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Perceived Teaching Style and Academic Growth in an International School Setting

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PERCEIVED TEACHING STYLE AND ACADEMIC GROWTH IN AN INTERNATIONAL SCHOOL SETTING

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PERCEIVED TEACHING STYLE AND ACADEMIC GROWTH
IN AN INTERNATIONAL SCHOOL SETTING

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I dedicate this dissertation to the two most important men in my life.

To my brother, Phillip, who, in his short life, has shown me what it truly means to fully embrace life, take risks, and value every experience as an opportunity.

"The presence of the absence is everywhere." -Edna St.Vincent Millay

To my husband, Casey, whose love, encouragement, patience and support throughout this long journey have been unyielding. You are my everything!

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The presence of international schools has grown significantly around the world to accommodate a growing need for academic instruction that differs from that provided in local schools and to meet the rapid demands of globalization. As demands for international schools increase, demands for student performance are also increasing.

This quantitative correlational study seeks to determine if correlations exist between teaching style and student academic growth in mathematics within an international school setting. The study also determines if a dominant teaching style exists and if correlations between teacher grade level and teaching style can be made among international teachers who teach in the 37 international schools in the Quality Schools International (QSI) organization.

A number of studies have investigated factors affecting student achievement and examined teaching styles. However, little research on teaching style has been performed in an international school context. Research has consistently identified the teacher as the most important external factor affecting student achievement. The body of research outlined in the literature review of this paper suggested that external or background factors do not significantly affect student growth and achievement. Furthermore, the literature reviewed indicates teaching style significantly affects student adjustment, performance, engagement, and outcome.

While a statistically significant dominant teaching style was not evident, the Personal Model Teaching Style was the most dominant among overall respondents. Additionally, trends between teaching style and grade level were identified. The Expert and Formal Authority Teaching Styles were evenly distributed among upper elementary school teachers, while the Personal Model and Facilitator Teaching Styles seemed to be most common among lower elementary teachers. The Facilitator Teaching Style, followed by the Personal Model Teaching Style, yielded the highest academic achievement growth in mathematics among elementary teachers who teach in the QSI organization.

CHAPTER I: INTRODUCTION

Background

Although there is little current research investigating student achievement in international schools, matriculation rates within international schools are growing rapidly. According to Keeling (2018), a researcher with the International School Consultancy (ISC) Research Group, "There are now 9,318 international schools around the world delivering learning to over 5.07 million children from Kindergarten to grade 12" (p. 20). Forbes predicts the international school market to be valued at $89 billion by the year 2026, with the number of schools increasing by as much as 40 percent (Morrison, 2016). Furthermore, ISC expects this trend to continue and anticipates 10.8 million students to be enrolled in 17,100 international schools by the year 2028 (Data and Intelligence, n.d.). This growth rate is exponential, and there are no signs of it slowing down.

International school admission growth rates can largely be attributed to the current phenomenon of globalization. As a result of a world free of time barriers that plagued our economy in the past, product has become global, opening the doors for an expanding job market in new areas around the world. Globalization is a dominant theory guiding economic and political decision making worldwide, resulting in rapidly growing expatriate communities all over the world. International schools have followed suit and filled a need within these communities.

Cambridge and Thompson (2004) state that education provided in international schools can be executed in many ways. International schools offer a variety of curricula including the International Baccalaureate Program, the Advanced Placement Program,

and the Cambridge Program. In addition, an international school's curriculum can include criteria mandated in a host of foreign countries' national curricula. International school settings can provide unique environments and characteristics associated with educating students in a global world. In past studies, international education referred to a specific curriculum or philosophy that directs education within a school (Bates & Thompson, 2012; Bunnell, Fertig, & James, 2016; Madge, Raghuram, & Noxolo, 2015). The goal of an international school is to cultivate an international-minded student within a system that embraces global attitudes and consciousness (Cambridge & Thompson, 2004). According to Waldron (as cited in Winter's International Schools, 2007),

> Most international schools were established for the children of expatriates, but increasingly these 'international' children have been joined by pupils from the local population, their parents eager for them to learn a new language, to broaden their higher education options, or simply to benefit from a more 'international education' with all its special qualities. (p. 1)

While research in international school settings is limited, the need for exploration in subject specific areas is dire to the overall achievement of the student population attending school in this unique environment. Mathematics remains one of the single largest contributors to overall student success. According to the *Second Handbook of Research on Mathematics Teaching and Learning*, "The nature of classroom mathematics teaching significantly affects the nature and level of students' learning" (Frankin, 2007, p. 371), and Lee (2012) attributes higher scores in mathematics to overall college readiness.

Quality Schools International (QSI) is an international school organization of 37 schools in 31 different countries, including 16 schools in Europe, 15 in Asia, three in South America, two in Africa, and one in North America. QSI is a nonprofit entity founded in 1971 and established in August 1991 to facilitate English language, American style schools. As of June 2018, the total enrollment, was 6,850 students, with the average number of students per school exceeding 190 students. Thirty-one schools are accredited through Middle States Association of Colleges and Schools (MSA), and the remaining five schools are in various stages of the accreditation application process. QSI international schools are established upon the request of embassies, international organizations, and international businesses.

Statement of the Problem

The presence of international schools has grown significantly around the world to accommodate a growing need for academic instruction that differs from that provided in local schools and to meet the rapid demands of globalization. As demands for international schools increase, demands for student performance are also increasing. In an investigation between the relationship of international schools and international education, Hayden and Thompson (1995) found that although the growth of international schools was exceeding predictions, little research had been conducted in this setting. According to the ISC Chairman, Nicholas Brummitt (as cited in Duncan 2014), "the future will not only be about growth of international schools, but also maintenance of high standards" (p.1). ISC's (2015) research indicates approximately 25% of international schools administer the International General Certificate of Secondary Education (IGCSE) exam, 16% administer SATs or PSATs, and 14% administer the General Certificate of

Education (GCE) Advanced Level examination. International schools are seeking not only to reach high standards, but also to maintain them. Further investigation of international school settings, growth, and achievement is necessary in order to ensure successful student outcomes. More attention needs to be given to international school populations to determine what factors impact student performance.

Hattie (2003) engaged in extensive research over the last two decades to determine what controllable characteristics have the most significant impact on student achievement. His results indicated "what teachers know, do, and care about" have the largest impact on student achievement (Hattie, 2003, p. 2). While teaching styles, methodologies, and strategies have been researched and debated for decades, little research on teaching style has been performed in international school settings. According to Grasha's (1994) research, teaching style was multifaceted and "affected how people presented information, interacted with students, managed classroom tasks, supervised coursework, socialized students to the field, and mentored students" (p. 142). In order to fully understand which teaching styles have the greatest impact on student achievement in an international environment, further research is needed. This research should help administrators develop and provide teacher professional development and training that has a direct impact on student growth in an international school setting.

Purpose of the Study

The purpose of this study is to determine if correlations exist between teaching style and student academic growth in mathematics within an international school setting. The study also determined if a dominant teaching style exists and if correlations between teacher grade level and teaching style can be made among international teachers who

teach in the 37 international schools in the QSI organization. The current pool of research linking teaching style to academic growth is limited. Furthermore, no research exists linking teaching style to academic growth in an international school setting.

The study provides applicable recommendations to administrators, guidance departments, classroom teachers, and parents to improve students' learning of mathematics in an international school setting. Empirical data received from test scores ascertained which style of teaching increases student academic growth as quantified on the Measures of Academic Progress (MAP; Northwest Evaluation Association [NWEA], 2011) assessment, identifying teaching styles that promote student achievement in mathematics.

Research Questions

1. What is the dominant teaching style among elementary school mathematics teachers who teach in an international school environment?
2. Is there a significant association between teaching style and grade level?
3. Is there a significant difference in student academic growth in mathematics among the teaching styles of elementary school mathematics teachers within an international school?

General Methodology

Currently there are 37 schools in 31 different countries operating within the QSI System. Upon receiving permission from QSI, all teachers instructing an elementary school mathematics course, including kindergarten and grades 1-6 were asked to participate in the study. Each participant completed an electronic version of the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996). Additionally, Fall 2017 and Spring

2018 MAP (NWEA, 2011) scores, from each corresponding mathematics class, were utilized to determine the mean growth per class during the 2017-2018 school year.

Two instruments were used in this study. MAP (NWEA, 2011) was used to assess students' academic growth during the 2017-2018 school year. It is administered two times during the school year, once at the beginning of the school year and again at the end of the school year. MAP is a computer-based assessment that measures student growth. It uses adaptive questioning to determine student knowledge at the time of testing. Teachers' teaching styles was measured using the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996). The Grasha-Riechmann Teaching Style Survey is a 40-question survey revealing if a teacher falls into one of the following categories: 1 – Expert, 2 – Formal Authority, 3 – Personal Model, 4 – Facilitator, 5 – Delegator.

This quantitative study utilized Chi-square (χ^2) analysis to determine if there is a predominant teaching style among elementary school mathematics teachers who teach in an international school environment. Additionally, χ^2 analysis was be used to determine if a relationship exists between teaching style and grade level. Finally, analysis of variance (ANOVA) was be used to determine if there is a significant difference in student academic growth in mathematics between the teaching styles of elementary school mathematics teachers within an international school.

Limitations

The population under study is restricted to teachers who teach within the QSI group of schools. The results may not be generalizable to other international schools or groups of schools. In addition, the survey was distributed to mathematics teachers, specifically seeking data on their perceptions of their teaching style. Results may not be

generalizable to other teaching positions or across schools serving different international communities.

Definitions

Key terms used in this study are based on education terminology.

International school – According to the United Nations Educational, Scientific and Cultural Organization's (UNESCO) International Institute for Educational Planning, "The concept of an international school is difficult to define; the characteristic apparently common to all schools that might be considered as international schools being that they offer a curriculum other than that of the country in which they are located" (Hayden & Thompson, 2008, p. 15).

Teaching Style – According to Kaplan and Kies (1995), teaching style refers to "a teacher's personal behaviors and media used to transmit data to or receive it from the learner" (p. 29). Additionally, Cohen and Amidon (2004) found that teaching styles are "characterized by polarities along a continuum that identify categories of interaction that teachers use to communicate classroom control and motivation" (p. 1).

Student Achievement – According to the National Conference of State Legislatures, "The most common indicator of achievement generally refers to a student's performance in academic areas such as reading, language arts, mathematics, science and history as measured by achievement tests" (Cunningham, 2012, p.1).

Summary

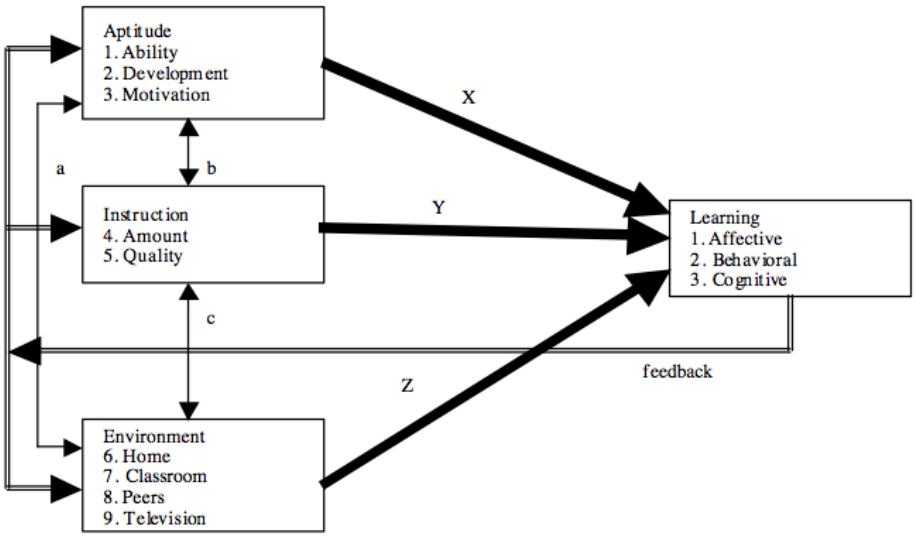
As current admission rates grow in international schools, so does the need for research that can guide both pedagogy and policy. There is high demand for high quality teachers with a variety teaching styles, abilities, and expertise to support the needs of a

rapidly growing international community. However, current research is lacking in this setting.

CHAPTER II: REVIEW OF THE LITERATURE

Theoretical Framework

Many learning theories have been generated in an effort to explain information acquisition. While they differ on many levels, all seek to understand how learning occurs. To better frame this review of literature, the Theory of Educational Productivity was examined and utilized as the overarching construct to understand the impact of teaching style on academic growth (see Figure 1).



Aptitude, instruction, and the psychological environment are major direct causes of learning (shown as thick arrows X, Y, and Z). They also influence one another (shown as arrows a, b, and c), and are influenced by feedback on the amount of learning that takes place (shown as outlined arrows).

Figure 1. Educational production function (Hanushek & Rivkin, 2006, p. 8).

The Theory of Educational Productivity states that, "In its simplest form, productivity can be defined as achieving the maximum output of a process with the use of minimum inputs" (Subotnik & Walberg, 2006). It seeks to explain the information acquisition process through outcomes. Simply, effective methods produce effective results. According to Subotnik and Walberg (2006), archetypically, economists utilized

production function analysis to conduct research, based on the theory of educational productivity, to relate student deficits to student achievement. Walberg (1984) proposed that learning should be assessed according to outcomes.

Furthermore, Walberg (1994) evoked that teaching methods, among nine other influences, must be enhanced to increase student achievement. He states that five identified influences are used within several other educational models. However, he argued that each one of these influences is critical for learning. All are indicators of student achievement. Walberg separated these nine influences into three different categories: aptitude, instruction, and environment. According to Walberg (1994), these three categories directly affect student achievement. The first category, aptitude, includes student ability levels, their developmental stage, and motivation. The second, instruction, considers both the amount of instructional time a learner receives as well as the quality of instruction. The third category, environment, assesses the quality of support received from the learners' family, their classroom environment, relationship with peers, and even the amount of time a learner spends watching television. For the purposes of the Walberg (1994) study, both instruction and environment are examined.

