INTERNATIONAL SCHOOL ELEMENTARY EDUCATORS' TRANSITION TO A REVISED MATHEMATICS CURRICULUM: A CASE STUDY

by

Christine H. Saba

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University

2021

INTERNATIONAL SCHOOL ELEMENTARY EDUCATORS' TRANSITION TO A REVISED MATHEMATICS CURRICULUM: A CASE STUDY

by Christine H. Saba

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University, Lynchburg, VA

2021

APPROVED BY:

Jerry Woodbridge, Ph.D, Committee Chair

Susan Quindag, Ed.D, Committee Member

ABSTRACT

The purpose of this single instrumental case study was to research how teachers at an organization of international schools transitioned to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. The guiding theories for this research were Schlossberg's (1981) transition theory, as the aim of the study was to research teachers in a time of transition, and Kolb's (1984) experiential learning theory, as teachers worked through the cycle of experiencing, reflecting, thinking, and acting. Data was collected through interviews, focus groups, and journaling. The site was an organization of international schools with a culturally and linguistically diverse student population. Participants were elementary teachers in the process of transitioning to using a revised mathematics curriculum. The methods of data triangulation, memoing, and data categorization were used for data analysis. Eight themes were determined from the data: First-Year Implementation, Collaboration, COVID-19, International School Differences, Teacher Perspectives, Professional Development and Training, Materials, and Leadership. This study discusses how teaching at an international school and implementing the curriculum during the COVID-19 pandemic affected the implementation. Teachers were supported in the transition by leadership, materials, collaboration, and professional development and training. They coped with the transition by remembering the first year of implementation is challenging and through various strategies based on their different perspectives of the transition.

Keywords: curriculum transition, transition theory, experiential learning theory, mathematics, elementary education, COVID-19

Copyright Page

Dedication

This research is dedicated to the international educators who taught during the COVID-19 pandemic. Thank you for your heroic efforts to maintain continuity of learning and an online social experience during the lockdown for the expatriate communities across the world, often teaching across time zones as students returned to their home countries. You quickly moved from teaching in a physical classroom to teaching online, many of you with only a day's notice and multiple times throughout the year. This research was planned before the pandemic, but the topic pervaded the 2020-2021 school year when this study took place; therefore, it was relevant to include it. Thank you to the educators who did "not grow weary of doing good" during this time (Galatians 6:9, English Standard Version).

Acknowledgments

Thank you to God, my Father, my Creator, my hope, my refuge. Thank you to Jesus Christ for salvation, love, and your example of the perfect teacher. Thank you, Holy Spirit, for your comfort and that you teach us all things. Thank you to my amazing, loving husband, Bill Saba, for your constant support and encouragement and for seeing the gifts God has given me and helping me develop them. Thank you for being my best friend and leading me in learning that "the law of the Lord is perfect, refreshing the soul. The statutes of the Lord are trustworthy, making wise the simple" (New International Version). Thank you to my parents, Scott and Glenda McConaughey, for teaching me in the way I should go and encouraging me to fulfill all that God has for me.

Thank you to Dr. Jerry Woodbridge for your guidance, prayers, and encouragement throughout this process as my dissertation chair. Thank you to Dr. Susan Quindag, my research methodologist, for the detailed feedback you provided and for the joy you share. Thank you to the 12 amazing teacher participants who selflessly volunteered their time and shared their experiences to make this study possible. Thank you to Christina Ontiveros for your friendship and support in reading my proposal and giving your perspective as an elementary educator.

