels Math

Grade Level	Classroom Setting	Achievement Levels			
		Below Basic	Basic	Proficient	Advanced
Third	multiage	26	31	36	19
Third	single-age	61	52	47	33
Fourth	multiage	25	27	16	13
Fourth	single-age	83	55	65	46

As with the ELA scores, the categorical distribution provided a quick view of the performance levels, but the researcher was unable to conclude the significance due to the variance in the sample numbers, which did not allow for a direct comparison of the results in this table. There were 193 student scores from single-age classrooms at the third-grade level, and 111 scores from multiage team-taught classrooms at the third-grade level. The fourth grade had 249 student scores from single-age classrooms and 81 student scores from multiage team-taught classrooms. For that reason, the results had to be based upon percentages to draw a valid conclusion. The cut score determination varied between grade levels which did not allow for the comparison of achievement level scores.

To overcome the variance required the data to be calculated into the percentage of scores in the top two categories, similar to the APR scores from the MoDESE (MoDESE, n.d.a.). The percentages were calculated for the achievement levels and the top two categories were combined for comparison. The results were shown in Table 8.

Table 8

Percentage of Scores in Top Two Categories Math

Grade Level	Classroom setting	%
Third	multiage	49%
Third	single-age	41%
Fourth	multiage	44%
Fourth	single-age	43%

Note. The % listed was the percentage of students' scores in the proficient and advanced categories on the spring 2018 MAP grade-level assessment.

The percentages were interpreted to show a difference between the multiage team-taught and single-age scores for the math MAP assessment. The eight percent variance calculated at the third-grade level did not carry over to the fourth-grade level with only a one percent increase in the multiage scores. However, both third and fourth grade did show that the multiage team-taught classroom setting outscored the single-age setting using this analysis. The level of significance was not calculated for this comparison.

The results from the achievement level could be used for comparison, but the scale scores allowed for a more thorough analysis. The scale scores were used to calculate the data presented in Table 2. The scale scores were subjected to a *t*-test to calculate the *P*-value to analyze the null hypothesis of the two groups. The results from the *t*-test were presented in Table 9.

Table 9

Math t-test Results

	Third grade	Fourth grade	Combined
t Statistic	2.0594	0.5382	0.8979
P-value (T<=t)	0.02020	0.2955	0.1849
t Critical one-tail	1.6504	1.6536	1.6481

Note. The calculation was a one-tailed *t*-test based on .05 alpha level.

The *P*-values were calculated at the .05 alpha level which would require a *P*-value to be less than or equal to the alpha level to reject the null hypothesis. Based upon the third-grade mean scores in math, the .02020 *P*-value was less than the .05 which was interpreted to be a significant difference in means. The fourth-grade *P*-value was greater than .05 which was not at a significant level of difference. When reviewing the scores for the combined third and fourth-grade math scores, the *P*-value of .1849 was also not at a significant level of difference.

To analyze the null hypothesis required looking at the mean scores of the combined grades. The means for the combined grades favored the multiage team-taught classroom setting. The *P*-value, .1849 was greater than the alpha value of .05, based on this result the differences between the groups were not at a significant level. The null hypothesis would not be rejected. The students' in the multiage team-taught classroom performed the same as students' in single-age classrooms on the mathematics grade-level assessments at the third and fourth-grade levels.

Research Question Three

What is the difference in teachers' sense of efficacy between teachers who teach in multiage team-taught classrooms and single-age classrooms?

***H*3$_a$**. Teachers who teach in multiage team-taught classrooms will have a significantly higher sense of efficacy than those that teach in single-age classrooms.

***H*3$_0$**. Teachers who teach in multiage team-taught classrooms will have the same or lower sense of efficacy as teachers who teach in single-age classrooms.

The third and fourth-grade teachers in the buildings selected for participation in the study were forwarded to the Teachers' Sense of Efficacy Scale (TSES) survey via

Qualtrics software, Version 8.2019 of Qualtrics (2019). The participating teachers responded to three multiple-choice demographic questions. The questions were written so the researcher could collect data to better analyze the participants' responses. The demographic questions addressed the teacher participants: 1) Type of classroom setting, 2) Range of teaching experience, 3) The classification of the school district. After completing the demographic questions, the teachers then completed the TSES survey (Tschannen-Moran & Woolfolk Hoy, 2001).

The survey consisted of 12 rating scale response items in which the teacher rated his/her own beliefs on a scale ranging from 1 to 9, with 1= "Nothing" and 9= "A Great Deal". The rating indicated the teachers' belief on the level that he/she could influence the stated situation. The responses to the statements were broken down into the subscale categories established by Tschannen-Moran and Woolfolk Hoy (2001): 1) Student engagement, which included items 2, 3, 4, and 11; 2) Instructional strategies, which included items 5, 9, 10, and 12; and 3) Classroom management, which included items 1, 6, 7, and 8 (Tschannen-Moran & Woolfolk Hoy, 2001). The un-weighted mean scores of the responses for the statements were calculated, and the subscale categories were calculated for comparison. The results for the subscale scores were shown in Table 3.

The survey was sent to the teachers at the participating schools that taught third grade, fourth grade, or taught a multiage team-taught classroom that contained third graders and fourth graders. There were 22 teachers who responded to the survey in the school buildings that were included in the study. The demographic data were used to compare the two results from the multiage team-taught and single-age settings and to

ensure that neither group was influenced by years of experience or varied by classifications. The demographics from the survey were shown in Table 10.

Table 10

Teacher Demographics TSES

	Multiage	Single-age
First year teacher	0	1
1 to 5 years exp.	3	7
6-10 years exp.	2	1
11-20 years exp.	3	3
20+ years exp.	0	2
Rural setting	8	13

Note. One participant marked suburban and was not included in the table. The outlier more than likely occurred, because a definition of suburban, rural, and urban was not included with the questions.

The survey responses aligned with the location of the schools that participated in the study which were from rural settings with 21 of 22 participants indicating that the district in which they taught was a rural school. Teachers indicated a varied level of experience in both the multiage team-taught classrooms and the single-age classrooms, with the teachers' experience in the multiage team-taught setting being fairly evenly distributed from one to 20 years of experience. The experience levels of the single-aged classroom instructors ranged from a first-year teacher to two teachers with 20+ years of experience.

The teachers' responses were recorded for all 12 statements into Excel Microsoft Office Professional Version 10. The mean scores were calculated for each statement and the subscale scores calculated for comparison. The results from the calculation of means were presented in Table 11.

Table 11

TSES Question Means with Subscales

Statement	Multiage	Single-age
1	7.75	6.93
2	6.88	5.21
3	7.88	6.43
4	7.75	5.57
5	8.13	7.64
6	7.63	7.14
7	8.00	6.36
8	8.13	7.43
9	8.13	7.50
10	8.50	7.71
11	7.63	5.29
12	8.25	6.93
SE	7.53	5.63
IS	8.25	7.45
CM	7.88	6.96

Note. SE was student engagement, IS was instructional strategies, and CM was classroom management.

The results from the calculation of means showed that teachers in the multiage team-taught classroom setting scored themselves higher on each statement. The higher individual statement mean scores resulted in a higher subscale mean score for the multiage team-taught classroom teachers when compared to the single-age classroom teachers who responded.

Lumley, Diehr, Emerson, and Chen (2002) discussed the effects of normality on a *t*-test. The findings in the discussion determined "...that t-tests produced appropriate significance levels even in the presence of small samples" (p. 155). Heneman, Kimball, and Milanowski (2006) found a skewed distribution of TSES scores during their analysis of the TSES. According to Bluman (2015), to be able to perform the *t*-test required two

assumptions when the standard deviation was unknown: the sample was a random sample and either the sample size was greater than or equal to 30 or the population was normally distributed when the population was less than 30. Based on the findings from Heneman, et al. (2006), the results from the TSES were not normally distributed; they were skewed. The findings from the Lumley et al. (2002) discussion contradicted the Bluman assumptions, so therefore the *t*-test was performed on the results from the TSES. The *t*-test was performed using Microsoft Excel Professional Version 10; the results from the *t*-test were shown in Table 12.

Table 12

Results t-test of Subscale Scores TSES

	Student Engagement	Instructional Practices	Classroom Management
t Statistic	4.1251	2.0433	2.5628
P(T<=t)	0.0002879	0.02721	0.009278
t Critical one-tail	1.7291	1.7247	1.7247

Note. The calculation was a one-tail *t*-test based on .05 alpha level.

The student engagement subscale had the smallest *P*-value of .0002879 and was interpreted to be a highly significant difference. The classroom management subscale calculated a *P*-value of .009278, which was also interpreted as highly significant. The instructional practices category was the only result that was not considered highly significant, at .02721, but was well below the .05 alpha level.

The results from the *t*-test allowed the analysis of the null hypothesis. Based on the researcher's interpretation of the *P*-values, all three subscale scores were less than the alpha level of .05; therefore, the null hypothesis was rejected. The alternate hypothesis was supported by the results, which stated: Teachers who taught in the multiage team-

taught classroom setting had a significantly higher sense of efficacy than teachers who taught in the single-age classroom setting.

Summary

The research questions were analyzed using the academic performance data of third and fourth-grade students on the 2018 MAP assessment. The academic performance data were collected from four elementary buildings located in three school districts for third and fourth graders. The teachers' sense of efficacy was collected using the short form of the Teachers' Sense of Efficacy Scale tool (Tschannen-Moran & Woolfolk Hoy, 2001). The responses from the 22 teachers from the elementary buildings that participated in the study were used for the analysis. The data from the MAP assessments as well as the TSES were used to produce the quantitative results. The results were scrutinized utilizing Excel to perform a battery of statistical tests to answer the research questions. The purpose of the statistical tests was ultimately to analyze whether the null hypothesis could be rejected or not rejected.