Walberg, Fraser, and Welch (1986) assessed this model using 1,955 teenage students from the United States. This study evaluated all three categories, aptitude, instruction, and environment, included in Walberg's Educational Production Function Model (Subotnik & Walberg, 2006). However, nine specific academic characteristics including student prior achievement, age, motivation, quantity and quality of instruction, home and school environment, peers, and media were examined to test the Educational

Production model. The characteristics were identified after a thorough review of approximately three thousand prior studies on student learning.

Several instruments including both quantitative and qualitative measures were used to assess each characteristic contributing to student learning. Instruments included a cognitive-achievement measure, an attitudinal outcome measure, and student self-reporting measures. The National Assessment in Science was utilized to measure academic content knowledge, inquiry skills, and understanding. It consisted of 49 multiple-choice questions. In addition, an attitudinal survey consisting of 19 Likert-type items was disseminated. Self-reporting measures were used to collect data on prior knowledge, motivation, and class environment. The teaching budget and students' attitudes were used to determine quality of instruction, and quantity of instruction was determined by the frequency of courses taken and time spent completing homework.

Results indicated prior knowledge, home environment, gender, and race were strong predictors of student achievement. Characteristics such as teaching budget and student attitudes were less likely to be linked to achievement. However, overall, results indicated factors such as motivation, attitude, quantity and quality of instruction, and the class environment did independently predict student achievement and support the validity of the Educational Production Function Model.

Factors Affecting Student Achievement

Characteristics influencing student achievement have been researched for decades. Administrators, educators, and policy-makers rely on sound research when employing practices that produce effective results in the classroom. According to Bronfenbrenner’s Bio-ecological Model (1979) student achievement is influenced by a

wide array of factors affecting a student's climate, community, experiences, and personal learning. Hattie (2009) collected data from 80,000 studies involving over 300 million students in an effort to determine what factors influenced student learning. He studied six possible contributors linked to increased student achievement including the student, the home, the school, the curricula, the teacher, and teaching and learning approaches. He ranked 138 influences that directly impacted student achievement. Results indicated the strongest influencers of student achievement were feedback, Piagetian programs, and formative evaluation.

Hattie's (2009) research continues to evolve as education and factors influencing student achievement are complex and susceptible to change. According to Terhart (2011) Hattie's research is "a milestone in the research and debate on the conditions for successful learning in schools" (p. 425), but the study's broad scope of reference yields complex results. Researchers continue to explore what factors positively influence student growth in schools.

Increased Financial Support

Past research has analyzed various factors in diverse settings in an effort to determine what impacts student achievement and growth. School funding has often been at the center of these discussions. It has been evaluated by researchers, school boards, and school administrations, and has influenced policy and policy change for decades. The Center on Budget and Policy Priorities found funding in public American schools had slowly risen since 2015. In a 2017 report, the Center on Budget and Policy Priorities (as cited in Leachman, Masterson, & Figueroa, 2017) asserted:

> Most states cut school funding after the recession hit, and it took years for states to restore their funding to pre-recession levels. In 2015, the latest year for which comprehensive spending data are available from the U.S. Census Bureau, 29 states were still providing less total school funding per student than they were in 2008. (p. 1)

As schools struggled to regain financial stability after the 2008 recession, they were motivated to understand the relationship between instructional costs and student achievement. Cullen, Polnick, Robles-Piña, and Slate (2015) investigated the relationship between instructional expenditures and student achievement in Texas public schools. The researchers sought to determine if student academic achievement relied on the school district's instructional expenditures and if any trends developed over a five-year period.

Student achievement data were collected from all school districts in Texas from the measure, Texas Assessment of Knowledge and Skills (TAKS), in five subject areas: language arts, mathematics, writing, science, and social studies. Cullen et al. (2015) specifically reviewed each school district based on its overall pass rate on the TAKS from the 2005-2006 school year to the 2009-2010 school year. The participant population ranged from 4,434,711 participants, during the 2005-2006 school year, to 4,705,641 total student participants, during the 2009-2010 school year. Additionally, researchers collected data from the Texas Education Agency (TEA). In order to determine instructional expenditures in each district, the researchers first defined instructional expenditures to be the "percentage of expenditures directly dedicated to instruction" (Cullen et al., 2015, p. 94). This included items such as teacher salaries, resources and

media directly related to instruction, library and curriculum materials, and professional development for teachers and staff.

A multivariate analysis of variance (MANOVA) was used to compare student achievement in each school district to their instructional expenditures. After a comprehensive analysis of all the data collected from five consecutive school years, it was concluded that a correlation existed between the ratio of instructional expenditures in a school district and student achievement (Cullen et al., 2015). School districts with lower instructional expenditure rates performed lower than school districts with a higher instructional expenditure rate. Furthermore, students who attended schools with larger amounts of money allocated to instructed consistently had higher achievement scores.

While Cullen et al.'s (2015) research investigated the relationship between increased instructional funding and its relationship to student achievement in Texas public schools, Neymotin (2010) investigated a potential correlation between funding in Kansas public schools and students' achievement. Specifically, the research examined correlations between revenue per pupil and student achievement. Data were compiled from all school districts in the state of Kansas. Measures of achievement included test scores, and graduation and dropout rates. Mathematics, reading, science, and social studies test scores were utilized, and graduation and dropout rates were obtained from the Kansas State Department Board of Education. The National Center for Educational Statistics provided an alternate measure of student achievement by using diploma rates from each district.

Data were collected between the years 1997 and 2006 to determine correlations through a cross-sectional Ordinary Least Squares (OLS) regression analysis. By using a

regression analysis, the effects of "total revenues; per student on measures of persistence after including school district characteristics as control variables" were revealed (Neymotin, 2010, p. 94). Neymotin's study focused on the long-term effects of the Changes to the School District Finance and Quality Performance Act rather than short-term effects. Results indicated that Changes in the School District Finance and Quality Performance Act did not correlate to higher levels of student persistence or positively affect test scores.

Resources

Rather than simply investigating allocation of funding in schools, Della Sala, Knoeppel, and Marion (2017) completed research on the effects of educational resources on student achievement. While past research on this topic remains mixed (Alexander, 1998; Archibald, 2006; Ferguson, 1991; Hanushek, 1997; Krueger, 2002; Rebell, 2009; Sanders, 1998). Della Sala et al. (2017) used Structural Equation Modeling (SEM) to determine the strength of the relationship between student achievement and educational resources in their quantitative research. SEM allowed researchers to determine the relationship between instructional resources and academic achievement more precisely.

Grade three through five elementary schools in a state located in the Southeastern United States were investigated. All 470 participating elementary schools were public. Student achievement data were collected from the state's 2013 Elementary and Secondary Education Act (ESEA) Waiver Index score. Scores included achievement in language arts, mathematics, science, and social studies. Like Cullen et al. (2015), Della Sala et al.'s (2017) results indicated that instructional resources directly affecting instruction increased student achievement. However, Della Sala et al. (2017) also

determined that utilizing school funds to acquire instructional resources directly impacting educational services positively affected student achievement.

Howtenville and Conway (2008) conducted research to evaluate the effect of parental involvement on student achievement and the influence parental involvement had on school resources. Data were utilized from the National Education Longitudinal study with an initial sample of 24,599 eighth grade students. The data collected in this study included 815 public schools and 237 private schools. Variables evaluated included parental involvement in class selection, peer groups of students, parent engagement with students regarding school activities, events and studies, meeting attendance and homework assistance. Evaluation of school resources was based on per pupil expenditures, instructional salaries and school characteristics as well as student-teachers ratio, lowest salary received by a teacher, percentage of teachers with a masters of doctoral degree, percentage of students not receiving subsidized lunches and the percentage of non-minority students enrolled in the school. Factors that had a direct impact on family structure were re-evaluated on a regular basis due to changing variables that could potentially change parental involvement.

Two exceptions emerged from the research (Howtenville & Conway, 2008). First, the frequency of attending meetings decreased as class sizes grew. This suggested that the number of meetings available to parents may be driven by school resources, and the larger the class size the less available teachers may be for parent meetings. Results also indicated parent effort had a strong positive effect on the achievement of the child. Additionally, data from the study suggested parent effort directly correlates to student achievement. Ultimately, positive effects of school resources were diminished as the

level of the parental involvement grew. The productivity effect was negative indicating no correlation between school resources and parental effort.

Facilities

Martorell, Stange, and McFarlin Jr. (2016) investigated investment in school facilities and the overall effect new and updated facilities had on student achievement. The researchers focused their research on 2,277 different proposals made to the Texas Bond Review Board for new building infrastructure or infrastructure improvements from 1997 to 2010. Approximately 80 percent of these proposals were approved, and nearly 1,400 of the approved schools were included in the study. The schools receiving funding for new and updated facilities were compared to those who did not received funds for school facility projects. Other factors considered included school campus type, student-teacher ratio in each school, student demographics and the average school expenditure per student. Data were also collected on school facilities. These data included information such as the age of the facility and the time elapsed since the latest renovation. Additionally, student attendance, achievement scores, and high school exit exam scores were attained from the University of Texas at Dallas' Texas Schools Project for students in grade three through grade 11.

Martorell et al.'s (2016) study used a pragmatic approach to estimate the effect investments in school facilities had on student achievement. The first method included a regression-discontinuity research design, and the second was an event study analysis determining the impact of new building infrastructure or infrastructure improvements on students. Results indicated that investments in facilities had little effect on student achievement or attendance. The effect size for students in grades three through eight were

close to zero. The effect size increased in grade six, but were determined statistically insignificant. While gains were observed in student achievement and attendance data, the researchers did note that other gains may be attributed to improving school facilities and infrastructure such as health and morale.

School Size

Crispin's (2016) research evaluated the effect of school size on student academic growth. The study relied on both quantitative and qualitative data collected between the year 1988 and 2000 in urban, suburban, and rural public schools in the United States. The study excluded participants who did not complete questionnaires or who were not enrolled in public schools. The total student population was 9,990 grade eight students from 210 rural schools, 340 suburban schools, and 210 urban schools. Information regarding students' experiences in school and their background was obtained through interviews in 1988, 1990, 1992, 1994, and 2000. In 1988, 1990, and 1992 students completed achievement tests in reading, mathematics, science, and history to determine academic growth. Teachers and school principals were also interviewed in 1988, 1990, and 1992 as well as students' parents in 1988 and 1992.

Crispin (2016) used a sequence of value-added education production functions to determine if correlations existed between school size and student achievement growth. The results were mixed, indicating that student growth was largest in both the smallest and largest schools included in the study. Relatively large as well as small schools offered students benefits that directly affected achievement growth. While these benefits differed, they influenced student outcomes. For example, large schools often offered an increased selection of courses, while smaller schools shared a stronger sense of

community and parent involvement. Ultimately, the research found that school size cannot be used to predict academic achievement.

Crispin's (2016) results corroborate the research performed by Shear et al. (2008). They examined the Bill and Melinda Gates Foundation's initiative for small school reform in American high schools. According to a *Washington Post* article,

> For five years it has been said that the Bill & Melinda Gates Foundation spent more than $2 billion to fund an initiative to create small high schools in an effort to increase student achievement and graduation rates, all based on the premise that smaller schools were more conducive to learning and retention than larger ones. (Strauss, 2014, p. 1)

Shear et al. (2008) conducted a five-year study to determine the effect of the Bill and Melinda Gates Foundation's initiative, to create smaller schools, on student outcomes as well as the overall implementation of the initiative in its early years. Specifically, the study examines new small schools and large schools converted to small ones supported by the Bill and Melinda Gates Foundation.

Researchers relied on both quantitative and qualitative data in the form of teacher, student, and school administrator surveys, case studies, student classwork and assessments, achievement test scores, school attendance, and grade progression in 79 schools from five types of high schools: model high schools, start-ups, large high schools planning to downsize, large high schools in the process of downsizing, and high school not participating in the initiative to convert to a smaller school. Nine low-income, large, urban districts with a large student minority population were targeted. Conclusions were

derived from Hierarchical Linear Modeling with adjustments made in statistical analysis for prior student achievement and demographics.

Results indicated little correlation existed between student achievement or attendance and the new environment in large schools that underwent a conversion to smaller ones. However, during the first years of the project start-up schools produced positive gains in attendance. Additionally, a small amount of achievement gains were made in start-up schools. Overall, no correlations between student achievement or attendance and the Bill and Melinda Gates Foundation's initiative, to create smaller schools, could be determined. Shear et al. (2008) does note that additional research into the long-term effects smaller school environments have on student outcomes is needed.

Emotional Climate

In a 2012 study by Reyes, Brackett, Rivers, White, and Salovey, a mixed approach was utilized to determine if any correlations existed between the emotional climate in a classroom and student academic achievement. Approximately 1,400 students, in grades five and six, and 63 teachers from Northeastern United States participated in the study. Teachers agreed to video classroom lessons to be used as observational data. Observational videos were coded according to the Classroom Assessment Scoring System (CLASS). Student participants were asked to complete the Engagement vs. Disaffection survey. Additional data from student report cards were collected to assess academic achievement. The emotional climate was measured according to three variables. The first variable, emotional support, included students' perceptions of classroom relationships, their satisfaction of the class, excitement levels, and experiences. The second, classroom organization, included classroom management techniques and

strategies, and the third, instructional support, focused on higher order thinking skills. Each variable was assessed to determine normality.

Reyes et al. (2012) used a two level hierarchical linear model to determine results. A significant correlation between a positive classroom environment and student grades was found. Students participating in classes with a positive environment scored nearly a half letter-grade higher than those participating in the alternative. Student engagement was confirmed as the main mediator in determining higher grades. However, instructional support and classroom organization played little to no role in student achievement.

Testing

Phelps (2012) investigated testing and its effect on student achievement. The research relied on hundreds of studies completed between 1910 and 2010. Phelps (2012) bases his research on the hypothesize that "testing affects achievement by way of certain mediating factors such as motivation, feedback, alignment, and the 'pure' testing effect" (p. 21). He evaluated each characteristic when conducting his research.