Table of Contents

ABSTRACT 3

Copyright Page 4

Dedication 5

Acknowledgments 6

List of Tables 13

List of Figures 14

List of Abbreviations 15

CHAPTER ONE: INTRODUCTION 16

Overview 16

Background 16

Social Context 20

Theoretical Context 21

Transformative Learning Theory 23

Situation to Self 23

Problem Statement 24

Purpose Statement 26

Significance of the Study 26

Research Questions 28

Central Research Question 29

Sub-Question 1 30

Sub-Question 2 30

Sub-Question 3 31

Definitions 32

Summary 33

CHAPTER TWO: LITERATURE REVIEW 35

Overview 35

Theoretical Framework 35

Transition Theory 36

Experiential Learning Theory 41

Related Literature 44

International Schools 44

Changes in Curriculum and Instruction 46

Defining Curriculum and Instruction 49

Roles in Curriculum Implementation 50

Mathematics Teaching Reform 57

Challenges in Math Reform 58

Transitions in Math Teaching Philosophies 60

Defining Traditional and Reform Mathematics 61

Evidence of Student Achievement 62

Changes in Education Involve a Process 64

Summary 66

CHAPTER THREE: METHODS 68

Overview 68

Design 69

Research Questions 70

Central Research Question 70

Sub-Question 1 70

Sub-Question 2 71

Sub-Question 3 71

Setting 71

Participants 72

Procedures 74

The Researcher's Role 76

Data Collection 77

Interviews 78

Focus Group 81

Journaling 83

Data Analysis 85

Trustworthiness 87

Credibility 87

Dependability and Confirmability 88

Transferability 88

Ethical Considerations 88

Summary 89

CHAPTER FOUR: FINDINGS 91

Overview 91

Participants 91

Abigail 93
Anna 93
Eve 94
Jacob 95
James 95
Leah 96
Levi 97
Luke 97
Lydia 98
Maria 98
Paul 99
Sarah 99
Results 100
Theme Development 100
Theme 1: First-Year Implementation 102
Theme 2: Collaboration 106
Theme 3: International School Differences 111
Theme 4: COVID-19 120
Theme 5: Teacher Perspectives 125
Theme 6: Leadership 129
Theme 7: Professional Development and Training 135
Theme 8: Materials 140
Research Question Responses 146

Central Research Question 147
Sub-Question 1: Situation 148
Sub-Question 2: Support 151
Sub-question 3: Coping 154
Summary 156
CHAPTER FIVE: CONCLUSION 158
Overview 158
Summary of Findings 158
Central Research Question 158
Sub-Question 1 159
Sub-Question 2 159
Sub-Question 3 160
Discussion 161
Theoretical Discussion 161
Experiential Learning Theory 164
Empirical Discussion 166
Implications 173
Theoretical Implications 173
Practical Implications 175
Delimitations and Limitations 178
Limitations 178
Delimitations 179

Recommendations for Future Research 180

Summary 181

REFERENCES 183

APPENDIX A 209

APPENDIX B 211

APPENDIX C 214

APPENDIX D 216

APPENDIX E 220

APPENDIX F 221

APPENDIX G 222

APPENDIX H 223

APPENDIX I 224

List of Tables

Table 3.1 General Participant Information..…..……73

Table 3.2 Grade Levels Taught By Participants 74

Table 4.1 Participant Background..... 92

Table 4.2 Themes And Codes..... 101

Table 4.3 Research Questions And Themes 146

Table 5.1 Research Questions, Themes, And Practical Implications 175

List of Figures

Figure 1.The Experiential Learning Cycle (Kolb, 2015)..... 42

List of Abbreviations

Assessment of Educational Progress (NAEP)

Common Core State Standards (CCSS)

Commonwealth of Independent States (CIS)

Computer-Assisted Qualitative Data Analysis Software (CAQDAS)

English as a Second Language (ESL)

Experiential Learning Theory (ELT)

International School Consultancy (ISC)

Middle States Association – Commissions on Elementary and Secondary Schools (MSA-CESS)

National Center for Educational Statistics (NCES)

National Council for Teaching Mathematics (NCTM)

National Defense and Education Act (NDEA)

Organization for Economic Cooperation and Development (OECD)

Professional Learning Community (PLC)

Program for International Student Assessment (PISA)

Standards for Mathematical Practice (SMP)

Science, Technology, Engineering, and Mathematics (STEM)

The Student Will (TSW)

Zone of Proximal Development (ZPD)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of this single instrumental case study was to research how teachers at an organization of international schools transitioned to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. The mathematics curriculum, in this case, focused on changing mathematics instructional methods used in the classroom as opposed to a change in the content taught. Additionally, the curriculum change involved a shift in philosophy to incorporate a growth mindset to teaching and learning mathematics. The organization of international schools in this study, Fairhart International Schools (a pseudonym), meets the definition of international schools according to some definitions and criteria but uses an American-based curriculum, is accredited by a U.S. association, and the majority of classroom teachers and administrative staff are from and have current licensure in the United States. The revised curriculum implemented was aligned with Common Core Standards for Mathematical Practice and focused on developing a mathematical mindset in students. This introduction first provides a brief background of the relevant literature on curriculum change in a historical and social context and the theoretical background of this study. This is followed by a discussion of the situation to self. Next, the problem is defined, and the purpose of the study is provided, followed by the significance of the study. Then, the research questions are listed, key terms defined, and a summary compiled.