The results from the students' academic performance on the MAP English language arts assessment at third and fourth-grade levels were used to analyze Research Question One. Based upon the significant difference in support of the multiage team-taught classroom setting, the null hypothesis for Research Question One was rejected which therefore supported the alternate hypothesis from the researcher. The alternate hypothesis stated: Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP English language arts assessments than students enrolled in single-age classrooms.

The results from the students' academic performance on the MAP mathematics assessment at third and fourth grade levels were used to analyze Research Question Two. Based upon the lack of a significant difference in scores based on classroom setting, the null hypothesis for Research Question Two was not rejected. The null hypothesis stated: Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP mathematics assessments as students enrolled in single-age classrooms.

The responses from the third and fourth-grade teachers on the TSES short form were used to analyze Research Question Three. Based upon the significant difference between the teachers who taught in the multiage team-taught classroom setting and those teachers who taught in the single-age classroom setting, the null hypothesis was rejected, which therefore supported the researcher's alternate hypothesis. The alternate hypothesis for Research Question Three stated: Teachers who teach in multiage team-taught classrooms will have a significantly higher sense of efficacy than those that teach in single-age classrooms.

The results shown in Chapter Four were interpreted as supporting the multiage team-taught classroom. While not significant in all grade levels, the differences overall were supportive of the multiage team-taught classroom setting. Chapter Five will further detail these findings and interpretations, as well as offer summaries, implications for further research, and recommendations.

Chapter Five: Discussion

Multiage classrooms have been utilized in many forms throughout history (Pratt, 1986). The multiage classroom has had many different titles that aligned to the theoretical basis for their creation: multi-grade, mixed-grade, and non-graded (Veenman, 1995). The outcomes of student performance within the existing literature were related to the reason for the creation of the classroom (H. Johnson, 2014). Veenman (1995) found that the classroom setting had no impact on the students' academic performance. Mason and Burns (1996) countered Veenman's results by saying that the students in a mixed-grade classroom underperformed as compared to students in a single-age classroom. Other researchers determined that students in multiage programs have been found to perform better than students in single-age classrooms (Barbetta et al., 2018; Nye et al., 1995).

The primary purpose of this quantitative causal-comparative study was to determine if there was a statistically significant difference in third and fourth-grade students' assessment scores in multiage team-taught classroom settings compared to single-age classroom settings. The secondary purpose was to compare the differences between the teachers' sense of efficacy in the multiage team-taught classroom setting versus the single-age classroom setting. After contacting all public-school district superintendents in Missouri, there were three districts that responded to participate. The districts had four school buildings that contained the classroom settings that matched the criterion for selection to participate in the study. The findings of this study were presented in this chapter. This chapter also included conclusions, limitations,

implications for practice, and recommendations for future research on the multiage team-taught classroom setting.

Findings

This causal-comparative study was organized into two separate sections to compare the multiage team-taught classroom setting and the single-age classroom setting. The first section was set up to analyze the students' performance on the Missouri Assessment Program (MAP) grade-level assessment. The results of the student scores from the spring of 2018 grade-level assessment for third and fourth-grade students on the English language arts and mathematics assessments were compared. The results from this section were utilized to analyze Research Questions One and Two. The second section was set up to analyze and compare the sense of efficacy of teachers who taught third and fourth-grade students in a multiage team-taught classroom setting or a single-age classroom setting. The results from this section were used to analyze Research Question Three.

Research Question One. What is the difference in student performance levels on the MAP English language arts grade-level assessment between students enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

The data collected from the students' scores on the English language arts (ELA) MAP assessment were used to analyze this question. The results from the assessment were interpreted to favor the multiage team-taught classroom setting. The ELA assessment scores for the third and fourth-grade-level assessments from the spring of 2018 were used to calculate the statistics that were shown in Table 6. The results were interpreted to show a significant difference in favor of the multiage team-taught

classroom setting at the third-grade level, with a *P*-value of .0005099, which was well below the alpha level of .05. The fourth-grade level results showed a difference in support of the multiage team-taught classroom setting, with a *P*-value of .06634, which was not at a significant level. The results from the combined third and fourth-grade levels calculated a *P*-value of .009164, which supported the multiage team-taught classroom setting at a significant level. Based upon the results, the null hypothesis was rejected. By rejecting the null hypothesis, the results were interpreted to support the first alternate hypothesis ($H1_a$). The first alternate hypothesis stated: Students enrolled in multiage team-taught classrooms will have significantly higher performance scores on the MAP English language arts assessments than students enrolled in single-age classrooms. This hypothesis was found to be supported at the .05 alpha level.

An analysis using the students' achievement level performance was also performed. The achievement level was used by MoDESE as part of the annual performance report (APR) to establish accreditation of school districts (MoDESE, n.d.a.). When analyzing the achievement level performance, the third and fourth-grade multiage team-taught students scored higher in the top two categories by 16% over the single-age classroom students. The difference of means was not analyzed for significance; however, a 16% difference in students' scores in the top two categories would influence the APR score of a school district in Missouri. The district would increase its Progress Measure points with an increase in the two-year rolling average if the top two categories could be increased at this level (MoDESE, 2018a).

Research Question Two. What is the difference in student performance levels on the MAP mathematics grade-level assessment between students who are enrolled in multiage team-taught classrooms and single-age classrooms for third and fourth grades?

The data collected from the students' scores on the mathematics MAP assessment were utilized to analyze this question. The results from the students' scores on the spring 2018 mathematics grade-level assessment were tabulated and showed a difference in favor of the multiage team-taught classroom at all levels. The difference between the multiage team-taught and single-age classroom setting scores at the third-grade level calculated a *P*-value of .02020 which was significant at a .05 alpha level. The difference at the fourth-grade level calculated a *P*-value of .2955, which was in favor of the multiage team-taught classroom setting but was not significant at a .05 alpha level. The combined third and fourth-grade mathematics scores calculated a *P*-value of .1849, which was slightly in favor of the multiage setting, but again not significant at a .05 alpha level. The data were interpreted to not reject the second null hypothesis ($H2_0$) at the .05 alpha level, which would reject the second alternate hypothesis. The second null hypothesis stated: Students enrolled in multiage team-taught classrooms will perform at the same level or lower on the MAP mathematics assessments as students enrolled in single-age classrooms. In this study, the students in the multiage team-taught classrooms mostly performed at nearly the same level as students in the single-age classroom setting.

The analysis of students' achievement level performance on the mathematics grade-level assessments for third and fourth grade was also performed. The achievement level was used by the MoDESE as part of the APR for accreditation. The scores of students' performance on the math assessments showed the third-grade multiage team-

taught classroom students outperformed the single-age classroom students. The students' scores in the top two categories for the multiage team-taught classroom setting were 8% higher at the third-grade level than the students' scores in the single-age classroom setting. The fourth-grade margin, while in favor of the multiage team-taught classroom setting, was only 1% greater in the top two categories than the single-age classroom. The results for mathematics, while not as large as the ELA, could influence the APR score for a school district, by increasing the Progress Measure points for the two-year rolling average increase (MoDESE, 2018a).

Research Question Three. What is the difference in teachers' sense of efficacy between teachers who teach in multiage team-taught classrooms and single-age classrooms?

The data collected from the TSES survey were utilized to analyze this question. The teachers' sense of efficacy was measured using the Teachers' Sense of Efficacy Scale (TSES) created by Tschannen-Moran and Woolfolk Hoy (2001). The teachers' responses on the TSES survey were utilized to calculate un-weighted averages for the 12 statements and the three subscales. The results from the tabulations were utilized to reject the third null hypothesis ($H3_0$) which stated: Teachers who teach in multiage team-taught classrooms will have the same or lower sense of efficacy as teachers who teach in single-age classrooms. By rejecting the null hypothesis, the alternate hypothesis was supported at the .05 alpha level. The alternate hypothesis stated: Teachers who teach in multiage team-taught classrooms will have a significantly higher sense of efficacy than those that teach in single-age classrooms.

The subscale scores were separated based upon a factor analysis. The factor analysis separated the responses into the three subscales from the combinations of statements that were related to the category. The first subscale was student engagement which included responses to statements: 2, 3, 4, and 11 (Tschannen-Moran & Woolfolk Hoy, 2001). The second subscale was instructional practices which included responses to statements: 5, 9, 10, and 12 (Tschannen-Moran & Woolfolk Hoy, 2001). The third subscale was classroom management which included responses to statements: 1, 6, 7, and 8 (Tschannen-Moran & Woolfolk Hoy, 2001). The un-weighted averages were calculated for each item as well as for the three subscales. The multiage team-taught classroom teachers' scores were determined to be higher than the scores from teachers who taught in a single-age classroom.

Based on the results from the TSES survey, the teachers in the multiage team-taught classroom setting had a stronger sense of student engagement than those teachers in the single-age classroom with a highly significant level of difference. The student engagement subscale had a *P*-value of .0002879. The instructional practices subscale had the smallest level of difference between the two groups with a *P*-value of .02721, which was less than the alpha level of .05. The classroom management subscale again showed an increased difference with a *P*-value of .009278, which was also highly significant at a .05 alpha level. All three subscale scores were interpreted to be at a significant level as the *P*-values tabulated were less than or equal to the alpha level of .05, which rejected null hypothesis three ($H3_0$) and supported the alternate hypothesis.

Conclusions

Conclusions were based upon the analysis of results from the three research questions. To analyze performance, the researcher calculated the mean scores, standard deviations, and performed the *t*-test of means for the students' scores on the MAP third-grade level assessment results, the fourth-grade level assessment results, and the combination of third and fourth-grade level assessment results. The results from the calculations were analyzed and compared using the *t*-test of means for significance to address Research Question One and Research Question Two. The results gathered from the teachers' responses to the TSES short form were utilized to analyze Research Question Three. The following conclusions were drawn based upon the analysis of the data.