Phelps (2012) utilized "keyword searches and citation chains" (p. 22) to locate studies. Searches were limited to research studies in the English language. However, geographic location was not accounted for. Libraries outside the United States were not utilized, resulting in a majority, 81 percent, of the studies included in the research, having a North American focus. In total, more than 3,000 studies with a focus on testing and academic achievement were located. Approximately 2,000 of these were determined irrelevant or did not include adequate evidence for this research study. Over 175 quantitative research studies, 247 survey studies, and 244 qualitative studies were analyzed.

Various study designs were included in the 177 quantitative research studies reviewed (Phelps, 2012). A majority of these studies employed a straightforward quasi-experiment method. However, 640 different instruments were used to collect data on the 7 million participants that were included in these studies. In addition to the 177 quantitative research studies reviewed, a separate category for quantitative studies conducted through surveys was also analyzed. Phelps (2012) reviewed 247 survey studies, including approximately 700,000 total responses. The third type of study evaluated in this study was qualitative. These included data collected through observations, question and answer sessions, site examinations, and various case studies.

According to Phelps (2012), quantitative studies employed several different aggregations to determine effect sizes. Survey responses were extracted from studies and categorized into two opposing groups, explicit and inferred. They were then further categorized into separate groupings to determine which items improved instruction and which improved learning. Qualitative studies considered improvements in instruction and achievement. The research is reliable due to the quantity of studies evaluated in the research and the length of time, 100 years, the research covered.

After careful analysis of all research included in the study, the results indicated testing had a positive effect on student achievement. Quantitative studies revealed moderately to strongly positive effects, while qualitative studies revealed a strongly positive effect of testing on student achievement. Overall, quantitative studies produced different effect sizes according to the way they were aggregated. They ranged from moderate, .55, to large, .88. However, qualitative studies reported positive effects in 93 percent of the studies (Phelps, 2012).

Summary of Student Achievement Factors

Cullen et al.'s (2015) research investigated the relationship between increased instructional funding and its relationship to student achievement and concluded that a correlation existed between the ratio of instructional expenditures in a school district and student achievement. Students who attended schools with larger amounts of money allocated to instruction consistently had higher achievement scores. Neymotin's (2010) also researched the correlation between increased financial support and student achievement, but focused on long-term effects in Kansas public schools. Results indicated that changes in the School District Finance and Quality Performance Act that directly allocated more school funding to public schools in Kansas did not correlate to higher levels of student persistence or positively affect test scores.

In summary, rather than simply investigating allocation of funding in schools, Della Sala et al. (2017) completed research on the effects of educational resources on student achievement. Like Cullen et al. (2015), Della Sala et al.'s (2017) results indicated that allocating more instructional resources directly affecting instruction increased student achievement. Similarly, Howtenville and Conway's (2008) research indicates there are school resources that directly impact levels of the parental involvement. Furthermore, the study confirms parent involvement positively affects student achievement. Conversely, Martorell et al. (2016) investigated investment in school facilities. Results indicated that investments in facilities had little effect on student achievement or attendance.

The research (Conway, 2008; Cullen et al., 2015; Della Sala et al., 2017; Howtenville & Conway, 2008; Martorell et al., 2016; Neymotin, 2010) examined reveals

only funds allocated to instructional resources directly affecting instruction increased student achievement. Funds allocated to schools with little direct impact on instruction yielded little to no effect on student achievement. However, overall correlations were not significant and produced mixed results.

Conversely, Crispin (2016) and Shear et al.'s (2008) research evaluated the effect of school size on student growth. Crispin's (2016) research examined school size in different environments from 1988 until 1992. Ultimately, the research found that school size cannot be used to predict academic achievement. Shear et al. (2008) conducted a five-year study to determine the effect of the Bill and Melinda Gates Foundation's small school initiative on student outcomes. Similar, to Crispin's (2016) results, Shear et al. (2008) determined there was little correlation between student achievement and school size.

Reyes et al. (2012) examined the impact of students' emotional climate on their achievement. The research indicated a significant correlation between a positive classroom environment and student grades. However, instructional support and classroom organization played little to no role in student achievement. Phelps (2012) investigated testing and its effect on student achievement. After careful analysis of all research included in the study, the results indicated testing had a positive effect on student achievement.

A comprehensive analysis of the research reveals that most variables including increased financial support (Cullen et al., 2015; Neymotin, 2010), facilities (Martorell et al., 2016), and school size (Crispin, 2016; Cullen et al., 2015; Shear et al., 2008) had no significant effect on student achievement. However, correlations and moderate effect

sizes were found in some of the research. Instructional resources directly affecting instruction increased student achievement (Della Sala et al., 2017; Howtenville & Conway, 2008) produced positive correlations. Furthermore, Reyes et al. (2012) found more significant correlations between students' emotional climate and student achievement, and Phelps (2012) determined testing had a positive effect on student achievement.

Factors Affecting Student Achievement in Mathematics

Mathematics education has been identified as one of the major challenges and concerns of educators. According to Hoyles (2015), mathematics education is not only vital to the individual student, but also to society overall. "It is central to the development of a well-trained workforce that can advance the economic standing of a country" (Hoyles, 2015, p. 1). According to results from the National Assessment of Educational Progress (NAEP) administered to grade 4, grade 8, and grade 12 students, the average 2017 mathematics scores in grade 4 and grade 8 were comparable to the average mathematics scores on the assessment in 2015. Singh, Granville, and Dika (2002), Yu and Singh (2018) and Farooq, Chaudhry, Shafiq, and Berhanu (2012) investigated several factors affecting student achievement in mathematics.

Singh et al. (2002) studied three variables, motivation, attitude, and academic engagement, affecting student achievement in mathematics and science. Participants included American students in grades five through eight and relied on data from the National Center for Education Statistics for the U.S. Department of Education to select participating schools. One thousand and fifty-seven schools were selected based on estimated enrollment numbers. Schools were categorized according to status, region, and

enrollment. Twenty-six students were then randomly selected from each school participating in the study. A total sample of 24,599 students enrolled in grade 5 through grade 9 participated. These students completed a questionnaire including items related to motivation, attitude, and engagement. The questionnaire asked questions related to school attendance, participation, preparedness, student attitude toward mathematics or science as classes and content areas, content usefulness, and engagement. Grades and achievement test scores were also used as measure.

In Singh et al.'s (2002) correlational study, researchers sought to determine each variable's effect on the other. Both direct and indirect effects were observed. Results indicated all variables including motivation, attitude, and academic engagement were statistically significant. While all factors impacted mathematics achievement, some had a more significant impact than others. Strong correlations were found between motivation, positive attitude, and engagement.

While Singh et al.'s (2002) research examined motivation, attitude, and academic engagement's effect on student achievement in middle school mathematics, Yu and Singh (2018) investigated the correlation between two factors, motivation and classroom practices, on mathematics achievement in high school. The researchers related these variables to the teacher's role in improving student academic performance in mathematics and specifically focus on teacher support, conceptual teaching, and procedural teaching.

Data were collected from the High School Longitudinal Study of 2009 and included longitudinal data from the students' first year of high school, grade nine, to post-secondary performance. Course selection, majors, careers, and academic and social

experiences were evaluated. In addition, the High School Longitudinal Study of 2009 provided survey data on mathematics teachers' reported classroom practices. Through random sampling, 944 schools were selected to participate. From the 944 selected schools, 21,444 grade nine students were chosen through random sampling to participate in the study. Students completed a mathematics ability assessment as well as an attitude survey. Final advanced level mathematics course grades were used to determine students' prior achievement.

A descriptive analysis revealed correlations between student characteristics and mathematics teachers' classroom practices. Confirmatory factor and structural model analyses were also utilized to determine if significant correlations existed. Results indicated students typically felt supported by their mathematics teachers, and teachers felt they there was a minimal instructional emphasis on conceptual understanding and procedural skills in their mathematics lessons. However, according to Yu and Singh (2018), "conceptual and procedural teaching approaches did not have significant influence on students' mathematics self-efficacy and interest in mathematics courses, but they influenced students' mathematics achievement significantly" (p. 89). Overall, results indicated teacher support was a significant indicator of students' confidence and interest in mathematics and positively influenced mathematics achievement. Furthermore, results indicated a significant positive effect between conceptual teaching and mathematics achievement and a negative correlation between procedural teaching and mathematics achievement.

Farooq et al. (2012) investigated the effects of socio-economic status, parents' education, parents' occupation, and gender on student achievement in mathematics and

English. Their case study included twelve schools in a metropolitan city in Pakistan. The population consisted of 300 male and 300 female students currently in grade 10. Data were collected through surveys about various variables including parents' education, occupation, socio-economic status, urban/rural belongingness and gender. A standard *t*-test and ANOVA were used to evaluate the factors affecting student academic achievement, and overall academic performance was measured against grade 9 mathematics achievement scores. Annual exam scores were verified through school records, and researchers collected quantitative data from the Board of Intermediate and Secondary Education.

Results indicated socio-economic status, fathers' education, mothers' education played a significant role on student achievement (Farooq et al., 2012). Students showed significant growth in the areas of mathematics and English compared to prior years achievement scores. Students of parents holding a bachelor's or master's degree resulted in a more significant increase in academic performance overall. Although the education of both parents played a significant role, the parents' occupation had no significant effect on academic performance. The study also found that students from families with higher socio-economic status performed better in mathematics and the cumulative achievement exam as a whole. Additionally, gender played a significant role in student achievement, with females performing higher in mathematics as well as overall on the student achievement exam.

Singh et al.'s (2002) results indicated motivation, attitude, and academic engagement positively influenced mathematics achievement, specifically motivation, positive attitude, and engagement. Similarly, Yu and Singh (2018) found teacher support

was a significant indicator of students' success in mathematics and positively influenced mathematics achievement. Conversely, Farooq et al. (2012) investigated correlations between socio-economic status and gender on student achievement in mathematics. The study revealed girls perform better on mathematics assessments, and results indicated positive correlations between high socio-economic status and mathematics achievement.

Impact of Teacher on Student Achievement

In recent years, teacher quality has been consistently identified as the most important factor in student growth (McCaffrey, Lockwood, Koretz, & Hamilton, 2004; Rivkin, Hanushek, & Kain, 2000; Rowan, Correnti, & Miller, 2002; Wright, Horn, & Sanders, 1997). John Hattie's (2003) research analyzed the effect of five different variables on student achievement including students, home, schools, principals, peers, and teachers. Hattie concluded the largest characteristic affecting student achievement was the student, with the teacher being the largest external factor directly impacting student performance.

Teacher Perceptions

Muñoz, Scoskie and French (2013) analyzed teachers' perceptions of important classroom characteristics, procedures, and methodologies. They wanted to determine effective teachers by measuring reading achievement. The researchers investigated the teacher's role in student achievement in two different phases. Phase one of the research identified educators whose students demonstrated a history of achievement gains. Phase two attempted to determine variances between teachers' perceptions of effective teaching and links to achievement. The researchers collected data from one of the largest school districts in the United States. Approximately 90 elementary schools were included in the

study, including 281 teachers and 6,962 students in phase one and nearly 380 reading teachers in phase two.

Phase one of Muñoz et al.'s (2013) research identified effective teachers based on reading achievement. Teachers were placed in two groups, those whose students performed well on district achievement tests were placed in one while those who did not perform well on the state assessment were placed in another. A Hierarchical Linear Modeling analysis was used to calculate results on the grade three and four Kentucky Core Content Test (KCCT). The socioeconomic status of each student as well as prior achievement was also considered and evaluated as a predictor of success. In addition, during phase two, researchers distributed the Williams' survey to 380 reading teachers. Teachers participating in the survey were asked to rank teacher characteristics based on their perception of the impact each had on student achievement.

In the Muñoz et al. (2013) study, survey data were sorted into groups of high achievement and low achievement. Researchers then determined if correlations existed between achievement and teachers' perceptions of effective teaching attributes using the Cronbach's alpha. Based on survey results and student achievement scores, the most significant finding was related to classroom management, specifically pertaining to a safe emotional and physical classroom environment. Students who scored high on the KCCT achievement test received instruction from teachers who place a higher value on creating safe emotional and physical classroom environments. Muñoz et al. (2013) determined that "effective teachers focus on meeting students' basic physical and emotional needs understanding that if these are not met the students' brains are not likely to engage in cognitive thinking" (p. 226). They also determined teachers who focused more on

limiting interruptions, and less on the importance of meeting students' basic physical and emotional needs were less effective.

Teacher Training and Qualifications

Harris and Sass (2011) conducted a quantitative study to determine whether teacher training and qualifications have a direct correlation to the quality and productiveness of the teacher. Data were collected from a Florida educational state database including numerous public schools throughout the state. Researchers were able to make comparisons between student performance in these schools and their classroom teacher. Years of experience, number professional development hours, class size, and demographics were considered. Participants in this study included students enrolled in grades three through 10. Each student's performance in mathematics and reading from 1990 - 2000 to 2004 – 2005 was assessed. This study differed from similar, previous, studies because researchers were able to gain information directly linking students to specific teachers and classrooms from the database.

A significant correlation was found between teacher experience and the achievement of elementary and middle school students (Harris & Sass, 2011). However, no correlations existed between professional development and student achievement. Additionally, continual gains were observed in the first five years of teaching. In subject grade combinations, there were also more positive effects from formal training, but there was no evidence that a teacher's college exam scores had a relationship to his or her productivity in the classroom. There was also no correlation, other than in middle school mathematics, between advanced degrees results and a student's level of achievement.

Whereas Harris and Sass (2011) analyzed teacher experience, professional development, and qualifications, Motoko and Liang (2016) analyzed the effectiveness of professional development on student growth in middle school mathematics over the course of four years. The study was conducted in the Missouri School district and included mathematics teachers who teach grades 6, 7, and 8. Both formal and informal professional development opportunities in six different areas including professional development programs, teacher collaboration, university courses, professional conferences, informal communications, and individual learning activities that have direct correlation to the statewide mathematics assessment were assessed.