Background

Schools change to provide students with an education that will prepare them to be productive, successful citizens. Schools implement new curricula and instructional methods to serve students best. Fairhart International Schools (FIS) is a private, nonprofit organization that

can choose its own curricula and standards. In today's competitive and evolving world, international schools need to implement change for their continued success (Morrison, 2018). In the current environment of standardized testing, globalization, and economic competition, nations compare test results, specifically, in math as an indicator of academic success. In 2012, the Program for International Student Assessment (PISA) results showed U.S. students ranking below average in mathematics. A weakness found among students in the United States included applying mathematical terms and interpretations to real-world situations (OECD, 2012). Although an international school, the site of this research is an American international school making U.S. results impactful.

The traditional method of teaching with its emphasis on rote memorization and repetition has needed revision as a new generation is being prepared for a rapidly changing world. As technology advances, new skills are needed in the workplace, which requires a transition in how students are being taught in schools. Teaching in a revised manner requires a change in mindset on behalf of educators, and this change of mindset is a transitionary process. In his book, The New Meaning of Educational Change, Michael Fullan (2016) writes of the need for "reculturing" in education, where teachers' beliefs and habits are changed, as opposed to the superficial "restructuring" that so often occurs when changes are implemented in education. A better understanding of how educators transition to using new instructional methods would be beneficial to various stakeholders in international schools, including administrators, educators, students, and parents but may also apply to all schools.

Historical Context

Reform in schools has become a global event (Alvunger, 2018). Education reform is not new. The industrial revolution of 1900-1920 brought a demand from business owners that

students be educated to become functional, productive workers (Wiles & Bondi, 2011). A structured school system with objectives, standards, and testing was implemented to accomplish this objective (Wiles & Bondi, 2011).

After the Soviet Union launched the first satellite in 1957, the National Defense and Education Act (NDEA) was issued to implement science and math reform in the United States (Tampio, 2017). During the 1950s and 60s, there were changes in pedagogy introduced to the education system. However, many of these ideas failed in implementation, lacking meaningful change in the classroom (Fullan, 2016). Despite good intentions for change in education during the civil rights movements of the 1960s, there were only isolated cases of improvement for the disadvantaged (Fullan, 2016).

In 1983, the Secretary of Education, Terrell H. Bell, renewed the call for education reform by appointing a National Commission on Excellence in Education. The commission's report, A Nation at Risk: The Imperative for Educational Reform, attributed a decline in productivity in the United States at least partially to poor academic performance in the nation's schools, and curriculum reform was recommended (National Commission on Excellence in Education, 1983). However, the report did not include what to do or how to change (Fullan, 2016). Despite this, in the 1980s, educators saw a series of educational reforms in many states, including increased academic requirements for high school graduation and the implementation of proficiency tests for academic skills (Gutek, 1995).

Next, in the early 1990s, standards-based education emerged, and the National Council for Teaching Mathematics (NCTM) introduced the Professional Standards for Teaching Mathematics, redefining elementary mathematics with new goals and improvements for teaching math (NCTM, 1991). Then, in 2000, the Organization for Economic Cooperation and

Development (OECD) began testing students worldwide in math, reading, and science using the Program for International Student Assessment (PISA) (Ansari, 2016). According to OECD (2012), PISA assesses student preparedness for participation in society by having students apply their knowledge to unfamiliar situations. This application of knowledge in new circumstances parallels the need in the modern world to apply knowledge rather than simply have knowledge (OECD, 2012). PISA results have provided a tool for countries to compare education status with each other. When a country compares their scores and falls below others, politicians and citizenry believe math is failing in their country and that education needs reform (Ansari, 2016). The early 2000s also saw the No Child Left Behind government initiative introduced by President George W. Bush, which emphasized the individual child but lacked guidance for accomplishing its goals (Fullan, 2016).