Multiage team-taught classroom students outperformed the single-age classroom students. Overall, the results of the study were interpreted to support the multiage team-taught classroom setting as a viable option for schools. The findings from the students' performance on the MAP grade-level assessments at the third-grade level in both mathematics and ELA supported the multiage team-taught classroom over the single-age classroom. The findings from the students' performance on the MAP grade-level assessments at the fourth-grade level supported the multiage team-taught but neither, ELA or mathematics were at a significant level. When combining the results from the students' performance on the MAP grade-level assessment for ELA and mathematics, the results were interpreted to show a significant difference in favor of the multiage team-taught classroom setting for ELA, but not at a significant level for mathematics. The results were similar to prior studies conducted that supported the

multiage team-taught classroom setting (Barbetta et al., 2018; Leuven & Ronning, 2014; Ong et al., 2000).

The younger students outperformed the older students in the multiage team-taught classroom. The results from the student performance were interpreted to support the multiage team-taught classroom for the third-grade students in both ELA and mathematics. The *P*-values at the third-grade level were calculated with a .0005099 for ELA and .02020 for math. These values were interpreted as a significant difference at the .05 alpha level. The fourth-grade students' scores were interpreted to support the multiage team-taught classroom setting, but not at a significant level. The results from the study were similar to prior research by Barbetta et al. (2018), which showed a significant difference for the lower age students and a non-significant difference for the older students in the classroom.

The results from the study were interpreted to demonstrate that the multiage team-taught classroom had a greater effect on the ELA scores than the math scores. The *P*-values for the ELA scores when looking at the combined third and fourth-grade scores were .009163 for the ELA and .1848 for the mathematics. The *P*-values were interpreted to show a significant difference in favor of the multiage team-taught classroom at .05 alpha level for ELA and a non-significant difference in favor of the multiage team-taught classroom for mathematics. Prior research from Quail and Smyth (2014) had similar results revealing students performed better in ELA compared to mathematics.

Teachers who taught in a multiage team-taught classroom had a higher sense of efficacy than teachers who taught in single-age classrooms. The results from the TSES survey were interpreted to show that teachers who taught in the multiage team-

taught classroom setting had higher levels of self-efficacy than those who taught in single-age classrooms. The subscale scores were used to calculate *P*-values that were less than the alpha level of .05 on all three of the subscales.

The preliminary questions on the TSES survey included demographic data to get a general sense of the experience of teachers who completed the survey. The 22 responses on the survey showed a wide range of teacher experiences. There was an unequal split with eight teachers teaching in a multiage team-taught classroom and 14 in the single-age classroom. The single-age classroom respondents had the largest split on experience, with one first-year teacher and two teachers with more than 20 years of experience. The multiage team-taught classroom teachers were well mixed at the level of experience. A general viewing of the results can be used to interpret that one of the teachers with more than 20 years and the first-year teacher scored themselves low on the TSES. These individual results could have influenced the single-age classroom setting results, but could not be used to draw a conclusion as to the effects of experience alone on the results.

Limitations

A causal-comparative study was performed. This type of study had limitations because it was an ex post facto study of student performance. The Missouri Department of Elementary and Secondary Education does not track specific types of classroom settings utilized for elementary buildings. To reduce the limitations, all public schools were contacted through the initial email of superintendents, no schools or districts that responded to the inquiry were left out of the study. The study was limited to four school buildings within three districts in rural Missouri. The districts were located in Central

and Southwest Missouri. The teachers who participated in the study by completing the TSES were located in the four buildings within the districts that participated.

The independent variable of the study was unable to be manipulated. The independent variable was the classroom setting. The student' had previously been assigned to the classrooms, the students had a year of instruction within the classroom setting, and the assessments were completed before the start of the study. The separate locations that participated in the study also limited the control of the teaching environment. While Missouri has created the Missouri Learning Standards for consistency throughout the school districts in the state, there was not a standard curriculum (MoDESE, 2018c). The lack of controlling the curriculum taught in the classrooms was a limitation on the study. The ex post facto nature made it difficult to isolate the classroom setting as the only factor that influenced the students' performance on the MAP grade-level assessments.

A limitation for Research Question Three was the sample size due to the limited availability of schools to participate in the Teachers' Sense of Efficacy Scale survey. The results from the TSES were limited based on the small sample size of teachers located within the four school buildings selected to participate. The 22 teachers who responded to the survey were 56% of the 39 available teachers who met the criterion of the study to participate. The sample size allowed for the significance of difference to be calculated but would make it difficult to generalize the results beyond the scope of the study.

Implications

The results from the study could be interpreted to support the use of the multiage team-taught classroom setting for students in third and fourth grades. The findings for

the fourth-grade students' performance on the MAP grade-level assessment were similar to prior research on the effects of the multiage classroom setting in which studies supported the multiage classroom setting, but not at a significant level (Bailey, 2014; Eames, 1989; Elmore et al., 1996; Gorrell, 1998; Gutierrez & Slavin, 1992; Nye et al., 1995; Pratt, 1986; Veenman, 1995). The findings for the third-grade students' performance on the MAP grade-level assessment were similar to prior research that supported the multiage classroom setting at a significant level (Fuller et al., 1993; Kinsey, 2001; Leuven & Ronning, 2014; Ong et al., 2000). The students in the multiage team-taught classroom outscored the single-age counterparts in the same buildings. The results from the study on students' academic performance on the MAP grade-level assessment in this classroom setting could be useful to administrators in other school districts to provide options for implementing multiage team-taught programs throughout Missouri.

The team-teaching aspect of the multiage team-taught classroom setting provided an enhancement of the teaching and learning environment. The two certified teachers in the multiage classroom setting provided an enhanced learning environment for the students as well as increasing a teacher's sense of efficacy (Ashton et al., 1983). Two adults in the room increased the individual efficacy of the teachers which in turn could have led to a higher sense of collective efficacy which Goddard et al. (2000), supported would increase student achievement.

The teachers in the multiage team-taught and single-age classrooms, based on the results of the demographics from the TSES survey, were of similar characteristics. There was a wide range to the level of teacher's experience in both of the classroom settings. The results from the teachers' responses to the TSES survey were interpreted to support

the multiage team-taught classroom setting on developing a teacher's sense of efficacy. The team-teaching aspect of the classrooms studied would support the development of efficacy. Similar results were found by Ashton et al. (1983), in which the multiage classroom setting and team teaching enhanced teacher efficacy. With the limited number of responses, it was difficult to generalize the results from the study to all third and fourth-grade teachers. The small sample size provided relevant results to interpret that teachers in the multiage team-taught classroom setting had a higher sense of efficacy and opened the potential for further study.

Recommendations

While the study results could be interpreted to support the multiage team-taught classroom setting, further studies should be undertaken to check for similar results for more than just third and fourth-grade students. Furthermore, other studies should be performed to measure the effects as students move from one multiage team-taught classroom to analyze if moving from the older students in a classroom to again being the younger students had an influence on performance. The narrow focus of this study and the relevant results should be checked for comparison of other grade spans.

The school settings and demographics were not analyzed as part of the study. While the schools were found in multiple locations, the socioeconomic background and other demographic information was not included as part of the analysis. Further analysis should occur throughout the state of Missouri for all multiage programs in the state, as many districts have multiage classrooms, but these districts might not have two teachers team teaching in the multiage room or do not have the single-age setting in the same buildings.

The teachers' sense of efficacy results opened the door for further analysis. There were only 22 teachers that participated in the study. The limited number of teachers in the study and the purposive sample did not allow for generalization to the overall population of third and fourth-grade teachers and other school districts. The demographic information collected showed a variety of years of experience, but one or two outliers could have influenced the overall results of the study. Further study needs to take place to see if the results would carry over to a larger sampling of teachers.

Summary

There were many school districts around the country and in Missouri that have been seeking viable options for classroom settings to meet the changing needs of schools due to budget shortfalls and changes in state and federal legislation (Carey et al., 2018). The schools in this study implemented multiage team-taught settings at the elementary level. The students in these programs were being taught by a team of teachers implementing the learning standards of two grade levels. While these teachers were working together to meet the needs of students, the students learned at various paces within the context of the classroom.

The multiage team-taught classroom setting allowed for ability grouping and instructional practices that were not always practical in a single-age classroom (McCarthey et al., 1996). The multi-grade classroom setting was analyzed by Hattie (2009) and did not show a strong effect on student performance. The results from this study could be interpreted to show that when combining the team-teaching aspect into the classroom setting, there can be a significant difference in performance in favor of the multiage team-taught classroom setting.

The results from the students' performance in the two classroom settings supported the multiage team-taught classroom setting with two teachers team teaching at the third and fourth-grade levels. Results from past studies showed similar results to this study with the multiage classroom setting outperforming the single-age at a significant level (Barbetta et al., 2018; Gutierrez & Slavin, 1992; Leuven & Ronning, 2014). Some prior research had results that matched the fourth-grade performance results from the study with students performing better in the multiage classroom, but not at a significant level (Bailey, 2014; Eames, 1989; Gorrell, 1998; Pavan, 1992; Veenman, 1995). The overall results from the study matched the results from the Nye et al. (1995) study. The Nye et al. (1995) study showed that lower grade students in multiage classroom settings performed better at a significant level, while the higher aged students performed better, but not at a significant level. Based on the support from the literature (Bailey, 2012; Barbetta et al., 2018; Eames, 1989; Gorrell, 1998; Gutierrez & Slavin, 1992; Leuven & Ronning, 2014; Nye et al., 1995; Pavan, 1992; Veenman, 1995) and the results from this study, multiage team-taught classrooms could be implemented at the third and fourth-grade levels to improve students' academic success. With the results found for third and fourth grade, other grade levels could be combined as well to help students attain greater academic achievement.