The Teachers' Opportunity to Learn survey was used to determine the active participation of middle school mathematics in professional development from 2008 to 2011 with 6 different controlled variables. A total of 2,690 middle school mathematics teachers were selected to participate. Student achievement was measured by 2008-2011 Missouri Assessment Program results in the area of mathematics. Half the teachers were measured against the statewide assessment with five different school background variables in 91 middle schools in the area of mathematics.

Motoko and Liang (2016) found students of teachers who were actively involved in teacher collaboration increased their achievement in mathematics in comparison to those teachers' students who did not actively collaborate with colleagues. Additionally, a one-hour increase in attendance of professional conferences and informal communication increased statewide assessments by .15 points and .23 points in the area of mathematics. Professional development, university courses, and individual learning activities did not significantly impact student achievement growth. Overall, results indicated teacher-

centered collaborative learning activities involving formal and informal communication has the most significant effect on student achievement.

Teaching Style

Khandaghi and Farasat (2011) recognized the teacher's central role in student performance. The researchers investigated the effect of two types of teaching style on student adjustment, and considered teaching style in three domains: emotional adjustment, educational adjustment, and social adjustment. The study measured teaching style based on four variables: creation, continuity, effectiveness, and evaluation. Based on these characteristics, two distinctive teaching styles were identified: teacher-centered style and learner-based style. This causative-comparative study included 30 elementary school teachers and 300 fifth grade students.

Khandaghi and Farasat (2011) administered the Moosapoor Teaching Style questionnaire (Moosapoor, 1998) to teachers to determine if they relied upon teacher-oriented or learner-oriented teaching practices. Teachers were presented with a Likert-type scale and indicted their preferred teaching methods. Conversely, the Student Adjustment questionnaire (Sinha & Singh, 1993) was administered to students. It included 55 questions separated into five different categories, requiring simple yes or no responses. The results divided students into two categories, good adjustment and poor adjustment, in three categories, emotional, educational, and social. Reliability was measured by the Cronbach's Alpha. The reliability coefficient in the emotional domain was .90, the social domain yielded a reliability coefficient of .80, and the educational domain yielded a reliability coefficient of .85.

Overall, results indicated no significant correlation between teaching style and social adjustment (Khandaghi & Farasat, 2011). However, results did indicate teaching style, teacher-centered style, and learner-based style had a significant impact on the educational and emotional adjustment of students. According to Khandaghi and Farasat (2011), a learner-centered teaching style leads to improved educational and emotional adjustment.

Wentzel (2002) explored the relationship between teaching style and student adjustment. Wentzel examined parent socialization models to better understand the teacher's influence on student adjustment utilizing a longitudinal approach. However, in this study, social adjustment was not only defined as emotional, educational, and social, but also included students' interest in class and classroom behavior. Additionally, Wentzel (2002) relied on parent influence to help determine effective teaching styles.

Two groups of grade six students participated in this study, with a total student population of 452 students (Wentzel, 2002). In addition, 18 teachers, eight from one school and ten from the other, participated in the study. Data were collected in the form of a questionnaire from all participants. Students responded to questions relating to their social goal pursuits, interest in class, and control beliefs. Classroom behavior data were collected through teacher and peer feedback. Additionally, grades were analyzed to determine academic performance. Teachers completed rating scales to describe teaching style as defined by Baumrind's measurements of parenting. Baumrind measures parenting based on a parent's level of responsiveness and demandingness.

Ultimately, the Wentzel (2002) study concluded there was a significant correlation between teaching and student adjustment. Specifically, the study found clear

differences between teaching style, including student perceptions of classroom rules, fairness, expectations, teacher feedback, and teacher attention to the content among the 18 teachers who participated in the study. Results also found teachers who emulated Baumrind's parenting dimensions in their teaching style influenced student adjustment in grade 6 classes.

Frunză's (2014) research sought to determine the most effective teaching style based on student perceptions and determine if correlations existed between a teacher's teaching style and self-esteem. 30 teachers and 60 students between the ages of 15 and 19-years-old were included in the study. Teachers' self-esteem was assessed using an instrument called the Self-Esteem Scale (Rosenberg, 1965). Additionally, teachers' teaching style was determined based on the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996). A questionnaire created by Frunză (2014) was administered to students. Student responses determined how effective identified teaching styles were on student learning.

This correlational study found significant and direct correlations between teaching style, students' opinion of effective teaching, and student learning. Teachers' teaching styles were classified into two categories: ineffective and effective. Ineffective teachers were ones who were described as "apathetic, sad, seems to have no interest to students and classroom activities, pessimistic, too serious, too busy, and insensitive to humor" (Frunză, 2014, p. 345), whereas effective teachers were described as interested in students, optimistic, animated, active, and happy. This study found that teachers characterized as effective impacted student learning more significantly. Furthermore, a significant correlation was found between high levels of teacher self-esteem and two

specific teaching styles. The study found teachers with a higher level of self-esteem were deemed to represent a more personal and relational style of teaching.

In summary, the literature reviewed the effects of teacher perceptions (Muñoz et al., 2013), teacher training and qualifications (Harris & Sass, 2011), and teaching style (Frunză, 2014; Khandaghi & Farasat, 2011; Motoko & Liang, 2016; Wentzel, 2002) on student achievement. Muñoz et al. (2013) analyzed teachers' perceptions of important classroom characteristics, procedures, and methodologies and determined that successful teachers focus meeting students' basic physical and emotional needs. When these needs are met in the classroom, student achievement scores were higher. Harris and Sass (2011) and Motoko and Liang's (2016) research revealed teacher experience and active participation in professional development involving teacher collaboration increased student achievement in mathematics. However, Harris and Sass (2011) found little correlation between traditional professional development and student achievement in mathematics. Khandaghi and Farasat (2011), Wentzel (2002), and Frunză's (2014) research investigated the effect of teaching style on student adjustment and self-esteem. Results indicated a clear difference between teaching styles in mathematics classrooms and identified student centered approaches had a significant impact on the emotional adjustment and learning of students.

Grasha's Teaching Styles

Student learning and academic achievement can be attributed to teaching methods. Instructional styles and methods are procedures instructors utilize to help students achieve learning goals or adopt the content being relayed (Heinich, Molenda, Russell, & Smaldino, 1999). Teaching style affects student adjustment, performance,

engagement, and outcome. Grasha (1996) states that teaching style is based more on individual personal qualities. Furthermore, teaching qualities depend on teachers' "preferences for particular instructional processes and are often markers that students, administrators, peers, and others employ when judging our effectiveness as teachers" (p. 1).

Aldhafri and Alrajhi (2014) conducted research to determine the effects of authoritative and authoritarian teaching styles on students' mathematics achievement. Specifically, the study examined the influences of teaching styles on student motivation. The researchers felt, "Examining teaching styles may allow development of a theoretical base for possible future interventions to promote specific teaching styles, in particular, ones that are found to support students' mathematics motivations" (Aldhafri & Alrajhi, 2014, p.137).

Aldhafri and Alrajhi (2014) utilized an Omani sample population from three different school districts. Four hundred twenty-five eighth grade students volunteered to participate in the study. Two-hundred and two females and 223 males completed questionnaires to determine teaching style perceptions and motivational levels in their mathematics courses. Students completed the Students' Perceptions of Teaching Style Scale (Aldhafri, Kazem, Alzubiadi, Yousif, Al-Bahrani & Alkharusi, 2009) to determine the specific teaching style of their instructor. This questionnaire included 30 items based on authoritative and authoritarian teaching styles. In order to determine students' motivational levels, the Mathematics Motivational Scale (MMS) (Yavuz, Ozyildirim, & Dogan, 2012) was completed. The MMS required participants to rank 44 different items on a 5-point Likert Scale.

Results indicated that teaching style influenced student motivations in mathematics (Aldhafri & Alrajhi, 2014. Authoritative teachers were determined to be those who were highly demanding, yet highly responsive. Higher levels of intrinsic motivation were found in students who perceived their teachers to be authoritative, while lower levels of extrinsic motivation existed. Overall, students felt more supported when teachers utilized authoritative teaching styles. Conversely, the study revealed that students who perceived their teachers to be authoritarian exhibited higher levels of extrinsic motivation in mathematics. However, intrinsic motivations were not affected. Students felt this teaching style was used less frequently.

In conclusion, teachers who utilize authoritative rather than authoritarian teaching styles create a learning environment more conducive to learning. According to Aldhafri and Alrajhi (2014), "Students start to value, enjoy and perhaps even love learning mathematics" (p. 140). This type of intrinsic motivation was found to produce higher levels of student achievement.

Shaari, Yusoff, Ghazali, Osman, and Dzahir (2014) utilized the Grasha-Riechmann Teaching Styles Survey to determine if a relationship existed between lecturers' teaching style, and student engagement. The study had three main objectives including identifying university lecturers' teaching style, examining levels of student academic engagement in various courses, and determining if significant correlations exist between teaching style and academic engagement.

In the Shaari et al. (2014) study, 226 students completed a questionnaire to determine academic engagement. The questionnaire utilized was an adapted version of the National Survey on Student Engagement (Kuh, 2002). Teachers completed the

Grasha-Riechmann Teaching Styles Survey. The study found the most prevalent style of teaching among lecturers was the personal model followed by the expert style of teaching. However, it was also found that a variety of styles existed among the faculty. Additionally, the study found that student engagement was high in the classes examined. A Person's correlational analysis revealed there was a modest relationship between a specific teachers' teaching style and student engagement.

Like Shaari et al. (2014), Chowdhury (2015) utilized the Grasha-Riechmann Teaching Styles Survey to determine teaching style. The case study analyzed individual learning styles of engineering students and the teaching style of academic professors to improve the quality of Project Based Learning (PBL) in the classroom. The study evaluated four key areas of learning styles according to the Felder model: active/reflective, sensing/intuitive, visual/verbal and sequential/global among 118 (42 male and 76 female) engineering students in two courses (CIVL 270- Introduction to Environmental Education and GENG 315- Engineering Practice and Entrepreneurship General Engineering) during the fall of 2012, spring of 2013 and the spring of 2014.

The Felder (1999) questionnaire was used to evaluate learning styles of the study group, and the Grasha-Riechmann Teaching Styles Survey was utilized to determine the preferable teaching style (expert, formal authority, personal model, facilitator, and delegator) among 24 randomly selected academic staff from different academic departments of the College of Education. The Center for Excellence in Teaching and Learning conducted a survey during the fall of 2012-2013 among 1617 students to determine the learning resources and educational technology most frequently used in the classroom.

Results of the survey were opposing and contradictory. According to the survey results, most students at UAEU were sequential, visual, observed active and sensory learners while most academic educators prefer delegator, expert, and facilitator as the preferred method of teaching. However, results did indicate the best teaching style in a Project Based learning environment was instruction through facilitation, not dismissing and recognizing the individual learning style of each student when developing instruction, and utilizing a variety of technology based educational and learning resources to support student performance.

Grasha (1994) introduced five teaching styles based on observable teacher qualities prevalent across different fields, subjects, and environments, and identified three categories of characteristics that determine a teacher's style. The first includes factors such as course demands, and the student's ability to perform in class. The second examines the level of classroom control a teacher implements as well as the methodology used to control classroom activities. The third category considers teacher-student relationships and communication.

Grasha's (1994) research relied on extensive observations, interviews, and discussions that produced five categories of teaching style: expert, formal authority, personal model, facilitator, and delegator (see Figure 2). While teachers can exhibit qualities from each of the five categories and use them in conjunction with others, one or more teaching style is typically dominant. According to Grasha (1994), "The primary or dominant styles are like the foreground in a painting. They are easily seen and central to understanding the artist's vision. The other qualities are like the background" (p. 143).

Expert

According to Grasha (1994), the expert style is characterized by a high level of content knowledge and expertise in the subject area. Class preparedness and the distribution of information is central to the approach. Expert teachers provide great depth and detail, and deliver abundant information.

Table 1.—Five Teaching Styles

Style	Description	Advantage	Disadvantage
Expert	Possesses knowledge and expertise that students need. Strives to maintain status as an expert among students by displaying detailed knowledge and by challenging students to enhance their competence. Concerned with transmitting information and ensuring that students are well prepared.	The information, knowledge, and skills such individuals possess.	If overused, the display of knowledge can be intimidating to inexperienced students. May not always show the underlying thought processes that produced answers.
Formal authority	Possesses status among students because of knowledge and role as a faculty member. Concerned with providing positive and negative feedback, establishing learning goals, expectations, and rules of conduct for students. Concerned with the "correct, acceptable, and standard ways to do things."	The focus on clear expectations and acceptable ways of doing things.	A strong investment in this style can lead to rigid, standardized ways of managing students and their concerns.
Personal model	Believes in "teaching by personal example" and establishes a prototype for how to think and behave. Oversees, guides, and directs by showing how to do things, and encouraging students to observe and then to emulate the instructor's approach.	The "hands on" nature of the approach. An emphasis on direct observation and following a role model.	Some teachers may believe their approach is "the best way," leading some students to feel inadequate if they cannot live up to such expectations and standards.
Facilitator	Emphasizes the personal nature of teacher–student interactions. Guides students by asking questions, exploring options, suggesting alternatives, and encouraging them to develop criteria to make informed choices. Overall goal is to develop in students the capacity for independent action and responsibility. Works with students on projects in a consultative fashion and provides much support and encouragement.	The personal flexibility, the focus on students' needs and goals, and the willingness to explore options and alternative courses of action to achieve them.	Style is often time consuming and can be ineffective when a more direct approach is needed. Can make students uncomfortable if it is not used in a positive and affirming manner.
Delegator	Concerned with developing students' capacity to function autonomously. Students work independently on projects or as part of autonomous teams. The teacher is available at the request of students as a resource person.	Contributes to students perceiving themselves as independent learners.	May misread students' readiness for independent work. Some students may become anxious when given autonomy.

Figure 2. Grasha's five teaching styles (Grasha, 1994, p. 143).

Formal Authority

Grasha (1994) defines the formal authority style as one that is characterized by structured lessons and consistent feedback, whether negative or positive, and procedures that are in accordance with school rules.