Recent reform in the United States revolved around Common Core State Standards (CCSS). Released in 2010, CCSS were adopted by more than 40 states (Polikoff et al., 2020). The CCSS aimed to promote the higher-order thinking skills among students deemed necessary for the 21st century (Parkay et al., 2014). A study comparing CCSS standards and the 2009 New Jersey high school curriculum standards found the previous standards to have more connections to the use of higher-order thinking skills (Sforza et al., 2016). Although many states have moved away from using the CCSS, the movement has aimed to promote higher-order thinking skills in the classroom and raise the standards for learning in schools. Polikoff (2015) concludes his study on textbook alignment with CCSS-mathematics by saying there is insufficient research on standards transition in mathematics.

The historical trends for change are echoed in today's calls for educational reform based on technological changes and increasing globalization. Reform and change in education are not

new and are not going away. Intended changes in education have a history of failure, and the consequences of failed reform include decreased economic growth and less social cohesion (Fullan, 2016; Putnam, 2015). Therefore, educators need to better understand the transitionary process teachers go through to implement change effectively.

Social Context

Within a social context, an additional influence in education reform recently has been from the field of psychology, including the work of Carol Dweck and Angela Duckworth (Duckworth, 2017; Sparks, 2013). Duckworth (2017) has highlighted the importance of the trait of grit in finding success. Dweck (2016) has conducted research and advocates teaching students to have a growth mindset or belief that through effort and assistance from others, a person's essential qualities can be cultivated and changed. Math is an area where many people think rigidly regarding their ability to improve and believe they are either a math person or not (Boaler, 2016). A person with a growth mindset towards mathematics believes everyone can grow and develop ability in math with effort, use of strategies, and support from others (Boaler, 2016; Dweck, 2016). Learners with a growth mindset towards mathematics, or mathematical mindset, as Boaler (2016) calls it, are willing to engage in risk-taking, struggle to solve a problem, listen to others, and make mistakes. Teachers who have a mathematical mindset give students challenging work and encourage students in their mistakes, teaching them to learn from them (Boaler, 2016). They teach math openly and creatively without focusing on right and wrong answers but the connections, sense-making, and mathematics questions (Boaler, 2016).

The social context of this study included all members of the learning community, as changes in mathematics instructional methods affect administrators, teachers, students, and parents (Aas, 2017; Thomas & Cooper, 2016). Overseas schools are in the unique position of

being able to draw from a variety of resources and best practices and provide a unique perspective on the topic of transitioning to revised instructional strategies, including implementing them in the context of an internationally diverse study body. Elementary school years are foundational to student learning and are an important segment of education to research.

Theoretical Context

Two theories will provide the theoretical framework for this study: transition theory by Schlossberg (1981) and experiential learning theory by Kolb (1984). Transition theory by Schlossberg (1981) was chosen as the focus of this research was teachers in transition, and experiential learning theory by Kolb (1984), was chosen because teachers progressed through the learning cycle alternating between experience and reflection. To provide further theoretical context for this study, three additional theories are highlighted below that relate to this study. The first are the constructivist theories of cognitive and social constructivism formed by Jean Piaget and Lev Vygotsky, the second is self-regulated learning theory, and the third is transformative learning theory.

Constructivist Theories

Constructivist theories are foundational for mathematics learning and include Jean Piaget's theory of cognitive constructivism and Lev Vygotsky's (1978) theory of social constructivism (Simon, 2009). Understanding constructivist theories helps with understanding the changes being made in how mathematics is being taught. Current literature and changes in mathematics have their foundation in Vygotsky's Zone of Proximal Development (ZPD) and emphasize scaffolding, where the teacher is the guide and socialization is used to develop mathematical language (Barwell, 2016; Slavin, 2012; Walshaw, 2017). This approach of constructivist thinking applied to mathematics allows students to discover how to figure out the

solution (Slavin, 2012). The constructivist approach draws from Vygotsky's theory that complex tasks should be given to students with enough support from teachers to guide them through it (Slavin, 2012).

Jean Piaget (1959) was also against education being focused on memorizing procedures but advocated teaching students to discover the relationships between ideas (Boaler, 2016). Current research on cognitive development is often rooted in Piaget's work, including the cognitive stages of development, cognitive organization, adaptation, and equilibrium (Miller, 2011). Cognitive equilibrium is dynamic rather than static (Miller, 2011). This parallels the understanding one would have with a growth mindset rather than a fixed mindset. Students go from points of equilibrium when things fit together to disequilibrium when they come across something new that does not fit in their frame of understanding, and students will then struggle to find their way to equilibrium again through the process of assimilation and accommodation (Boaler, 2016; Miller 2011).