The team-teaching aspect of the study lent itself to the development of the teachers' sense of efficacy (Goddard et al., 2000). The results from past studies supported that increases in teachers' sense of efficacy improved teachers' levels of job satisfaction (Karabiyik & Korumaz, 2014). The increased individual efficacy of the teaching staff, in turn, had an increased effect on the collective efficacy of a building (Hoy et al., 2002).

Increasing the collective efficacy within a building had a greater effect on student achievement than did demographic controls, including overcoming the negative effects from socioeconomic status (Bandura, 1993; Goddard et al., 2000). With the support from the literature and based on the limited results from this study, the team-taught multiage classroom setting should be implemented at the third and fourth-grade levels to increase the teachers' sense of efficacy and students' overall improved academic performance.

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Appendix A

Teachers' Sense of Efficacy Scale

Teachers' Sense of Efficacy Scale[1] (short form)

	Teacher Beliefs	How much can you do?								
	Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.	Nothing		Very Little		Some Influence		Quite A Bit		A Great Deal
1.	How much can you do to control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2.	How much can you do to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3.	How much can you do to get students to believe they can do well in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4.	How much can you do to help your students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5.	To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6.	How much can you do to get children to follow classroom rules?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7.	How much can you do to calm a student who is disruptive or noisy?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8.	How well can you establish a classroom management system with each group of students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9.	How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10.	To what extent can you provide an alternative explanation or example when students are confused?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11.	How much can you assist families in helping their children do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12.	How well can you implement alternative strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Appendix B

Email sent to superintendents in Missouri

Dear Superintendent,

My name is Troy Marnholtz, I am the superintendent at Chilhowee R-IV School District in Chilhowee, Missouri. I am currently pursuing my Educational Doctorate degree in Administration from Lindenwood University.

As part of the degree, I am writing my dissertation on the effects that classroom settings have on students' academic performance as well as teachers' sense of efficacy. I am comparing the effects of multiage team-taught classrooms versus single-age classrooms at the third and fourth grade level to see if there is a significant difference between students' performance based on classroom setting.

I am specifically looking for buildings that are utilizing two or more certified teachers to teach a multiage classroom that contains third and fourth graders in some form of grouping, while also having single-age classrooms with third and fourth graders in the same building at the same time. Buildings that utilize such a program will be asked to provide MAP results for the third and fourth-grade students. The results will be analyzed for a difference in performance between the multiage and the single-age groups on the ELA and Mathematics assessments.

I am seeking your permission to include your district's third and fourth grade teachers in the study as well as the students' MAP results if your district meets the selection criteria. To analyze your district's potential inclusion, I am asking that you take less than two minutes to fill out the questionnaire through Qualtrics.

https://lindenwood.az1.qualtrics.com/jfe/form/SV_eICoAuZql3tZozP

As part of the questionnaire, I ask for the contact information of the person in your district who can access the MCDS report system through the DESE website, if you have the matching type of classroom settings. The report that will be utilized to gather the student data is the MAP Scale Score Summary report. I will send the instructions to the contact person on how to run the report. The students' personally identifiable information will be redacted from the report to protect student identities prior to being sent to me.

The secondary part of the study is to measure teachers' sense of efficacy to compare multiage vs. single-age classroom teachers. I have included as an attachment, an Informed Consent Letter that I ask you to send on to the building(s) that meet the criteria for the study for completion by **all** the third and fourth grade teachers in the building.

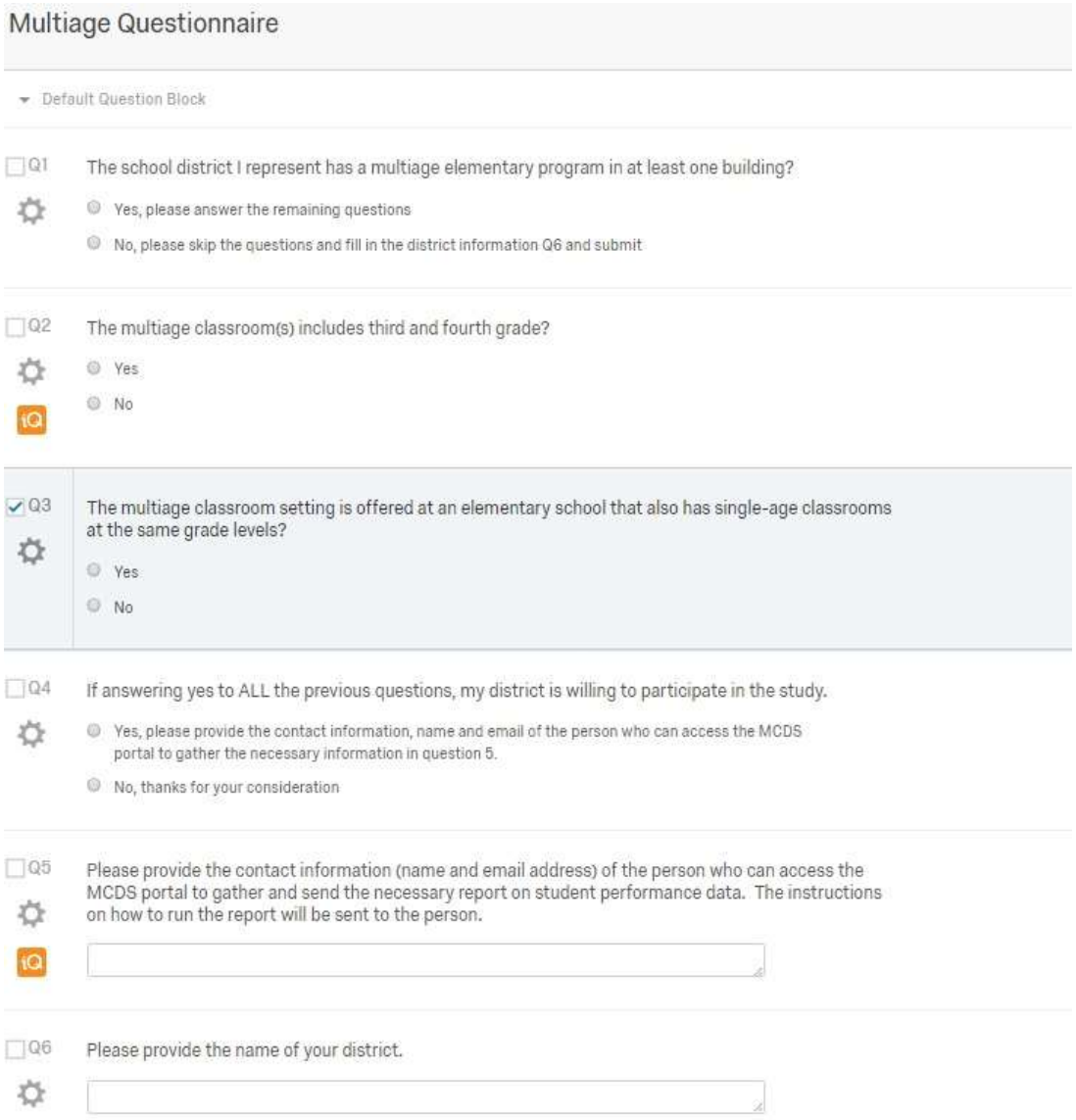
Please know that care will be taken to keep all information confidential during this process. There will be no identifying results shared as a result of this study. Thank you in advance for taking the time to complete the survey and for forwarding the teacher efficacy survey. If you have any questions regarding my research you can contact me or my chair Dr. Pamela Spooner, pspooner@lindenwood.edu.

Sincerely,

Troy Marnholtz

Appendix C

Superintendent Questionnaire from Qualtrics (2019)



Multiage Questionnaire

Default Question Block

Q1 The school district I represent has a multiage elementary program in at least one building?

- Yes, please answer the remaining questions
- No, please skip the questions and fill in the district information Q6 and submit

Q2 The multiage classroom(s) includes third and fourth grade?

- Yes
- No

Q3 The multiage classroom setting is offered at an elementary school that also has single-age classrooms at the same grade levels?

- Yes
- No

Q4 If answering yes to ALL the previous questions, my district is willing to participate in the study.

- Yes, please provide the contact information, name and email of the person who can access the MCDS portal to gather the necessary information in question 5.
- No, thanks for your consideration

Q5 Please provide the contact information (name and email address) of the person who can access the MCDS portal to gather and send the necessary report on student performance data. The instructions on how to run the report will be sent to the person.

Q6 Please provide the name of your district.

Appendix D

Recruitment letter to third and fourth grade teachers

LINDENWOOD

Survey Research Information Sheet

Title of Research Project: Student Achievement and Teacher Efficacy in Multiage Classrooms vs. Single-age Classrooms

You are being asked to participate in a survey conducted by Troy Marnholtz under the guidance of Dr. Pamela Spooner at Lindenwood University. The purpose of this study is to determine if there is a significant difference between student performance on MAP grade level assessments at the third and fourth grade as well as the level of teachers' sense of efficacy in team-taught multiage classrooms vs. single-age classrooms. Your participation will involve completing a short survey about your sense of teacher efficacy. The survey will ask you three demographic questions then ask you to indicate your opinion on 12 statements. It will take about 5-6 minutes to complete this survey.

Your participation is voluntary. You may choose not to participate or withdraw at any time by simply not completing the survey or closing the browser window.

There are no risks from participating in this project. We will not collect any information that may identify you. There are no direct benefits for you participating in this study.