Personal Model

Grasha (1994) characterized the personal teaching style as one on which the teacher behaves as the model, teaching students how to perform through observation and guidance.

Facilitator

According to Grasha (1994), the facilitator style of teaching guides students to be self-reliant and responsible. Teachers utilizing this approach prefer to teach through guidance and support, and they encourage students to complete tasks independently when implementing a project.

Delegator

Grasha (1994) defines the delegator as a teacher who encourages students to perform tasks on their own. They expect autonomy from students with the teacher acting as a guide when needed.

According to the literature reviewed (Aldhafri and Alrajhi, 2014; Chowdhury, 2015; Shaari et al., 2014), teaching style affects student engagement and achievement. Additionally, different teaching styles implemented in different setting produces different results. While many styles of teaching have been discussed, Grasha (1994) introduced five teaching styles based on observable teacher qualities prevalent across different fields, subjects, and environments, and identified three categories of characteristics that determine a teacher's style.

Student Achievement, Teaching Style, Mathematics, and the International Context

According to Program for International Student Assessment (2017), or PISA testing, students from the United States attending international schools witnessed a decline in mathematics scores "ranking below 36 countries or educational systems out of

more than 70 that participated" (Daily News, 2017). Seventy-three countries participated in the PISA testing. Participants in the study included fifteen–year–old mathematics students. Jon Star, a Harvard professor, feels teachers "should strive to ask better questions, wait longer for students to come up with answers, think about project-based problems that would challenge their students more, and be more reflective about their teaching practice" (Daily News, 2017).

International schools differ from traditional home country schools. International school environments provide distinctive settings including a diverse student body and faculty typically hailing from various countries around the world. According to Shams (2017), international schools face new challenges including academic quality and non-academic experiences. Shams' (2017) research sought to understand how educators can nurture international students' academic experience, alleviate challenges associated with teaching a multicultural student population, and foster academic experiences of international students. The study asserts "delivering and monitoring innovative teaching and learning approaches" (Shams, 2017, p. 206) can create more productive academic experiences in an international school setting.

Shams' (2017) research utilized a qualitative ethnographic approach based on the analysis of prior research and observation of students with a non-English speaking background attending international schools. Results indicate that relationships fostered by teachers and staff in all aspects of school life positively affect a student's academic and non-academic experience. Strong relationships within an international school setting produce an environment that allows students to adapt to new challenges such as language acquisition, multiculturalism, and different teaching approaches. In addition, the study

revealed student commitment to academics, regular student-teacher contact, and a constructive attitude contributed to better academic experiences. Teachers who were committed to taking an individual approach also favorably impacted student achievement.

Hayden and Thompson (1998) also researched different factors affecting the experience of students attending an international school. The study relied on both teachers' and students' perceptions to determine what characteristics affect student achievement and performance. Hayden and Thompson's (1998) research included responses from over 3,000 students and 226 teachers. All teachers were secondary teachers who teach in international schools. Teachers' nationalities and teaching experience differed broadly. All participants were asked to rate specific items from on a Likert-type scale from most to least important. Items covered a wide range of topics including teaching style and approaches, curriculum, and exposure to extra activities and the local community. The average of each question was computed and ranked in order accordingly.

Hayden and Thompson (1998) found five characteristics to be important contributors to international students' achievement and experience. These characteristics include learning that supported tolerance of all cultures, class assessments that supported entry into universities worldwide, respect and understanding of different perspectives, and an internationally-minded curriculum.

Summary

The Theory of Educational Productivity was utilized as the theoretical framework to understand the impact of teaching style on academic growth. It seeks to explain the

information acquisition process through outcomes. Simply, effective methods produce effective results. A plethora of school characteristics and background variables have been accounted for within the research. A thorough review of the research revealed that most variables including increased financial support (Cullen et al., 2015; Neymotin, 2010), facilities (Martorell et al., 2016), and school size (Crispin, 2016; Cullen et al., 2015; Shear et al., 2008) had no significant effect on student achievement. Della Sala et al. (2017) and Howtenville and Conway (2008) found that increasing school funding has little effect on student achievement and only funds directly allocated to instructional resources produced student achievement gains. Reyes et al. (2012) found more significant correlations between students' emotional climate and student achievement, and Phelps (2012) determined testing had a positive effect on student achievement.

Characteristics affecting student performance and achievement in mathematics were also reviewed. Both Singh et al. (2002) and Yu and Singh (2018) found results indicated motivation, attitude, and academic engagement positively influenced mathematics achievement, specifically motivation, positive attitude, and engagement. However, Farooq et al.'s (2012) research indicated socio-economic status and gender correlate to higher achievement in mathematics.

While background variables played little role in increasing student achievement, research has consistently identified the teacher as the most important external factor affecting student achievement (Hattie, 2003). Furthermore, Muñoz et al. (2013) found that students who had teachers who embraced emotional growth, through teaching methods and approaches, made more significant achievement gains. Harris and Sass (2011) also found that teaching experience directly affected student achievement. More

specifically, the literature reviewed indicates teaching style significantly affects student adjustment, performance, engagement, and outcome.

A number of studies have investigated factors affecting student achievement and examined teaching styles. However, little research on teaching style has been performed in an international school context. International school environments drastically differ from national public and private schools in diversity and student need. Due to lofty demands and growing need, the presence of international schools has risen exponentially. Additionally, ISC expects the number of international school to rise by 10,000 schools worldwide in the next 10 years (Data and Intelligence, n.d.; Keeling, 2018). This study fills a gap in the record of research by examining teaching style and its impact on student achievement in an international school setting.

CHAPTER III: METHODOLOGY

Overview

As demands for international schools increase, demands for student performance are also increasing. More attention needs to be given to international school populations to determine what factors impact student performance. While teaching styles, methodologies, and strategies have been researched and debated for decades, little research on teaching style has been performed in international school settings. In order to fully understand which teaching styles have the greatest impact on student achievement in an international environment, further research is needed.

The purpose of this quantitative study was to determine if correlations exist between teaching style and student academic growth in mathematics within an international school setting. The study also determined if a dominant teaching style exists among elementary mathematics teachers, kindergarten through grade six, teaching in QSI schools. Additionally, the study determined if correlations between teacher grade level and teaching style can be made. The body of research (Cullen et al., 2013; Crispin, 2016; Martorell et al., 2016; Neymotin, 2010; Shear et al., 2008) outlined in the literature review of this paper suggested that external or background factors do not significantly affect student growth and achievement. Some research (Farooq et al., 2012; Singh et al., 2002; Yu & Singh, 2018) identifies mathematics as predictor of overall and future student success. Furthermore, teacher quality has been consistently identified as the most important factor in student achievement (Harris and Sass, 2011; Hattie, 2003; Muñoz et al., 2013). Empirical data received from test scores ascertained which style of teaching

increases student academic growth as quantified on the MAP (NWEA, 2011) assessment, identifying teaching styles that promote student achievement in mathematics.

Research Questions

The following research questions guided this study:

1. What is the dominant teaching style among elementary school mathematics teachers who teach in an international school environment?

   Null Hypothesis: There is not a dominant teaching style among elementary school mathematics teachers who teach in an international school environment.

2. Is there a significant association between teaching style and grade level?

   Null Hypothesis: There is not a significant association between teaching style and grade level.

3. Is there a significant difference in student academic growth in mathematics among the teaching styles of elementary school mathematics teachers within an international school?

   Null Hypothesis: There is not a significant difference in student academic growth in mathematics among the teaching styles of elementary school mathematics teachers within an international school.

Research Design

This quantitative study utilized χ^2 analysis to determine if there is predominant teaching style among elementary school mathematics teachers who teach in an international school environment (Wiersma & Jurs, 2009). Additionally, χ^2 analysis was used to determine if a relationship exists between teaching style and grade level. Finally, ANOVA was used to determine if there is a significant difference in student academic

growth in mathematics between the teaching styles of elementary school mathematics teachers working international schools.

Setting

QSI is a school organization including 37 schools in 31 different countries including 16 schools in Europe, 15 in Asia, three in South America, two in Africa, and one in North America. QSI is a nonprofit entity established in August 1991 to facilitate English language, American style schools upon the request of embassies, international organizations, and international businesses. Thirty-one schools are accredited through Middle States Association of Colleges and Schools (MSA), and the remaining five schools are in various stages of the accreditation application process. As of June 2018, there were 5,846 students from 116 different nationalities attending QSI schools.

QSI implements a student performance-based approach to learning. Students take a full academic program, including core subjects like English, mathematics, science, and cultural studies as well as various additional courses such as library, music, art, physical education, technology, and foreign languages. Students leaving QSI schools transfer to other international or stateside schools, and QSI graduates typically attend colleges and universities on every continent.

Participants

As Table 1 indicates, the population studied included teachers instructing an elementary school mathematics course, including kindergarten and grades 1-6 during both the 2016-2017 and 2017-2018 school years in a QSI school. A total of 309 teachers instructed kindergarten through grade six mathematics courses during the 2017-2018 school year and a total of 337 teachers instructed kindergarten through grade 6

mathematics courses during the 2018-2019 school year. Only participants teaching the same grade level in the same location for at least two consecutive school years were selected to participate in the study. The total population of available participants was 156 mathematics teachers who teach in 33 of the 37 QSI schools in 27 different countries.

Table 1

Potential Study Participants (Elementary Mathematics Teachers) by Country and School

Country	School	N 2017-18	N 2018-19	Possible Participants
Albania	Tirana International School	8	12	7
Armenia	QSI International School of Yerevan	7	7	5
Azerbaijan	Baku International School	9	9	7
Belarus	QSI International School of Minsk	7	8	3
Belize	QSI International School of Belize	4	3	1
Benin	QSI International School of Benin	3	4	2
Bosnia & Herzegovina	QSI International School of Sarajevo	7	7	4
China	QSI International School of Chengdu	12	11	5
China	QSI International School of Dongguan	15	14	9
China	QSI International School of Shenyang	4	5	2
China	QSI International School of Shenzhen	44	49	19
China	QSI International School of Zhuhai	7	9	4
Djibouti	QSI International School of Djibouti	4	5	1
Germany	QSI International School of Münster	4	5	2
Georgia	QSI International School of Tbilisi	12	14	7
Hungary	QSI International School of Pápa	5	6	1
Italy	QSI International School of Brindisi	3	4	0
Kazakhstan	QSI International School of Atyrau	7	7	1
Kazakhstan	Almaty International School	20	20	6
Kazakhstan	QSI International School of Astana	13	15	4
Kosovo	QSI International School of Kosovo	4	5	2
Kyrgyzstan	QSI International School of Bishkek	5	3	2
Macedonia	QSI International School of Skopje	4	5	1
Malta	QSI International School of Malta	11	11	7
Moldova	QSI International School of Chisinau	7	6	3
Montenegro	QSI International School of Montenegro	7	7	4
Slovakia	QSI International School of Bratislava	7	7	6
Slovenia	QSI International School of Ljubljana	6	4	3

(continued)

Table 1 (continued)

Country	School	N 2017-18	N 2018-19	Possible Participants
Tajikistan	QSI International School of Dushanbe	6	6	5
Suriname	QSI International School of Suriname	0	4	0
Thailand	QSI International School of Phuket	3	4	2
Timor-Leste	QSI International School of Dili	5	6	3
Trinidad & Tobago	QSI International School of Trinidad	4	4	1
Turkmenistan	Ashgabat International School	13	15	9
Ukraine	Kyiv International School	27	30	18
Venezuela	QSI International School of El Tigre	0	0	0
Vietnam	QSI International School of Haiphong	5	6	0

Instrumentation

MAP. According to the NWEA (2011), the MAP assessment is used in all 50 states in the US and in 49 other countries to determine student achievement and growth. There are currently over 3,400 school districts utilizing MAP as student growth tools. The MAP was created by the NWEA as an adaptive computerized test to target students' academic performance, growth, and progress in reading, language, mathematics and science over the course of designated time, usually consisting of testing at the beginning and ending of year, but can be given at any time. Each assessment is tailored to a student's individual current achievement level and does not fall under any particular time restriction. Each assessment is uniquely designed to adjust up and down in difficulty as the test progresses. MAP provides students, teachers, parents and administrators the current level of instruction for each student while providing scores comparative to norms within ones district and worldwide (NWEA, 2018).

Teaching styles. Teachers' teaching styles was measured using the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996; see Appendix A), a 40-question

survey categorizing teachers into one or more of the following categories: 1 – Expert, 2 – Formal Authority, 3 – Personal Model, 4 – Facilitator, 5 – Delegator. It consists of 40 statements about teaching (e.g., "Students are encouraged to emulate the example I provide," and "I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things"). Respondents are asked to indicate their agreement with each statement based on a 7-point Likert scale.

Validity and Reliability

Samejima (1994) conducted marginal reliability studies and found total reliability scores ranging between .92 and .96 for MAP (NWEA, 2011) results from students in Grades 2 through 10 for all subjects tested. Scores on the MAP exams are based upon RIT scores that range from 140 to 300 and correlate directly to Rasch ability estimates (NWEA, 2018). The MAP assessment is adaptive reducing the Standard Error of Measurement (SEM). According to NWEA, the SEM "is a function of the match between item difficulty and student proficiency level" (NWEA, 2013, p. 6).

The Grasha-Riechmann Teaching Styles Surve**y** (Grasha, 1996) determines the perceptions teachers have regarding their teaching styles. The survey asks teachers to rank specific characteristics of their teaching style according to importance. In order to ensure the validity of the data collected, data collected were used for purposes of the determining teaching style. According to Grasha (1994), the Grasha-Riechmann Teaching Styles Surve**y** contains items that describe teaching characteristics. To ensure reliability, participants respond to each items based on their teaching style and their response is analyzed based on a specific course.