Self-Regulated Learning Theory

Another theory important to establishing the context of this study is self-regulated learning theory, where a self-regulated learner actively pursues their learning and manages stress to recover and continue learning (Shanker, 2016; Zimmerman & Schunk, 2001). Motivation is a crucial precursor to self-regulation, and a students' perception of their control over academic achievement contributes to their motivation (Schunk & Zimmerman, 2008). A student who believes an increase in effort will change an outcome will have more significant self-regulated learning than a student who believes their ability cannot be changed (Schunk & Zimmerman, 2008). These ideas are foundational to Dweck's (2016) ideas of growth and fixed mindsets and,

subsequently, Boaler's (2016) mathematical mindset. These are part of the context of the mathematics transitions happening at the site of this research.

Transformative Learning Theory

The context of adult learning theories also forms an important part of this research as the way adults learn in a professional environment is being explored. Kolb's (1984) experiential learning theory is used to frame this study, and closely related is Mezirow's (1991) transformative learning theory, an adult learning theory related to the experience of the teacher participants. In transformative learning theory, learners go through a "disorienting dilemma," meaning a new experience that does not fit into their prior worldview (Johnson & Olanoff, 2020; Mezirow, 1991). The learner must then critically reflect on the experience, often through dialogue with others, to work this experience into their beliefs and prior experience (Johnson & Olanoff, 2020; Mezirow, 1991). Teacher participants in this study will be working through developing a new mindset towards teaching mathematics as they implement a revised curriculum in their classrooms.

Situation to Self

My desire for conducting this research comes from my experience as an elementary teacher watching fellow teachers and experiencing for myself the struggle to implement new teaching methods. This motivated me to contribute to the body of knowledge on how to best implement change in schools. I often hear frustration from parents, as the way math is being taught is different from how they learned math and how it is challenging for them to help their child with math. I chose mathematics to focus on for this study as a model for how teachers transition through change since it has gone through a distinct transition in recent years.

Human researchers have beliefs and assumptions and must be aware of them during their

research (Creswell & Poth, 2018). The interpretive framework for this study was based on social constructivism. Those with a social constructivist viewpoint have the goal of better understanding the world in which they live and work (Creswell & Poth, 2018). My goal was to better understand how teachers transition to using a revised curriculum. Within a social constructivist framework, I looked to discover the participants' view of their situation and how their background shaped their interpretation (Creswell & Poth, 2018). My ontological beliefs also align with social constructivism regarding research, as I see participants as having different realities based on their experiences (Creswell & Poth, 2018). Epistemologically, my views towards research also align with social constructivism, where co-constructed knowledge is formed by the experiences of the researcher and the participants (Creswell & Poth, 2018). I also believe in respecting the values of each individual in my study, which forms my axiological perspective towards research and also aligns with a social constructivist viewpoint (Creswell & Poth, 2018).

Problem Statement

The problem is, when schools transition to using a new curriculum, the majority of curriculum failure occurs during the phase of implementation in the classroom. According to Wiles and Bondi (2011), 90% of curriculum work failure happens in the implementation stage. Without proper support, teachers in a four-year study abandoned the use of new classroom patterns and materials associated with curriculum reform (Hemmi et al., 2018). In large-scale national curriculum reform, minimal attention has been paid to the impact on the school personnel implementing the standards (Porter et al., 2015). Problems cited by researchers include a lack of curriculum fidelity in curriculum implementation and scarce integration of curriculum innovation in actual classrooms (Chalkiadaki, 2019; Nevenglosky et al., 2019). The

continual change in schools can cause teacher fatigue, decreased student enjoyment, and inconsistencies during the transitionary process (Dilkes et al., 2014; Leavy et al., 2017; Martinie et al., 2016). Change in schools is a current topic of research in the field of education as it affects student learning and teacher retention (Dilkes et al., 2014; Leavy et al., 2017; Martinie et al., 2016).

Education reflects society. Educators seek to teach what are deemed by society to be the critical skills students need for a successful future (Parkay et al., 2014). As values change and technology advances, new skills are needed. Educators are expected to adapt to changes in curricula and instructional strategies as schools are consistently changing and improving. The skills necessary in the 21st century include collaboration, communication, problem-solving, and critical thinking (Voogt & Roblin, 2012). These skills are being applied across the subjects, including mathematics.