WHO CAN I CONTACT WITH QUESTIONS?

If you have concerns or complaints about this project, please use the following contact information:

Troy Marnholtz tmarnholtz@chilhowee.k12.mo.us

Dr. Pamela Spooner Pspooner@lindenwood.edu

If you have questions about your rights as a participant or concerns about the project and wish to talk to someone outside the research team, you can contact Michael Leary (Director - Institutional Review Board) at 636-949-4730 or mleary@lindenwood.edu.

Continuing with this survey indicates that you have read this consent information and are willing to participant in this research. Control and Click to follow the link

Teachers' Sense of Efficacy Scale Survey Link

https://lindenwood.az1.qualtrics.com/jfe/form/SV_4JFQHk0ebUlz19X

Appendix E

Permission Letter TSES

THE OHIO STATE UNIVERSITY COLLEGE OF EDUCATION AND HUMAN ECOLOGY

ANITA WOOLFOLK HOY, PH.D.

PROFESSOR
PSYCHOLOGICAL STUDIES IN EDUCATION

Dear

You have my permission to use the *Teachers' Sense of Efficacy Scale* in your research. A copy the scoring instructions can be found at:

http://u.osu.edu/hoy.17/research/instruments/

Best wishes in your work,

Anita Woolfolk Hoy

Anita Woolfolk Hoy, Ph.D.
Professor Emeritus

Appendix F

Email Instructions for running MAP Scale Score Summary Report

Dear Sir/Maam,

My name is Troy Marnholtz, I am the superintendent at Chilhowee R-IV School District in Chilhowee, Missouri. I am currently pursuing by Educational Doctorate degree in Administration from Lindenwood University.

As part of the degree I am writing my dissertation on the effects that classroom settings have on students' academic performance as well as teachers' sense of efficacy. I am comparing the effects of multiage team-taught classrooms versus single-age classrooms at the third and fourth-grade level to see if there is a significant difference between students' performance based on classroom setting.

I am specifically looking for buildings that are utilizing two or more certified teachers to teach a multiage classroom that contains third and fourth graders in some form of grouping, while also having single-age classrooms with third and fourth graders in the same building at the same time. Buildings that utilize such a program will be asked to provide MAP results for the multiage students and a comparable number of students enrolled in single-age classrooms from third and fourth grade. The results will be analyzed for a difference in performance between the two groups on the ELA and Mathematics assessments.

I was provided your contact information by your superintendent. I am asking that you access the MCDS secured website and provide the redacted student performance data for your third and fourth grade multiage classroom as well as the third grade and fourth grade single-age classrooms. To gather the necessary information from the MCDS portal requires running the MAP Scale Score Summary Report (instructions included below).

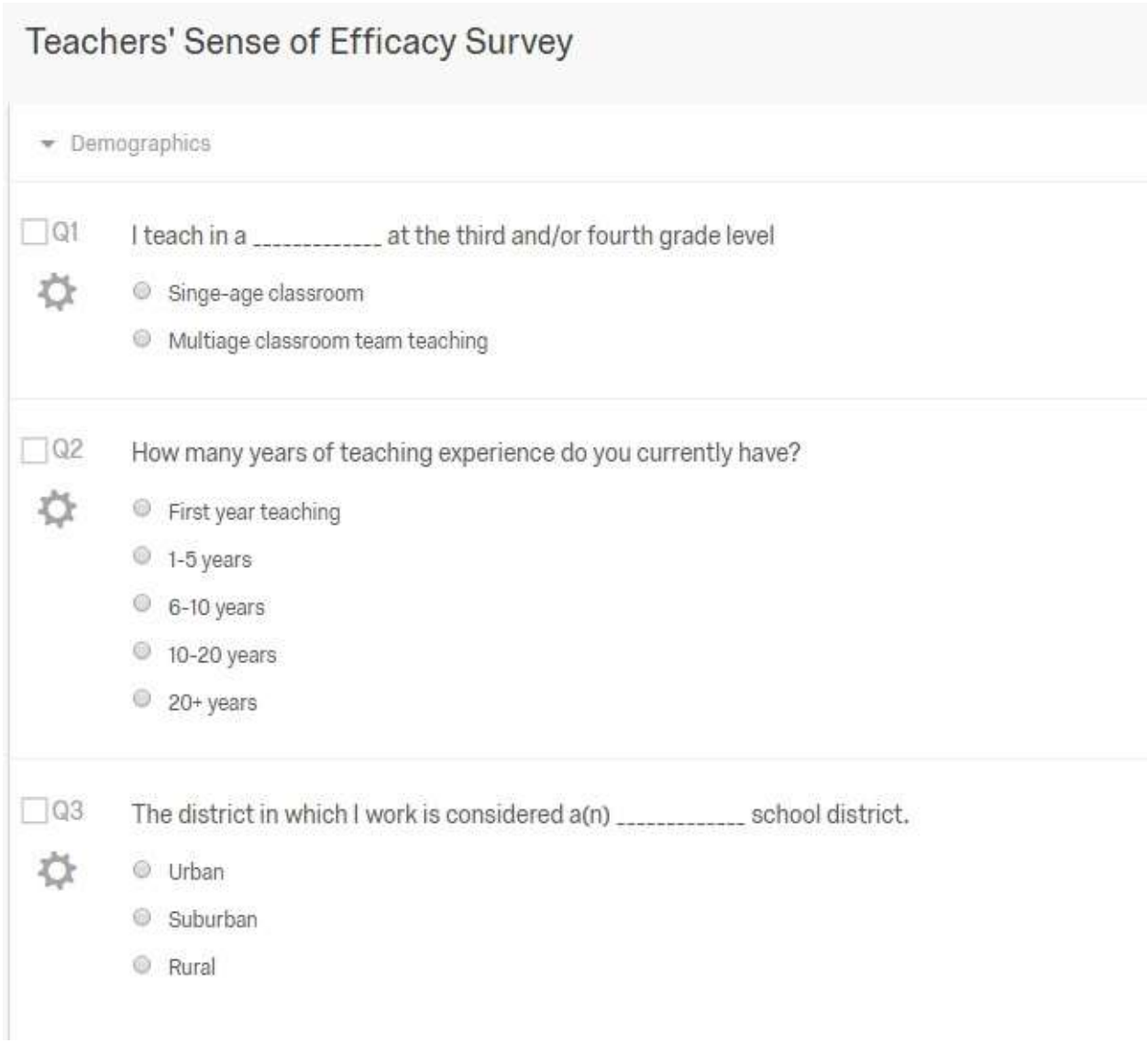
1. Go to DESE website
2. DESE Web Applications
3. MCDS link
4. Reports and Resources link under district name
5. Scroll down to the MAP Scale Score Summary Report
    a. Select school year 2018
    b. Select appropriate elementary school
    c. Select CA and mathematics
    d. Select Grade level 3 and 4
    e. Select multiage classroom examiner's name
    f. Select the 3rd grade examiner's names
    g. Select the 4th grade examiner's names
    h. Run Report as a csv delimited report
6. After the report downloads delete the student name columns, State ID column and DOB column from the report
7. Save the report as a CSV report as districtname_scalescoresummary2018.csv
8. Email the saved report to tmarnholtz@chilhowee.k12.mo.us

Thank you for taking the time and sending the above report.

Sincerely,
Troy Marnholtz

Appendix G

TSES survey sent to teachers from Qualtrics (2019).



Teachers' Sense of Efficacy Survey

Demographics

Q1 I teach in a _____ at the third and/or fourth grade level

- Singe-age classroom
- Multiage classroom team teaching

Q2 How many years of teaching experience do you currently have?

- First year teaching
- 1-5 years
- 6-10 years
- 10-20 years
- 20+ years

Q3 The district in which I work is considered a(n) _____ school district.

- Urban
- Suburban
- Rural

Q4

Teacher Beliefs

Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.

	How much can you do?								
	Nothing (1)	(2)	Very Little (3)	(4)	Some Influence (5)	(6)	Quite a Bit (7)	(8)	A Great Deal (9)
How much can you do to control disruptive behavior in the classroom?									
How much can you do to motivate students who show low interest in school work?									
How much can you do to get students to believe they can do well in school work?									
How much can you do to help your students value learning?									
To what extent can you craft good questions fro your students?									
How much can you do to get children to follow classroom rules?									
How much can you do to calm a student who is disruptive or noisy?									
How well can you establish a classroom management system with each group of students?									
How much can you use a variety of assessment strategies?									
To what extent can you provide an alternative explanation or example when students are confused?									
How much can you assist families in helping their children do well in school?									
How well can you implement alternative strategies in your classroom?									

Appendix H

Reminder Email

My name is Troy Marnholtz, I have previously contacted you in regard to my study of student achievement and teacher efficacy in multiage versus single-age classrooms. As part of the previous contact, you forwarded an Informed Consent Letter to third and fourth grade teachers in buildings that had both multiage and single-age classroom settings.

I am asking that you please forward this email with the survey link to the third and fourth grade teachers again.

https://lindenwood.az1.qualtrics.com/jfe/form/SV_4JFQHk0ebUIz19X

Thank you for your help with my dissertation.