Procedures

After receiving QSI permission (see Appendix B) and WKU IRB approval (see Appendix C), an electronic version of the Grasha-Riechmann Teaching Style Survey (Grasha, 1996) was distributed to the 156 selected participants teaching mathematics, kindergarten to grade six, within the QSI school group. The survey instrument contained four questions designed to collect demographic data about the respondents. The first question asked respondents to include their name, first and last. The second and third questions asked respondents to identify the name of the school they were currently teaching and the grade level of mathematics taught during the 2018-2019 school year. The fourth question asked respondents to indicate the number of years they have taught mathematics.

A score was issued for each of the five teaching style categories. Responses were numbered from highest to lowest, with (1) being the highest and (5) being the lowest. These scores were assigned a ranking to each variable. A total score calculation was determined according to each participant's preference for a particular style.

Individual student achievement and growth scores were obtained using the MAP (NWEA, 2011) in mathematics. Mathematics scores from both the 2017 fall assessment and 2018 spring assessment were obtained to determine student growth from the beginning to the end of 2017-2018 school year.

Further data, including mathematics teachers who teach in kindergarten through grade 6 during the 2017-2018 and 2018-2019 school years, were collected through Quality School International Headquarters in Ljubljana, Slovenia. Teacher names, course data, country and school location were accessed through the QSI's Quality Management System (QMS), a database of containing both teacher and student educational data.

Research Question 1

Research questions 1 asked, "What is the dominant teaching style among elementary school mathematics teachers who teach in an international school environment?" The Likert-style questions on the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996) asked mathematics teachers, kindergarten through grade six, to indicate their level of agreement on 40 statements about teaching. Based on the answers, teachers were categorized into five groups corresponding to their dominant teaching style. To determine if there is a dominant teaching style among elementary school mathematics teachers who teach in an international school environment a χ^2 analysis was conducted.

Research Question 2

Research question 2 asked, "Is there a significant association between teaching style and grade level?" All kindergarten through grade 6 mathematics teachers who teach in a Quality School International school during the 2016-2017 and 2017-2018 school years were identified. Data were collected through Quality School International Headquarters in Ljubljana, Slovenia. To ensure validity, data were also obtained from a demographic section of the survey, which asked respondents to indicate the grade level of mathematics they were currently teaching. Teaching style was determined based on teacher responses on the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996). A χ^2 analysis using was used to determine if any association existed between grade level and teaching style.

Research Question 3

Research question 3 asked, "Is there a significant difference in student academic growth in mathematics among the teaching styles of elementary school mathematics

teachers within an international school?" Student academic growth data were obtained from the MAP (NWEA, 2011) assessment. Students completed the assessment in the fall and spring of each school year. Scores from the 2017 fall assessment and 2018 spring assessment were obtained to determine student growth from the beginning to the end of 2017-2018 school year. Teaching style was determined based on teacher responses on the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996).

The mean growth of each teacher's class, participating in the study, was measured against the overall mean growth expectation of each grade level as published by NWEA (2017) in the 2015 RIT Scale Norms. To determine the mean growth of each participating teacher's students' MAP (NWEA, 2011) scores, individual MAP growth scores from the 2017 fall assessment and 2018 spring assessment were obtained. The mean growth for each grade level is different and based on age, content, and academic level. Individual student growth scores were used to determine the mean for each class. Each participating teacher was assigned a mean growth score based on the mean growth of their students and growth norms during the 2017-2018 school year. To check the null hypothesis raised from the third research question, an ANOVA was conducted.

Trustworthiness

Anonymization of the survey responses ensured the confidentiality of the data. The confidentiality of the respondents were further protected by reporting data in aggregate.

Limitations

The population under study is restricted to teachers who teach within the QSI group of schools. The results may not be generalizable to other international schools or groups of schools. In addition, the survey was distributed to mathematics teachers,

specifically seeking data on their perceptions of their teaching style. Results may not be generalizable to other teaching positions or across schools serving different international communities.

Summary

This quantitative correlational study seeks to determine if correlations exist between teaching style and student academic growth in mathematics within an international school setting. The study also determined if a dominant teaching style exists among elementary mathematics teachers who teach in QSI schools. Additionally, the study determined if correlations between teacher grade level and teaching style could be made.

CHAPTER IV: RESULTS

Introduction

This study examined relationships between teaching style and student academic growth in mathematics within an international school setting. The study also determined if a dominant teaching style existed among elementary mathematics teachers, kindergarten through grade 6, teaching in QSI schools. Additionally, the study determined if there were correlations between teacher grade level and teaching style. The population under study consisted of teachers instructing an elementary school mathematics course, including kindergarten and grades 1-6 during both the 2016-2017 and 2017-2018 school years in a QSI school (Table 1). Only participants teaching the same grade level in the same location for at least two consecutive school years were selected to participate in the study. The initial total population of available participants was 156 mathematics teachers. However, two teachers were on maternity leave and another was on sabbatical, leaving 153 available participants.

A survey was distributed by email to the available population. An email served as the cover letter (see Appendix D) and was accompanied by IRB approved consent documentation. The survey was distributed on March 21, 2019, and was closed for responses on March 28, 2019. A reminder email was distributed to the survey population on March 27, 2019. Of the 153 teachers, 51 completed the survey, representing a 33% response rate.

Research Questions

The following research questions guided this study:

1. What is the dominant teaching style among elementary school mathematics teachers who teach in an international school environment?

   Null Hypothesis: There is not a dominant teaching style among elementary school mathematics teachers who teach in an international school environment.

2. Is there a significant association between teaching style and grade level?

   Null Hypothesis: There is not an association between teaching style and grade level.

3. Is there a significant difference in student academic growth in mathematics among the teaching styles of elementary school mathematics teachers within an international school?

   Null Hypothesis: There is not a difference in student academic growth in mathematics among the teaching styles of elementary school mathematics teachers within an international school.

Teacher responses from the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996) directly addressed Research Questions 1-3. Research Question 2 also relied on data collected through QSI Headquarters in Ljubljana, Slovenia. Research Question 3 also utilized student academic growth data obtained from the MAP (NWEA, 2011) assessment.

Demographic Data

The survey instrument contained four questions designed to collect demographic data about the respondents. The first question asked respondents to include their name; the second asked them to identify the school where they were currently teaching; the third

asked about the grade level of mathematics they taught; and the fourth asked them to indicate the number of years they have taught mathematics.

Table 2 contains descriptive statistics on the data gathered for the second demographic question. Data were collected from 70% of QSI schools. Teachers from 26 of 37 QSI schools participated in the study. The highest number of respondents were from QSI Dushanbe followed by respondents from QSI Malta. All other schools had 1-3 respondents, with over half having only one mathematics teacher responding. Two respondents did not specify the QSI schools where they were teaching and were categorized as QSI unidentified.

Table 2

QSI Schools and Participants

SCHOOL	Frequency	Possible Participants	Percent	Cumulative Percent
QSI UNIDENTIFIED	2		3.9	3.9
QSI ALMATY	3	20	5.9	9.8
QSI ASHGABAT	3	9	5.9	15.7
QSI ASTANA	1	4	2.0	17.6
QSI BAKU	1	7	2.0	19.6
QSI BELIZE	1	1	2.0	21.6
QSI BENIN	1	2	2.0	23.5
QSI BISHKEK	2	2	3.9	27.5
QSI BRATISLAVA	1	6	2.0	29.4
QSI CHENGDU	2	5	3.9	33.3
QSI CHISINAU	1	3	2.0	35.3
QSI DILI	3	3	5.9	41.2
QSI DJIBOUTI	1	1	2.0	43.1
QSI DONGGUAN	1	9	2.0	45.1
QSI DUSHANBE	5	5	9.8	54.9
QSI KIEV	1	18	2.0	56.9
QSI LJUBLJANA	1	3	2.0	58.8
QSI MALTA	4	7	7.8	66.7
QSI MONTENEGRO	1	4	2.0	68.6

(continued)

Table 2 (continued)

SCHOOL	Frequency	Possible Participants	Percent	Cumulative Percent
QSI PAPA	1	1	2.0	70.6
QSI SARAJEVO	3	4	5.9	76.5
QSI SHENZHEN	3	19	5.9	82.4
QSI SKOPJE	1	4	2.0	84.3
QSI TIRANA	3	7	5.9	90.2
QSI TRINIDAD AND TOBAGO	1	1	2.0	92.2
QSI YEREVAN	2	5	3.9	96.1
QSI ZHUHAI	2	4	3.9	100.0
Total	51	156	100.0	

The third demographic question asked respondents to indicate the grade level of mathematics taught. Table 3 contains descriptive statistics on the data gathered for the third demographic question. The fourth demographic question asked respondents to indicate the number of years they have taught mathematics. Table 4 presents the results of this question.

Table 3

Mathematics Grade Level

Grade Level	Frequency	Percent	Cumulative Percent
K	9	17.6	17.6
1	12	23.5	41.2
2	6	11.8	52.9
3	6	11.8	64.7
4	5	9.8	74.5
5	8	15.7	90.2
6	5	9.8	100.0
Total	51	100.0	

The largest number of respondents instructed grade 1, followed by kindergarten, and grade 5. The smallest number of respondents instructed grades 4 and 6.

Table 4

Number of Years Teaching Mathematics

Years	Frequency	Percent	Cumulative Percent
2	3	5.9	5.9
3	4	7.8	13.7
4	2	3.9	17.6
5	4	7.8	25.5
6	4	7.8	33.3
7	7	13.7	47.1
8	3	5.9	52.9
10	4	7.8	60.8
11	3	5.9	66.7
13	1	2.0	68.6
14	2	3.9	72.5
15	1	2.0	74.5
16	1	2.0	76.5
18	2	3.9	80.4
20	3	5.9	86.3
23	1	2.0	88.2
24	1	2.0	90.2
25	1	2.0	92.2
27	1	2.0	94.1
32	1	2.0	96.1
35	2	3.9	100.0
Total	51	100.0	

The minimum number of years completed teaching was 2, while the maximum number of years completed teaching was 35. A majority of respondents indicated they completed 7 years of classroom instruction, while over half of the respondents completed between 2 and 8 years of classroom instruction.

Categorization of Teachers for Statistical Analysis

Because of a small sample size and in order not to violate assumptions and categorical requirements associated with chi-square analysis, similar teaching styles were grouped into three different categories. The Expert and Formal Teaching Styles were included in the teacher directed category, the Personal Model Teaching Style was

considered as the modeling category, and the Facilitator and Delegator Teaching Styles were included in the student directed category. While Grasha's literature does not advocate the three categories utilized in this study, teachers were categorized according to Grasha's (1994) identified characteristics of each teaching style. Additionally, for similar statistical reasons, teachers who taught in grades K-3 were grouped into "lower primary" and grades 4-6 teachers into "upper primary."

Findings for Research Question 1

Research question 1 asked, "What is the dominant teaching style among elementary school mathematics teachers who teach in an international school environment?" Data for this question data were obtained through a Likert-style matrix on the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996). Mathematics teachers, kindergarten through grade 6, were asked to indicate their level of agreement on 40 statements about teaching. The instrument utilized a seven-point (1 = Strongly Disagree to 7 = Strongly Agree) Likert scale.

The Grasha-Riechmann Teaching Styles Survey (Grasha, 1996) included eight questions targeting each of the five teaching styles. Teacher responses assessed their perception and attitude toward classroom instruction. Based on the answers, teachers were categorized into one of five groups corresponding to their dominant teaching style. Results revealed high, moderate, and low ranges for each teaching style. If there was a single high range for only one teaching style, this was determined the dominant teaching style, if a high range was observed in more than one teaching style the highest score was utilized to determine the dominant teaching style.

As presented in Table 5, more teachers were highest in Personal Model Teaching Style than in the other styles, followed by the Facilitator Teaching Style, the Formal Authority Teaching Style, the Delegator Teaching Style, and the Expert Teaching Style. For the purpose of determining if a particular teaching style were dominant (i.e., more prevalent), a χ^2 analysis of the observed frequencies was performed. While the most dominant observed teaching styles were the Personal Model Teaching Style and Facilitator Teaching Style, a significant difference in dominant teaching style distribution was not observed ($\chi^2 = 3.80$, $p = 0.43$) among these teachers who teach in a QSI school; thus, the null hypotheses of no difference was not rejected.

Table 5

Frequencies and Percentages of Dominant Teaching Style

	Overall		Lower Primary		Upper Primary	
	N	%	N	%	N	%
Expert	7	13.7	2	6.1	5	27.8
Formal Authority	9	17.6	6	18.2	3	16.7
Personal Model	14	27.5	10	30.3	4	22.2
Facilitator	13	25.5	10	30.3	3	16.7
Delegator	8	15.7	5	15.2	3	16.7
Total	51	100.0	33	100.0	18	100.0

Note. Because of small N sizes, grades K-3 combined into lower primary and grades 4-6 combined into upper primary

Findings for Research Question 2

Research question 2 asked, "Is there a significant association between teaching style and grade level?" As reported in Table 3, the largest number of respondents instructed grade 1 followed by kindergarten teachers, grade 5 teachers, grade 2 teachers, and grade 3 teachers. The smallest number of respondents indicated they instructed grades 4 and 5.

A χ^2 analysis was used to determine if any associations existed between grade level and teaching style. Again, due to small N sizes, teachers were grouped into lower and upper grade levels. Additionally, similar teaching styles were grouped into three different categories. The Expert and Formal Teaching Styles were included in the teacher directed category, the Personal Model Teaching Style was considered as the modeling category, and the Facilitator and Delegator Teaching Styles were included in the student directed category. Table 6 delineates the number of teachers in each teaching style category by grade level. A χ^2 analysis revealed no significant association between overall teaching style and grade level ($\chi^2 = 1.80$, $p = 0.41$); thus, the null hypothesis of no association was not rejected.

Table 6

Teaching Style and Grade Level

		Grade level		
		Lower primary	Upper primary	Total
Teacher directed	Count	8	8	16
	Expected Count	10.0	6.0	16.0
	% within Teaching Style	50.0%	50.0%	100.0%
	% within Grade level	25.0%	42.1%	31.4%
	Adjusted Residual	-1.3	1.3	
Modeling	Count	10	4	14
	Expected Count	8.8	5.2	14.0
	% within Teaching Style	64.3%	35.7%	100.0%
	% within Grade level	28.1%	26.3%	27.5%
	Adjusted Residual	.1	-.1	
Student directed	Count	15	6	21
	Expected Count	13.2	7.8	21.0
	% within Teaching Style	71.4%	28.6%	100.0%
	% within Grade level	46.9%	31.6%	41.2%
	Adjusted Residual	1.1	-1.1	
Total	Count	33	18	51
	Expected Count	33.0	18.0	51.0
	% within Teaching Style	62.7%	37.3%	100.0%
	% within Grade level	100.0%	100.0%	100.0%

Findings for Research Question 3

Research question 3 asked, "Is there a significant difference in student academic growth in mathematics between the teaching styles of elementary school mathematics teachers within an international school?" Student academic growth data were obtained from the MAP (NWEA, 2011) assessment. Scores from the 2017 fall assessment and the 2018 spring assessment were obtained to determine student growth from the beginning to the end of 2017-2018 school year. Teaching style was determined based on teacher responses on the Grasha-Riechmann Teaching Styles Survey (Grasha, 1996).

The mean growth of the class for each teacher participating in the study was measured against the overall mean growth expectation of each grade level as published by NWEA (2017) in the 2015 RIT Scale Norms. The mean growth for each grade level is different and based on age, content, and academic level. An expected mean growth score is determined for each grade level. Individual student growth scores were used to determine the mean for each class. Each participating teacher was assigned a mean growth score based on the mean growth of their students and growth norms during the 2017-2018 school year.

Table 7 presents mean values for all five teaching styles. It reveals the highest mean MAP (NWEA, 2011) growth was observed for the Facilitator Teaching Style while lowest MAP growth score was observed for the Expert Teaching Style. An ANOVA was conducted to determine if significant differences in student academic growth in mathematics between the teaching styles of elementary school mathematics teachers existed. It revealed no significant differences in academic growth among different

teaching styles ($F = 0.789$; $p = 0.538$); thus, the null hypotheses of no difference was not rejected.

Table 7

MAP Growth in Mathematics and Teaching Styles

Teaching Style	*N*	*M*	*SD*
Expert	7	10.86	6.59
Formal Authority	9	13.03	9.35
Personal Model	13	14.79	6.49
Facilitator	11	16.50	6.21
Delegator	8	12.79	7.66
Total	48	13.95	7.19

Summary

This study sought to determine if a relationship existed between teaching style and student academic growth in mathematics within an international school setting. The study also explored whether a dominant teaching style exists overall and whether associations between teacher grade level and teaching style can be made among international teachers who teach the QSI organization. Overall, no associations were found. While a significant difference between dominant teaching styles was not observed in mathematics teachers, the Personal Model Teaching Style revealed a higher frequency than the other styles, followed by the Facilitator Teaching Style, the Formal Authority Teaching Style, the Delegator Teaching Style, and the Expert Teaching Style. Additionally, no significant difference between overall teaching style and grade level was observed. However, the Expert Teaching Style tended to be more dominant among grade 6 teachers and the Formal Authority Teaching Style was dominant in grade 3, while the Facilitator Teaching Style was dominant kindergarten, and the Delegator Teaching Style was dominant in grade 1. Furthermore, no significant differences in academic growth

between different teaching styles were present. The highest MAP (NWEA, 2011) growth score was observed for the Facilitator Teaching Style, followed by the Personal Model, while lowest MAP growth score was observed for the Expert Teaching Style.

CHAPTER V: DISCUSSION

This study examined relationships between teaching style and student academic growth in mathematics within an international school setting. The study also determined if a dominant teaching style existed among elementary mathematics teachers, kindergarten through grade six, teaching in QSI schools. Additionally, the study determined if there were correlations between teacher grade level and teaching style.

Purpose of the Study

The purpose of this study was to determine if relationships exist between teaching style and student academic growth in mathematics within an international school setting. The study also sought to determine if a dominant teaching style existed and if correlations between teacher grade level and teaching style could be made among international teachers who teach in the QSI organization. The current pool of research linking teaching style to academic growth is limited. Furthermore, no research exists linking teaching style to academic growth in an international school setting.

The study provides applicable recommendations to administrators, guidance departments, classroom teachers, and parents to improve students' learning of mathematics in an international school setting. Empirical data received from test scores ascertain which style of teaching increases student academic growth as quantified on the MAP (NWEA, 2011) assessment, identifying teaching styles that promote student achievement in mathematics. The following research questions guided this study:

1. What is the dominant teaching style among elementary school mathematics teachers who teach in an international school environment?
2. Is there a significant association between teaching style and grade level?

3. Is there a significant difference in student academic growth in mathematics among the teaching styles of elementary school mathematics teachers within an international school?

Discussion of Findings

Research Question 1

Research question 1 asked: What is the dominant teaching style among elementary school mathematics teachers who teach in an international school environment?

Results failed to reject the null hypothesis. There was not sufficient evidence to support the claim that there is not a dominant teaching style among elementary school mathematics teachers teaching in an international school environment. Conversely, not enough evidence was observed to substantiate the hypothesis that there is a dominant teaching style among elementary school mathematics teachers teaching in an international school environment? However, data revealed discernable trends.

The Personal Model Teaching Style tended to be the most dominant among overall respondents (27.5%), with 18.2% of respondents identifying as lower elementary mathematics teachers and 16.7% identifying as upper elementary mathematics teachers. However, both the Personal Model Teaching Style (30.3%) and the Facilitator Teaching Style (30.3%) were identified as being the most dominant teaching style among lower elementary teachers and the Expert Teaching Style (27.8%) was identified as being the most dominant among upper elementary school teachers.

The Facilitator Teaching Style (25.5%), followed by the Formal Authority Teaching Style (17.6%), the Delegator Teaching Style (15.7%), and the Expert Teaching

Style (13.7%) followed the Personal Model Teaching Style the as being dominant in overall respondents. While the most dominant observed teaching styles were the Personal Model Teaching Style and Facilitator Teaching Style, a significant difference in dominant teaching style distribution was not observed.

Overall, trends revealed teachers tended to prefer the Personal Teaching Style. The nature of this style is personal and is characterized by a "hands-on" (Grasha, 1994, p. 143) approach. "It encourages students to observe and emulate" (Grasha, 1994, p. 143). The results are consistent with Shaari, Yusoff, Ghazali, Osman, and Dzahir's (2013) study. Similarly, the researchers utilized the Grasha-Reichmann Teaching Styles Survey (Grasha, 1994) to determine relationships between teaching style. The study found the most prevalent style of teaching was the personal model. Khandaghi and Farasat's (2011) research to determine if elementary teachers relied more on teacher-oriented or learner-oriented teaching practices revealed a learner-centered teaching style leads to improved educational adjustment.

Research Question 2

Research question 2 asked: Is there a significant association between teaching style and grade level?

There was not a substantial statistical association between teaching style and grade level. Nevertheless, there was not sufficient evidence to support the claim that there is not a significant association between teaching style and grade level. The small sample size affected the statistical power to detect possible significant differences. However, the data did reveal trends between grade level and teaching style.

Teachers were grouped into lower and upper grade levels. Additionally, similar teaching styles were grouped into three different categories. Due to a limited sample size, three teaching style categories rather than five produced more statistically significant results. The Expert and Formal Teaching Styles were included in the teacher directed category, the Personal Model Teaching Style was considered as the modeling category, and the Facilitator and Delegator Teaching Styles were included in the student directed category. The small sample size affected the statistical power to detect possible significant differences. However, trends were identified.

Dominant teaching styles seemed to be more evenly distributed among upper elementary teachers with the teacher directed category being more dominant, including The Expert and Formal Authority Teaching Styles. The Expert Teaching Style emphasizes class preparedness and the distribution of information, and is characterized by a high level of content knowledge in the subject area. Expert teachers provide great depth and detail, and deliver abundant information. The Formal Authority Teaching Style emphasizes structured lessons and consistent feedback, whether negative or positive, and procedures that are in accordance with school rules (Grasha, 1994).

The Personal Model and Facilitator Teaching Styles seemed to be most common among lower elementary teachers. The Personal Model Teaching Style emphasizes teaching students through observation and guidance. The teacher serves as the model through lessons and activities. The Facilitator Teaching Style relies on the teacher as guidance throughout daily lessons. Teachers utilizing this approach encourage students to complete tasks independently when implementing a project (Grasha, 1994).

While the null hypotheses of no difference was not rejected, trends in the data suggest upper and lower elementary teachers differ in preferred teaching style. Upper elementary teachers, grades 4 through 6, tended to prefer more teacher-centered styles that are characterized by expertise and subject-area knowledge. However, lower elementary teachers, kindergarten through grade 3, tended to prefer teaching styles that were more personal and focused on student-teacher interaction

Research Question 3

Research question 3 asked: Is there a significant difference in student academic growth in mathematics between the teaching styles of elementary school mathematics teachers within an international school?

While no significant associations were found, trends were identified. The highest academic growth in mathematics was observed for the Facilitator Teaching Style. The mean academic growth revealed on Measures of Academic Progress (MAP) assessment (NWEA, 2011) for teachers who identified the Facilitator Teaching Style as their preferred model was 16.5 RIT points. Trends in the data also revealed higher academic growth in students whose teacher preferred the Personal Model Teaching Style. The mean academic growth revealed on Measures of Academic Progress (MAP) assessment (NWEA, 2011) for teachers who identified the Personal Model Teaching Style as their preferred method of teaching was 14.79 RIT points. Conversely, the lowest academic growth in mathematics was observed for the Expert Teaching Style. The mean academic growth revealed on Measures of Academic Progress (MAP) assessment (NWEA, 2011) for teachers who identified the Expert Teaching Style as their preferred method of teaching was 10.8 RIT points.

Overall, more academic growth in mathematics was identified in teaching styles that emphasize a more personal approach to teaching. While the Personal Model Teaching Style utilizes personal example and a hands-on approach, the Facilitator Teaching Style also relies heavily on personal teacher-student relationships and interactions (Grasha, 1994). The personal aspect of both approaches guides daily interactions and lessons. The trends revealed are consistent with Aldhafri and Alrajhi (2014)'s research results indicating that teaching style does influence student performance in mathematics.

Significance of the Study

As admission rates grow globally in international school settings, little research investigating student achievement exists. Furthermore, no research examining teaching style in international school environments is available. While international school settings provide unique characteristics, the need for research in subject specific areas is dire to the overall achievement of the student population attending school in this unique environment. Mathematics remains one of the single largest contributors to overall student success (Franklin, 2007; Lee, 2012).

This study is significant because it analyzed the distribution of different teaching approaches in mathematics and their effect on student achievement in an international school setting. The study relied on teachers' perceptions to determine what teaching style was most dominant. The results from this study indicate that no significant differences exist. However, specific trends were observed within the elementary school teachers instructing an elementary school mathematics course, including kindergarten and grades 1-6 in the QSI organization.

Limitations

Limitations were noted for this study. The population under study was restricted to teachers who teach within the QSI group of schools. Although the response rate was 33%, the overall available population was small. Only participants teaching the same grade level in the same location for at least two consecutive school years were selected to participate in the study. The total population of available participants was 156 mathematics teachers who teach in 33 of the 37 QSI schools in 27 different countries. The sample size affected the statistical power to detect significant differences. A good faith effort was made to get a good response rate. Due to location restraints, the survey was distributed by email to the available population. Reminder emails were also distributed.

Furthermore, the results may not be generalizable to other international schools or groups of schools. In addition, the survey was distributed to mathematics teachers, specifically seeking data on their perceptions of their teaching style. Results may not be generalizable to other teaching positions or across schools serving different international communities.

Recommendations for Future Research

Based on the trends observed in the research, further study should be extended to larger and more diverse populations. This study was limited to elementary teachers in the QSI organization. A larger population in more varied international school settings would produce more significant results. In addition, this study was limited to elementary mathematics teachers. The study could be expanded to include further subject area and grade levels. Further research with a larger population, applied to wider range of

international schools, subject area and grade levels could yield more substantial and applicable results. Furthermore, the research could be expanded to include qualitative instruments including teacher and student interviews and observations. This may help strengthen the research, provide a deeper and more detailed understanding, and supply helpful explanations for further practice.

An additional area for further research could involve comparing the effect of teaching style on academic growth in international settings and traditional settings. International school environments differ from traditional home country schools. International school environments include a diverse student body and faculty typically hailing from various countries around the world while traditional school settings are far less diverse.

Another area for further study could include the influence of teaching style on student emotional and social growth in an international school setting. Research identified in the literature review (Reyes et al., 2012) revealed a significant correlation between a student emotional and social growth and student achievement. The research indicated a significant correlation between a positive classroom environment and student grades.

Implications for Future Practice

Administrators, guidance departments, and classroom teachers in international school settings should give thought to how teaching style affects academic growth. Based on a careful analysis of the literature reviewed teacher quality has been consistently identified as the most important factor in student academic growth (McCaffrey et al., 2004; Rivkin et al., 2000; Rowan et al., 2002; Wright et al., 1997). Trends observed in

this research reveal more academic growth in teaching styles that emphasize a personal approach in teaching mathematics in an international school setting. Empirical data received from test scores ascertained the Facilitator Teaching Style, followed by the Personal Model Teaching Style, promote higher levels of student achievement in mathematics. The characteristics attributed to these personal approaches should be implemented in elementary school mathematics classrooms.

Conclusions

Previous research has investigated factors affecting student achievement and examined teaching styles. However, little research on teaching style has been performed in an international school context. International school environments drastically differ from national public and private schools. This study examines teaching style and its impact on student achievement in mathematics in an international school setting.

It was believed that a dominant teaching style existed among elementary school mathematics teachers who teach in an international school environment. While a statistically significant dominant teaching style was not evident, the Personal Model Teaching Style was the most prevalent among overall respondents. It was also believed there was a significant association between teaching style and grade level. No significant associations were found. However, trends were identified. The Expert and Formal Authority Teaching Styles were evenly distributed among upper elementary school teachers, while the Personal Model and Facilitator Teaching Styles seemed to be most common among lower elementary teachers.