Sincerely,

Troy Marnholtz

Appendix I

Third Grade MAP Scores

English Language Arts				Mathematics			
Multiage		Single-age		Multiage		Single-age	
Achievement Lvl	Scale Score	Achievement Lvl	Scale Score	Achievement Lvl	Scale Score	Achievement Lvl	Scale Score
Basic	361	Basic	333	Basic	349	Below Basic	315
Below Basic	318	Proficient	391	Below Basic	305	Advanced	399
Proficient	373	Proficient	371	Basic	336	Basic	358
Basic	354	Below Basic	297	Proficient	383	Below Basic	325
Advanced	397	Basic	359	Proficient	375	Proficient	388
Basic	354	Basic	336	Below Basic	306	Basic	342
Advanced	396	Proficient	277	Advanced	398	Advanced	394
Below Basic	299	Proficient	386	Below Basic	242	Basic	333
Basic	342	Proficient	391	Below Basic	259	Advanced	407
Below Basic	295	Basic	350	Below Basic	303	Proficient	369
Proficient	366	Basic	360	Basic	348	Proficient	380
Advanced	407	Basic	336	Proficient	382	Basic	337
Proficient	392	Basic	344	Proficient	382	Basic	350
Advanced	462	Proficient	390	Advanced	417	Below Basic	320
Advanced	434	Proficient	369	Proficient	379	Proficient	368
Advanced	424	Basic	359	Proficient	387	Proficient	377
Advanced	410	Proficient	376	Below Basic	324	Advanced	408
Basic	356	Basic	342	Proficient	386	Basic	328
Advanced	413	Basic	335	Advanced	401	Proficient	367
Advanced	401	Basic	349	Advanced	402	Basic	331
Advanced	407	Basic	362	Advanced	395	Advanced	398
Proficient	382	Basic	344	Advanced	400	Proficient	370
Proficient	385	Basic	344	Proficient	375	Below Basic	316
Advanced	407	Advanced	403	Proficient	381	Advanced	413
Advanced	404	Proficient	394	Basic	359	Advanced	409
Proficient	370	Proficient	366	Advanced	395	Basic	340
Advanced	405	Basic	360	Below Basic	299	Proficient	382
Advanced	399	Basic	356	Basic	341	Basic	349
Proficient	372	Below Basic	320	Proficient	372	Below Basic	324
Basic	351	Advanced	401	Advanced	394	Advanced	392
Advanced	407	Proficient	372	Proficient	371	Proficient	367
Proficient	380	Below Basic	322	Proficient	382	Basic	351
Proficient	380	Advanced	424	Proficient	369	Advanced	452
Advanced	398	Basic	361	Proficient	385	Basic	361
Basic	361	Proficient	373	Advanced	395	Below Basic	292
Basic	351	Basic	331	Proficient	381	Below Basic	274
Advanced	427	Basic	351	Advanced	436	Basic	336
Advanced	422	Proficient	375	Advanced	391	Basic	340

Advanced	403	Below Basic	321	Advanced	394	Basic	351
Proficient	365	Proficient	376	Basic	356	Basic	361
Proficient	386	Below Basic	327	Proficient	382	Proficient	372
Basic	346	Basic	360	Basic	348	Proficient	378
Basic	339	Basic	347	Below Basic	293	Proficient	370
Below Basic	316	Proficient	387	Below Basic	301	Proficient	388
Proficient	367	Basic	344	Basic	337	Below Basic	286
Basic	341	Basic	351	Basic	354	Basic	334
Basic	337	Proficient	386	Proficient	374	Proficient	369
Basic	359	Below Basic	310	Below Basic	313	Below Basic	232
Proficient	384	Basic	350	Advanced	419	Basic	350
Below Basic	298	Proficient	390	Below Basic	262	Proficient	384
Below Basic	276	Below Basic	307	Below Basic	290	Proficient	374
Below Basic	322	Proficient	379	Basic	329	Proficient	362
Below Basic	308	Basic	360	Below Basic	259	Proficient	368
Advanced	416	Below Basic	293	Advanced	429	Advanced	395
Advanced	395	Basic	359	Basic	353	Advanced	398
Below Basic	316	Advanced	413	Below Basic	322	Advanced	418
Proficient	379	Advanced	395	Basic	345	Advanced	398
Basic	359	Basic	336	Basic	336	Advanced	391
Basic	340	Proficient	373	Below Basic	313	Proficient	382
Basic	344	Advanced	407	Basic	351	Advanced	411
Below Basic	312	Advanced	403	Basic	330	Advanced	421
Proficient	373	Proficient	375	Basic	342	Advanced	395
Basic	333	Basic	358	Below Basic	285	Proficient	375
Basic	335	Proficient	388	Below Basic	303	Proficient	367
Below Basic	326	Proficient	382	Basic	350	Advanced	419
Below Basic	291	Proficient	392	Below Basic	257	Proficient	367
Basic	344	Advanced	438	Below Basic	320	Basic	354
Advanced	415	Proficient	386	Proficient	382	Advanced	393
Basic	334	Advanced	414	Basic	327	Advanced	396
Basic	339	Basic	361	Below Basic	304	Proficient	374
Proficient	373	Proficient	377	Basic	357	Proficient	388
Basic	354	Below Basic	324	Basic	345	Advanced	428
Proficient	391	Advanced	410	Basic	361	Proficient	371
Basic	353	Advanced	423	Basic	345	Proficient	387
Basic	360	Advanced	406	Proficient	370	Basic	328
Proficient	377	Proficient	392	Proficient	376	Proficient	381
Basic	347	Proficient	380	Basic	333	Basic	327
Below Basic	316	Proficient	379	Basic	331	Proficient	368
Below Basic	307	Basic	351	Below Basic	271	Below Basic	324
Basic	351	Basic	342	Basic	332	Below Basic	322
Below Basic	316	Below Basic	309	Proficient	382	Below Basic	288

Proficient	383	Basic	356	Below Basic	319	Basic	330
Below Basic	290	Below Basic	310	Proficient	375	Below Basic	255
Basic	341	Basic	337	Below Basic	323	Basic	347
Advanced	411	Basic	343	Basic	358	Below Basic	311
Proficient	364	Proficient	366	Proficient	367	Advanced	396
Proficient	384	Below Basic	329	Proficient	366	Below Basic	286
Proficient	369	Basic	355	Proficient	362	Below Basic	297
Basic	356	Below Basic	330	Basic	340	Basic	333
Basic	352	Basic	342	Proficient	377	Basic	332
Proficient	385	Below Basic	328	Proficient	389	Basic	332
Basic	361	Basic	334	Advanced	404	Basic	339
Proficient	382	Below Basic	314	Basic	347	Basic	334
Below Basic	290	Below Basic	273	Advanced	397	Basic	329
Advanced	398	Proficient	369	Below Basic	306	Basic	340
Proficient	366	Basic	350	Advanced	405	Basic	349
Basic	355	Basic	335	Basic	353	Below Basic	305
Basic	358	Basic	345	Proficient	371	Below Basic	311
Proficient	382	Proficient	367	Below Basic	304	Proficient	370
Proficient	389	Below Basic	326	Proficient	388	Basic	326
Proficient	371	Proficient	386	Basic	359	Basic	351
Basic	357	Basic	333	Proficient	367	Proficient	365
Advanced	420	Proficient	385	Proficient	380	Proficient	367
Basic	346	Proficient	379	Advanced	416	Advanced	394
Proficient	369	Basic	334	Proficient	382	Below Basic	325
Proficient	384	Below Basic	315	Proficient	389	Below Basic	232
Proficient	374	Basic	340	Advanced	391	Basic	354
Below Basic	313	Below Basic	282	Proficient	372	Below Basic	236
Basic	360	Advanced	430	Below Basic	289	Advanced	452
Basic	352	Below Basic	274	Basic	361	Below Basic	273
Proficient	389	Basic	341	Proficient	381	Basic	337
		Proficient	370	Proficient	388	Below Basic	319
		Basic	354			Proficient	367
		Proficient	385			Proficient	386
		Below Basic	258			Below Basic	264
		Basic	350			Advanced	396
		Basic	343			Basic	327
		Basic	343			Proficient	381
		Basic	346			Proficient	365
		Basic	357			Below Basic	315
		Proficient	370			Proficient	373
		Advanced	395			Proficient	380
		Below Basic	309			Below Basic	256
		Proficient	372			Basic	346

Advanced	417	Advanced	402
Below Basic	320	Below Basic	266
Below Basic	316	Below Basic	185
Below Basic	317	Below Basic	283
Below Basic	320	Below Basic	311
Basic	338	Basic	351
Below Basic	309	Below Basic	307
Advanced	400	Advanced	425
Advanced	397	Proficient	382
Basic	337	Below Basic	325
Basic	363	Basic	335
Below Basic	317	Below Basic	283
Below Basic	327	Basic	335
Proficient	378	Basic	350
Below Basic	324	Below Basic	325
Below Basic	310	Below Basic	310
Below Basic	308	Below Basic	185
Basic	352	Below Basic	185
Basic	340	Proficient	362
Basic	336	Below Basic	318
Below Basic	313	Proficient	368
Basic	355	Below Basic	318
Below Basic	317	Basic	336
Below Basic	278	Basic	341
Below Basic	299	Below Basic	306
Proficient	385	Below Basic	314
Below Basic	319	Basic	357
Basic	346	Below Basic	313
Below Basic	320	Basic	342
Below Basic	296	Basic	347
Basic	357	Below Basic	282
Proficient	369	Advanced	391
Below Basic	271	Proficient	368
Below Basic	330	Below Basic	185
Proficient	364	Proficient	364
Below Basic	304	Below Basic	307
Proficient	371	Below Basic	281
Below Basic	306	Advanced	404
Below Basic	304	Below Basic	256
Basic	336	Below Basic	243
Basic	339	Basic	339
Advanced	408	Below Basic	287
Below Basic	308	Advanced	438

Advanced	415
Proficient	368
Below Basic	305
Below Basic	317
Below Basic	263
Below Basic	314
Basic	347
Below Basic	316
Below Basic	309
Basic	339
Proficient	371
Basic	357
Advanced	438
Proficient	388
Basic	346
Below Basic	316
Basic	337
Below Basic	305
Below Basic	308
Basic	336
Proficient	364
Basic	361
Basic	331
Below Basic	329
Advanced	409
Below Basic	278
Advanced	418
Basic	336
Below Basic	317
Below Basic	316
Below Basic	185
Below Basic	307
Basic	328
Below Basic	321
Below Basic	278
Basic	335
Basic	346
Proficient	385
Advanced	421
Proficient	374
Proficient	372
Below Basic	324
Basic	335
Below Basic	319
Below Basic	251
Basic	326
Advanced	406
Proficient	367
Below Basic	322
Below Basic	306
Proficient	389

Appendix J

Fourth Grade MAP Scores

English Language Arts				Mathematics			
Multiage		Single-age		Multiage		Single-age	
Achvmnt Lvl	Scale Score	Achvmnt Lvl	Scale Score	Achvmnt Lvl	Scale Score	Achvmnt Lvl	Scale Score
Proficient	406	Proficient	410	Proficient	394	Advanced	425
Basic	350	Below Basic	327	Below Basic	349	Below Basic	334
Advanced	424	Below Basic	307	Proficient	411	Below Basic	210
Basic	380	Basic	372	Basic	359	Below Basic	332
Proficient	399	Proficient	399	Proficient	391	Proficient	404
Proficient	395	Basic	353	Advanced	430	Below Basic	342
Proficient	398	Proficient	396	Basic	378	Basic	373
Advanced	431	Below Basic	313	Advanced	469	Below Basic	357
Advanced	443	Basic	364	Advanced	446	Below Basic	355
Advanced	466	Advanced	423	Basic	382	Proficient	391
Advanced	429	Basic	362	Below Basic	335	Basic	370
Advanced	447	Basic	341	Below Basic	349	Below Basic	305
Basic	362	Basic	370	Below Basic	350	Proficient	407
Basic	383	Basic	367	Below Basic	323	Below Basic	334
Basic	368	Basic	368	Basic	368	Basic	376
Basic	368	Basic	342	Basic	379	Proficient	391
Advanced	446	Basic	379	Basic	371	Proficient	407
Basic	369	Basic	362	Below Basic	352	Proficient	394
Basic	385	Proficient	388	Below Basic	353	Below Basic	354
Proficient	415	Basic	376	Proficient	400	Below Basic	356
Basic	360	Basic	372	Below Basic	337	Basic	386
Advanced	443	Proficient	391	Advanced	435	Basic	374
Advanced	443	Proficient	395	Advanced	447	Basic	373
Proficient	393	Proficient	409	Below Basic	327	Proficient	408
Basic	370	Proficient	393	Basic	371	Basic	378
Basic	384	Proficient	397	Basic	367	Proficient	408
Advanced	423	Basic	369	Below Basic	344	Below Basic	309
Advanced	437	Advanced	456	Below Basic	297	Advanced	422
Advanced	477	Proficient	406	Below Basic	349	Advanced	442
Proficient	416	Basic	385	Proficient	391	Below Basic	297
Basic	378	Advanced	439	Below Basic	210	Below Basic	307
Advanced	425	Proficient	390	Below Basic	354	Basic	372
Basic	380	Basic	376	Advanced	446	Advanced	466
Advanced	446	Proficient	418	Advanced	432	Below Basic	352

Advanced	446	Proficient	390	Proficient	412	Basic	381
Proficient	402	Basic	357	Below Basic	313	Advanced	444
Advanced	434	Proficient	395	Below Basic	341	Proficient	403
Basic	364	Advanced	432	Basic	383	Basic	384
Basic	368	Proficient	395	Proficient	387	Basic	376
Below Basic	321	Basic	385	Below Basic	286	Advanced	425
Basic	364	Proficient	391	Basic	383	Proficient	398
Basic	338	Proficient	392	Basic	369	Below Basic	337
Basic	365	Proficient	396	Below Basic	352	Basic	379
Basic	381	Proficient	417	Below Basic	325	Proficient	399
Advanced	421	Basic	341	Proficient	411	Proficient	406
Proficient	391	Proficient	389	Advanced	413	Proficient	390
Basic	376	Proficient	404	Basic	380	Basic	363
Advanced	444	Basic	387	Below Basic	261	Basic	374
Basic	366	Advanced	434	Advanced	422	Proficient	409
Advanced	473	Advanced	431	Advanced	421	Proficient	412
Advanced	457	Advanced	434	Below Basic	300	Advanced	462
Below Basic	315	Proficient	393	Below Basic	350	Advanced	457
Proficient	405	Basic	378	Proficient	388	Advanced	417
Proficient	395	Advanced	455	Below Basic	348	Proficient	396
Basic	361	Advanced	430	Basic	367	Proficient	397
Below Basic	329	Advanced	475	Basic	379	Advanced	421
Below Basic	311	Advanced	423	Proficient	401	Proficient	399
Advanced	421	Advanced	445	Basic	386	Proficient	402
Below Basic	320	Advanced	441	Basic	376	Advanced	417
Proficient	406	Proficient	403	Basic	362	Proficient	391
Advanced	439	Proficient	392	Proficient	397	Basic	383
Advanced	438	Proficient	390	Proficient	399	Advanced	430
Proficient	416	Proficient	403	Basic	384	Proficient	408
Below Basic	331	Proficient	412	Basic	380	Proficient	403
Basic	349	Proficient	400	Proficient	406	Advanced	456
Proficient	392	Proficient	417	Basic	379	Advanced	422
Basic	370	Proficient	413	Below Basic	350	Advanced	437
Basic	380	Basic	368	Below Basic	354	Advanced	420
Proficient	403	Advanced	451	Basic	383	Proficient	396
Basic	354	Proficient	404	Proficient	402	Advanced	416
Basic	387	Advanced	434	Basic	385	Below Basic	347
Basic	369	Proficient	410	Basic	383	Proficient	394
Advanced	434	Advanced	440	Proficient	391	Basic	380

Proficient	409	Advanced	450	Advanced	417	Basic	372
Basic	366	Advanced	436	Basic	379	Advanced	419
Below Basic	331	Advanced	422	Advanced	420	Proficient	402
Advanced	445	Advanced	459	Proficient	407	Advanced	420
Proficient	412	Advanced	427	Basic	367	Advanced	420
Below Basic	323	Advanced	436	Basic	372	Proficient	412
Basic	366	Advanced	442	Basic	358	Proficient	403
Proficient	390	Advanced	434	Advanced	417	Proficient	408
Basic	382	Advanced	431			Advanced	441
Basic	368	Advanced	434			Basic	364
Basic	368	Proficient	393			Proficient	408
Advanced	438	Basic	378			Proficient	393
Basic	382	Advanced	455			Advanced	424
Basic	351	Advanced	430			Proficient	406
Basic	369	Advanced	475			Basic	386
Advanced	426	Advanced	423			Advanced	454
Proficient	403	Advanced	445			Proficient	402
Basic	373	Advanced	441			Proficient	403
Proficient	409	Proficient	403			Advanced	495
Proficient	395	Proficient	392			Advanced	422
Proficient	416	Proficient	390			Advanced	430
Basic	352	Proficient	403			Basic	383
Basic	358	Proficient	412			Advanced	422
Basic	383	Proficient	400			Proficient	400
Proficient	405	Proficient	417			Advanced	413
Proficient	414	Proficient	413			Proficient	398
Proficient	400	Basic	368			Advanced	462
Basic	363	Advanced	451			Advanced	455
Proficient	400	Proficient	404			Advanced	420
Basic	386	Advanced	434			Advanced	477
Proficient	397	Proficient	410			Advanced	435
Proficient	402	Advanced	440			Advanced	436
Proficient	393	Advanced	450			Advanced	413
Proficient	390	Advanced	436			Advanced	462
Basic	377	Advanced	422			Proficient	393
Advanced	428	Advanced	459			Advanced	466
		Advanced	427			Below Basic	349
		Advanced	436			Proficient	411
		Proficient	400			Basic	358
		Basic	380			Below Basic	292

Basic	382	Below Basic	344
Below Basic	255	Proficient	391
Basic	339	Proficient	387
Advanced	432	Basic	371
Basic	383	Basic	366
Basic	354	Below Basic	246
Basic	387	Basic	382
Below Basic	324	Below Basic	354
Basic	352	Below Basic	346
Proficient	392	Below Basic	337
Basic	357	Below Basic	323
Proficient	404	Below Basic	324
Below Basic	316	Below Basic	306
Basic	341	Basic	359
Below Basic	308	Below Basic	306
Basic	343	Proficient	391
Below Basic	316	Below Basic	336
Basic	371	Basic	382
Below Basic	330	Below Basic	210
Proficient	404	Basic	385
Below Basic	327	Proficient	389
Proficient	404	Below Basic	330
Proficient	418	Below Basic	270
Proficient	392	Basic	386
Basic	339	Proficient	401
Basic	369	Advanced	432
Advanced	443	Below Basic	330
Advanced	419	Below Basic	337
Basic	342	Proficient	390
Basic	354	Below Basic	210
Basic	385	Basic	374
Below Basic	299	Below Basic	296
Basic	374	Below Basic	279
Basic	348	Below Basic	299
Below Basic	325	Basic	376
Basic	347	Below Basic	287
Proficient	389	Below Basic	210
Below Basic	276	Below Basic	210
Below Basic	327	Below Basic	304
Below Basic	258	Basic	383