Finally, it was believed that a significant difference could be observed in student academic growth in mathematics between the teaching styles of elementary school

mathematics teachers within an international school. Again, while no significant correlations were found, specific trends could be observed in the data. The Facilitator Teaching Style, followed by the Personal Model Teaching Style, yielded the highest academic achievement growth in mathematics among elementary teachers who teach in the QSI organization.

Hattie's (2003) past research has determined what controllable characteristics have the most significant impact on student achievement. His results indicated the teacher plays the largest external factor in student success. According to Grasha's (1994) research, teaching style is multifaceted and "affected how people presented information, interacted with students, managed classroom tasks, supervised coursework, socialized students to the field, and mentored students" (p. 142). In order to fully understand which teaching styles have the greatest impact on student achievement in an international environment, continued research and data on teaching style, methodology, and student achievement are vital.

This research will help administrators develop and provide teacher professional development and training that has a direct impact on student growth in an international school setting. The findings of this study provide implications relative to planning for students enrolled in elementary mathematics courses in an international school setting. The findings will aid policymakers in engaging in discussions to determine programs and supports that can be implemented to increase academic achievement in mathematics.

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APPENDIX A: Teaching Styles Inventory

Demographic Information

Answer the following questions before beginning the survey.

01.] Teacher Name (First and Last):

02.] School Name:

03.] Mathematics grade level currently teaching (2018-2019 school year):

04.] Number of years teaching mathematics:

Teaching Styles Inventory: Version 3.0

Use the following rating scale when responding to each item:

1	2	3	4	5	6	7
Strongly Disagree		Somewhat Disagree	Neither Disagree or agree	Somewhat Agree		Strongly Agree
Very Unimportant Aspect of My Approach to Teaching this Course						*Very Important Aspect of My Approach to Teaching this Course*

01.] Facts, concepts, and principles are the most important things that students should acquire..... _____
02.] I set high standards for students in this class. ..... _____
03.] What I say and do models appropriate ways for students to think about issues in the content. ..... _____
04.] My teaching goals and methods address a variety of student learning styles. ..... _____
05.] Students typically work on course projects alone with little supervision from me. ..... _____
06.] Sharing my knowledge and expertise with students is very important to me. ..... _____
07.] I give students negative feedback when their performance is unsatisfactory. ..... _____
08.] Students are encouraged to emulate the example I provide. ..... _____
09.] I spend time consulting with students on how

to improve their work on individual and/or group project. ..... _____

10.] Activities in this class encourage students to develop their own ideas about content issues. ..... _____

11.] What I have to say about a topic is important for students to acquire a broader perspective on the issues in that area. ..... _____

12.] Students would describe my standards and expectations as somewhat strict and rigid. ..... _____

13.] I typically show students how and what to do in order to master course content. ..... _____

14.] Small group discussions are employed to help students develop their ability to think critically. ..... _____

15.] Students design one or more self-directed learning experiences. ..... _____

16.] I want students to leave this course well prepared for further work in this area. ..... _____

17.] It is my responsibility to define what students must learn and how they should learn it. ..... _____

18.] Examples from my personal experiences often are used to illustrate points about the material. ..... _____

19.] I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things. ..... _____

20.] Developing the ability of students to think and work independently is an important goal. ..... _____

21.] Lecturing is a significant part of how I teach each of the class sessions. ..... _____

22.] I provide very clear guidelines for how I want tasks completed in this course. ..... _____

23.] I often show students how they can use various principles and concepts. ..... _____

24.] Course activities encourage students to take initiative and responsibility for their learning. ..... _____

25.] Students take responsibility for teaching part of the class sessions. ..... _____

26.] My expertise is typically used to resolve disagreements about content issues. ..... _____

27.] This course has very specific goals and objectives that I want to accomplish. ..... _____

28.] Students receive frequent verbal and/or written comments on their performance. ..... _____

29.] I solicit student advice about how and what to teach in this course. ..... _____

30.] Students set their own pace for completing independent and/or group projects. ..... _____

31.] Students might describe me as a "storehouse of knowledge" who dispenses the facts, principles, and concepts they need..... _____

32.] My expectations for what I want students to do in this class are clearly stated in the syllabus. ..... _____

33.] Eventually, many students begin to think like me about course content. ..... _____

34.] Students can make choices among activities in order to complete course requirements. ..... _____

35.] My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates. ..... _____

36.] There is more material in this course than I have time available to cover it. ..... _____

37.] My standards and expectations help students develop the discipline they need to learn. ..... _____

38.] Students might describe me as a "coach" who works closely with someone to correct problems in how they think and behave. ..... _____

39.] I give students a lot of personal support and encouragement to do well in this course. ..... _____

40.] I assume the role of a resource person who is available to students whenever they need help. ..... _____

Teaching Styles Inventory: Version 3.0

Scoring Key

1.] *Copy the ratings you assigned to each item in the spaces provided below.*

1. _____	2. _____	3. _____	4. _____	5. _____
6. _____	7. _____	8. _____	9. _____	10. _____
11. _____	12. _____	13. _____	14. _____	15. _____
16. _____	17. _____	18. _____	19. _____	20. _____
21. _____	22. _____	23. _____	24. _____	25. _____
26. _____	27. _____	28. _____	29. _____	30. _____
31. _____	32. _____	33. _____	34. _____	35. _____
36. _____	37. _____	38. _____	39. _____	40. _____

2.] *Sum the ratings for each column and place the total in the spaces below.*

_____	_____	_____	_____	_____

3.] *Divide each column score above by 8 to obtain the average numerical rating you assigned to the items associated with each teaching style.* Place your average rating to the nearest decimal point in the spaces below.

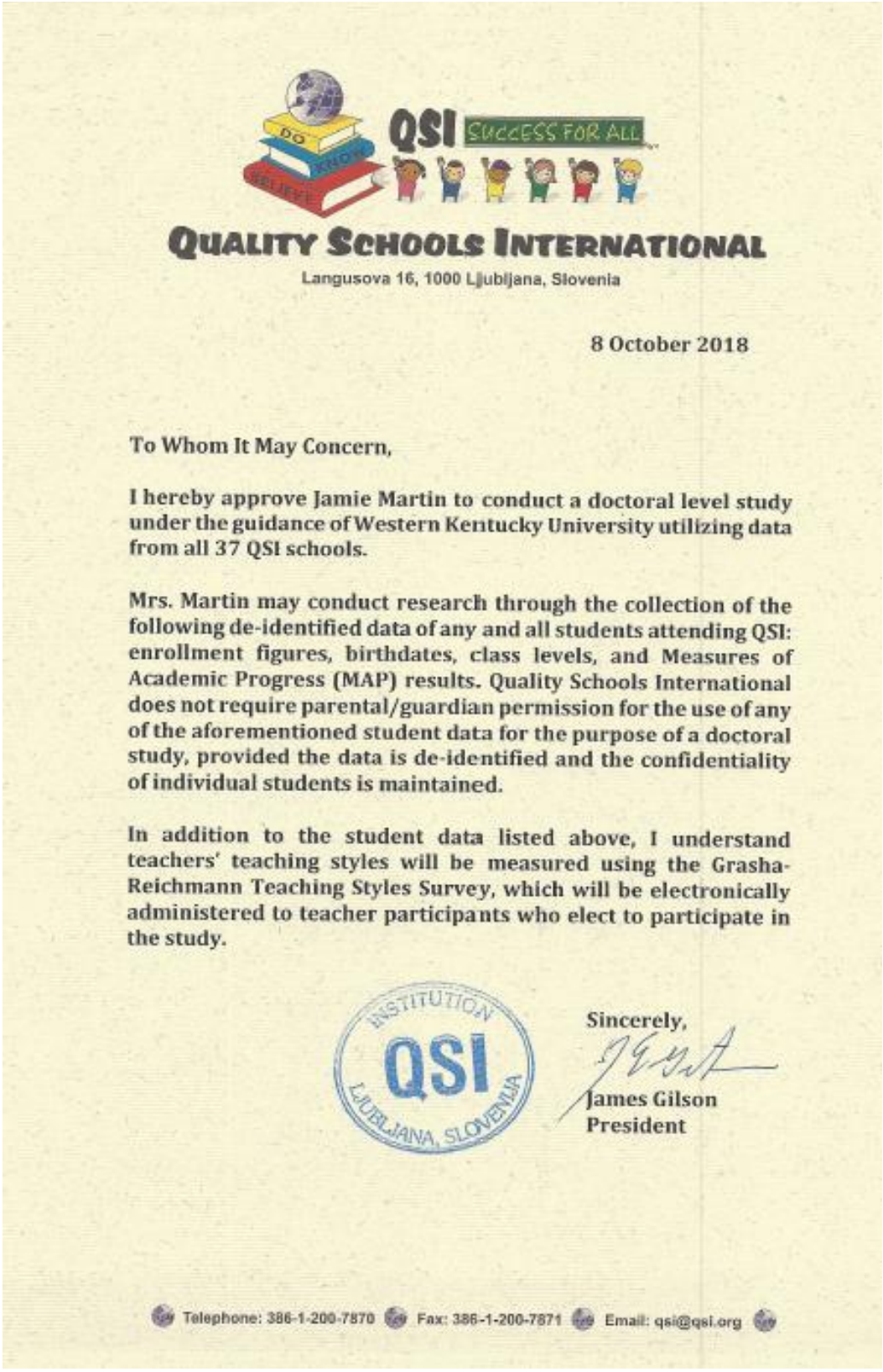
_____	_____	_____	_____	_____
Expert	Formal Authority	Personal Model	Facilitator	Delegator

4.] *The teaching styles that correspond to each pair of columns are shown above.*

5.] *Range of low, moderate, and high scores for each style based on the test norms.*

	Low Scores	Moderate	High Scores
Expert	[1.0-3.2]	[3.3-4.8]	[4.9-7.0]
Formal Authority	[1.0-4.0]	[4.1-5.4]	[5.5-7.0]
Personal Model	[1.0-4.3]	[4.4-5.7]	[5.8-7.0]
Facilitator	[1.0-3.7]	[3.8-5.3]	[5.4-7.0]
Delegator	[1.0-2.6]	[2.7-4.2]	[4.3-7.0]

APPENDIX B: Quality Schools International Permission to Conduct Research



QUALITY SCHOOLS INTERNATIONAL

Langusova 16, 1000 Ljubljana, Slovenia

8 October 2018

To Whom It May Concern,

I hereby approve Jamie Martin to conduct a doctoral level study under the guidance of Western Kentucky University utilizing data from all 37 QSI schools.

Mrs. Martin may conduct research through the collection of the following de-identified data of any and all students attending QSI: enrollment figures, birthdates, class levels, and Measures of Academic Progress (MAP) results. Quality Schools International does not require parental/guardian permission for the use of any of the aforementioned student data for the purpose of a doctoral study, provided the data is de-identified and the confidentiality of individual students is maintained.

In addition to the student data listed above, I understand teachers' teaching styles will be measured using the Grasha-Reichmann Teaching Styles Survey, which will be electronically administered to teacher participants who elect to participate in the study.

INSTITUTION QSI LJUBLJANA, SLOVENIJA

Sincerely,

James Gilson
President

Telephone: 386-1-200-7870 Fax: 386-1-200-7871 Email: qsi@qsi.org

APPENDIX C: IRB Approval Letter

INSTITUTIONAL REVIEW BOARD
OFFICE OF RESEARCH INTEGRITY

DATE:	March 11, 2019
TO:	Jamie Martin
FROM:	Western Kentucky University (WKU) IRB
PROJECT TITLE:	[1408327-1] PERCEIVED TEACHING STYLE AND ACADEMIC GROWTH IN AN INTERNATIONAL SCHOOL SETTING
REFERENCE #:	IRB 19-315
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	March 11, 2019
REVIEW TYPE:	Exempt from Full Board Review

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Exempt from Full Board Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by an *implied* consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a MINIMAL RISK project.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Robin Pyles at (270) 745-3360 or irb@wku.edu. Please include your project title and reference number in all correspondence with this committee.

APPENDIX D: Study Cover Letter

IMPLIED CONSENT DOCUMENT

Project Title: Perceived Teaching Style and Academic Growth In An International School Setting

Investigator: Jamie Martin, Educational Leadership, Jamie-Martin@qsi.org

You are being asked to participate in a project conducted through Western Kentucky University. The University requires that you give your agreement to participate in this project.

You must be 18 years old or older to participate in this research study.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have. You should keep a copy of this form for your records.

1. **Nature and Purpose of the Project:** The purpose of this study is to determine if correlations exist between teaching style and student academic growth, in mathematics, within an international school setting. The study will provide applicable recommendations to administrators, guidance counselors, classroom teachers, and parents to improve students' learning of mathematics. In addition to MAP (Measure of Academic Progress) Scores, a survey will be used to collect data.

2. **Explanation of Procedures:** I am inviting you to participate in this research study by completing the Grasha-Riechmann Teaching Styles Inventory. In order to complete the research, you will be asked 4 demographic questions. Your responses to all questions, in both the demographic section as well the survey, will remain *anonymous*. The survey will require approximately 15 minutes of time to complete. Data will be reported in aggregate to protect your confidentiality.

3. **Discomfort and Risks:** Your participation is completely voluntary. If you decide not to participate in the study there will be no penalty or negative consequences. There is no compensation for responding nor is there any foreseeable risk. Participants in this study are free to withdraw at any time with no penalty.

4. **Benefits:** There is no compensation for participating in this study nor is there any foreseeable risk to the participants. The study will provide applicable recommendations to administrators, guidance counselors, classroom teachers, and parents to improve students' learning of mathematics.

5. **Confidentiality:** Anonymization of the survey responses ensured the confidentiality of the data. The confidentiality of the respondents will be further protected by reporting data in aggregate.

6. **Refusal/Withdrawal:** Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.

Your continued cooperation with the following research implies your consent.

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Robin Pyles, Human Protections Administrator
TELEPHONE: (270) 745-3360