Basic	347	Below Basic	304
Basic	371	Basic	384
Basic	343	Below Basic	210
Basic	364	Proficient	391
Below Basic	238	Below Basic	294
Proficient	400	Proficient	401
Below Basic	276	Below Basic	353
Proficient	409	Advanced	420
Basic	362	Below Basic	337
Advanced	421	Below Basic	210
Basic	341	Basic	385
Proficient	397	Proficient	396
Basic	353	Below Basic	313
Basic	387	Basic	386
Below Basic	306	Below Basic	210
Proficient	395	Below Basic	295
Proficient	395	Below Basic	308
Basic	350	Below Basic	341
Below Basic	324	Basic	371
Basic	339	Below Basic	276
Basic	374	Basic	384
Basic	360	Below Basic	210
Advanced	425	Basic	372
Basic	344	Below Basic	326
Basic	360	Advanced	445
Below Basic	329	Advanced	416
Advanced	422	Proficient	412
Advanced	419	Basic	371
Proficient	418	Below Basic	348
Basic	384	Below Basic	351
Below Basic	281	Proficient	388
Below Basic	331	Basic	369
Basic	380	Below Basic	354
Basic	387	Below Basic	312
Advanced	448	Proficient	390
Below Basic	310	Basic	384
Basic	365	Proficient	412
Proficient	418	Advanced	415
Advanced	432	Basic	384
Basic	384	Below Basic	338

Proficient	401	Below Basic	347
Basic	364	Advanced	426
Proficient	400	Advanced	449
Advanced	471	Proficient	395
Advanced	474	Proficient	394
Basic	372	Proficient	408
Proficient	399	Proficient	388
Basic	358	Advanced	432
Basic	384	Below Basic	322
Advanced	428	Proficient	400
Basic	367	Basic	381
Basic	387	Proficient	387
Basic	370	Basic	386
Proficient	396	Below Basic	351
Advanced	421	Proficient	408
Proficient	388	Proficient	391
Proficient	403	Proficient	404
Advanced	422	Basic	383
Advanced	431	Proficient	392
Proficient	401	Basic	368
Basic	379	Advanced	462
Basic	368	Basic	369
Advanced	444	Basic	378
Basic	374	Below Basic	343
Advanced	421	Proficient	390
Proficient	407	Basic	375
Proficient	415	Basic	371
Basic	354	Proficient	411
Proficient	391	Proficient	392
Proficient	410	Proficient	403
Proficient	411	Below Basic	342
Proficient	414	Basic	380
Proficient	402	Below Basic	341
Basic	385	Below Basic	348
Basic	386	Below Basic	329
Basic	367	Below Basic	302
Basic	348	Below Basic	293
Basic	350	Below Basic	300
Below Basic	333	Below Basic	347
Below Basic	331	Basic	380

Basic	369
Proficient	401
Proficient	406
Proficient	394
Basic	380
Below Basic	303
Below Basic	332
Basic	387
Basic	352
Below Basic	290
Basic	362
Proficient	392
Below Basic	333
Basic	353
Below Basic	328
Proficient	389
Advanced	430
Below Basic	334
Basic	379
Basic	363
Below Basic	312
Below Basic	210
Below Basic	313
Below Basic	342
Basic	381
Below Basic	331
Below Basic	338
Basic	370
Below Basic	302
Below Basic	320
Below Basic	345
Below Basic	322
Proficient	410
Below Basic	314

Appendix K

TSES results

Multiage												Subscale Scores				
Subject	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	SE	IS	CM	YOE	School
1	8	5	7	7	7	7	8	9	8	8	8	7	6.75	7.5	8	6--10	R
2	8	8	9	9	9	7	9	7	8	9	9	9	8.75	8.75	7.75	10--20	R
3	7	7	7	9	9	8	7	9	8	9	8	8	7.75	8.5	7.75	1--5	R
4	8	8	9	9	9	7	9	7	8	9	9	9	8.75	8.75	7.75	6--10	R
5	9	7	8	7	8	8	8	8	9	8	7	8	7.25	8.25	8.25	10--20	R
6	8	6	7	6	8	9	8	9	9	9	6	9	6.25	8.75	8.5	1--5	R
7	7	7	8	8	9	9	9	8	8	9	7	8	7.5	8.5	8.25	1--5	R
8	7	7	8	7	6	6	6	8	7	7	7	8	7.25	7	6.75	10--20	R
	7.75	**6.88**	**7.88**	**7.75**	**8.13**	**7.63**	**8.00**	**8.13**	**8.13**	**8.50**	**7.63**	**8.25**	**7.53**	**8.25**	**7.88**		

Single Age													Subscale Scores				
Subject	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	SE	IS	CM	YOE	School
1	6	4	8	6	9	7	5	7	9	9	4	9	5.5	9	6.25	1--5	R
2	7	5	7	6	9	9	8	9	9	9	7	6	6.25	8.25	8.25	1--5	R
3	9	4	7	4	5	7	6	8	5	7	3	6	4.5	5.75	7.5	20	R
4	8	5	7	6	8	9	8	9	9	9	6	9	6	8.75	8.5	6--10	R
5	7	5	5	5	7	5	5	5	9	9	5	7	5	8	5.5	1--5	R
6	7	5	3	3	7	6	7	7	6	6	4	6	3.75	6.25	6.75	1	R
7	7	5	6	5	8	8	5	8	8	7	5	5	5.25	7	7	1--5	R
8	8	8	8	8	8	8	7	8	8	8	7	8	7.75	8	7.75	20	R
9	7	5	3	4	7	6	7	7	6	6	4	6	4	6.25	6.75	1--5	R
10	4	3	6	4	8	6	6	7	6	8	6	7	4.75	7.25	5.75	10--20	R
11	8	8	9	8	8	9	8	9	9	8	8	9	8.25	8.5	8.5	10--20	R
12	6	4	8	6	9	7	5	7	9	9	4	9	5.5	9	6.25	1--5	R
13	5	5	7	7	6	5	5	5	7	7	5	5	6	6.25	5	10--20	R
14	8	7	6	6	8	8	7	8	5	6	6	5	6.25	6	7.75	1--5	S
	6.93	**5.21**	**6.43**	**5.57**	**7.64**	**7.14**	**6.36**	**7.43**	**7.50**	**7.71**	**5.29**	**6.93**	**5.63**	**7.45**	**6.96**		

Appendix L

Achievement Level Scores

Third grade single-age ELA			Fourth grade single-age ELA		
Achievement Level	Count		Achievement Level		
Below Basic	55	29%	Below Basic	31	12%
Basic	69	36%	Basic	84	33%
Proficient	47	24%	Proficient	77	31%
Advanced	21	11%	Advanced	59	24%
	192			251	
Third Grade single-age Math			Fourth grade single-age Math		
Achievement Level	Count		Achievement Level		
Below Basic	61	32%	Below Basic	83	33%
Basic	52	27%	Basic	55	22%
Proficient	47	24%	Proficient	65	26%
Advanced	33	17%	Advanced	46	18%
	193			249	
Third Grade multiage ELA			Fourth grade multiage ELA		
Achievement Level			Achievement Level		
Below Basic	18	16%	Below Basic	8	7%
Basic	36	32%	Basic	43	39%
Proficient	32	29%	Proficient	30	28%
Advanced	25	23%	Advanced	28	26%
	111			109	
Third Grade multiage Math			Fourth grade multiage Math		
Achievement Level			Achievement Level		
Below Basic	26	23%	Below Basic	25	31%
Basic	31	28%	Basic	27	33%
Proficient	36	32%	Proficient	16	20%
Advanced	19	17%	Advanced	13	16%
	112			81	

Vitae

Troy A Marnholtz completed his undergraduate studies at Central Missouri State University (CMSU) in December of 1995. He earned his Bachelor of Science in Education degree in Chemistry with an Earth Science minor. Upon his return to Central Missouri, he earned a Master of Science in Education degree in Secondary Administration from CMSU in August of 2002. He later went on to complete his Education Specialist degree from the University of Central Missouri in May of 2011.

Troy began his career in education in the fall of 1996 at Mountain Grove High School in Mountain Grove, Missouri. The district was expanding its science department as part of the A+ schools grant. Through the grant, an Applied Biology and Chemistry program was started. The program provided the opportunity to design a science lab as well as teaching multiple science classes. While teaching was his primary focus the opportunity became available to also serve as an assistant volleyball coach. In 2000, the decision was made to move back to Central Missouri and to take a position teaching Freshman Earth Science at Holden High School. A position became available at Warrensburg High School teaching freshman physical science for four years and Chemistry and Advanced Chemistry for three years. While in Warrensburg, many leadership roles presented themselves which included: serving as an assistant JH cross country coach, starting a fishing club, serving as the science department chair, and serving as the HS professional development chair.

In 2008, Troy started in educational administration at Concordia High School, serving as the High School Principal from 2008 to 2013. As the principal, the goal was to implement change for student success. This included the implementation of the

School-wide Positive Behavior Support model and Professional Learning Communities. While serving as principal, Troy was a member of the Missouri Association of Secondary School Principals from 2008-2013 where he was recognized by his fellow administrators in 2010 as the Exemplary New Principal of the Central District and in 2013 as the Central District Principal of the Year

In 2013, Troy transitioned to his current educational endeavor as the Superintendent of Schools for the Chilhowee R-IV School District in Chilhowee, Missouri. While serving as the superintendent, student success was again the focus. The district was able to implement innovative instructional practices, including the starting of a multiage team-taught program for grades 1-6. As an administrator in Missouri, he has been a member in the Missouri Association of School Administrators where he was nominated and selected by his peers for the New Superintendent of Schools Award for the West Central District in 2016 and has served as the Treasurer, Vice-president, and President of the West Central District.

Troy has had the opportunity to serve the students in the State of Missouri. He was selected to represent small school districts on the state small schools committee. He also served on the Science Standards committee after the implementation of HB 1490, which set up committees to look at Missouri Learning Standards. Troy is currently serving on the Executive Board of the Missouri Association of Rural Educators serving as the President of the board for a two year term 2019-2021 after previously serving as the Vice-President from 2017-2019.