International schools are in the unique position of being able to draw from a variety of best practices and the latest research to form the curriculum for their schools. Few studies provide an in-depth understanding of the transitionary process of how curricular and instructional changes are being made in mathematics (Hemmi et al., 2019; Polikoff, 2015; Swars & Chestnutt, 2016). The most closely related study explores the experiences and perspectives of elementary teachers transitioning to using Common Core State Standards for Math in an urban, high-needs school (Swars & Chestnutt, 2016). Other studies focus specifically on the benefit of math coaches during times of mathematics transition in schools (Bengo, 2016; Hopkins et al., 2017). Additional studies focusing specifically on math transitions were done in early childhood, middle school, high school, or college settings (Jarvis, 2016; Kensington-Miller et al., 2014; Kim, 2019; Piasta et al., 2015). Furthermore, a few studies focus on teacher transition across multiple

subjects, including math (Al Salami et al., 2017; Dilkes et al., 2014; Porter et al., 2015). This study looked at the case of an organization of international schools. Through interviews, focus groups, and journaling, an analysis was formed as to how teachers transition from using one curriculum to another to explore in-depth the implementation phase of a curriculum rollout.

Purpose Statement

The purpose of this single instrumental case study was to research how teachers at an organization of international schools transitioned to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. For this study, transitioning to a revised mathematics curriculum was defined as the process an educator goes through to change the way mathematics is taught in the classroom. This process included looking at support, strategy, situation, and the self and how teachers use experience and reflection to implement the new curriculum. The theories guiding this study were transition theory by Schlossberg (1981), as the focus of this research is teachers in transition, and experiential learning theory by Kolb (1984), as teachers progressed through the learning cycle alternating between experience and reflection.

Significance of the Study

Characteristics of an exemplary case study include being of general public interest and national importance in some way (Yin, 2018). This research is significant nationally and internationally, as schools worldwide seek to change their mathematics instructional methods. The site of this research was four international schools under the same organization of schools. The significance of this study is that with the continuing pattern of change in schools' curricula

and instructional methods, this study adds knowledge of how to transition to the implementation of these changes most effectively.

The practical significance of this study includes other educators, especially administrators, can use the data collected and analyzed to prepare, assist, and execute a smoother transition between changes in mathematical instructional methods for educators and schools. Any teacher in transition could potentially benefit from the findings of this research, as it gives a better understanding of how teachers progress through a transition. Administrators and organizations of schools will have an easier time rolling out and implementing curricula when they understand how teachers transition to using a new curriculum. The support teachers need can then be planned for and given when it is needed. Professional development sessions can be more focused to provide what teachers need in times of transition. Pre-service and in-service teachers can be taught how to best transition when a school rolls out a new curriculum they need to learn and implement in their classrooms. Pre-service and in-service teachers should be aware of the many transitionary phases they will go through as educators and have resources in their toolkit from their education to draw from when they encounter transitions and changes in the curricula they are to teach. This study contributes to the body of knowledge on best practices in implementing change in education as there is a gap in the literature regarding the perspectives of educators who are making instructional shifts in mathematics.

The empirical implications of this study include providing a framework for other researchers to replicate or build on this study (Yin, 2018). This study will add to the body of knowledge on the transition of curricula and instructional methods, particularly mathematics (Swars & Chesnutt, 2016). School leadership, teachers, students, and parents' lives can be improved from the results of this case study.

Observations from this research can contribute to international school leaders' understanding of how to best roll out a new curriculum to teachers. International schools seek to provide consistency for students. Many students at international schools already experience change as they are not living in their home country, and added change has a history of being unhelpful in the international school context (Gardner-McTaggart, 2018).

Teachers' perspectives of the transitionary process aided in better understanding what teachers need and want during a transition between one curriculum and another. Teachers' roles and attitudes in transition are highly significant as they are the players implementing the curriculum in the classroom (Hemmi et al., 2019; Kondakci et al., 2017; Remillard & Kim et al., 2017; Salminen & Anneverta, 2016). Observing patterns is a vital part of case study research, and the patterns of success for teachers in times of transitional change in curriculum and implementation can assist other schools in finding success in this process (Yin, 2018).

Regarding theoretical significance, it has been suggested from the literature that further research on the topic of teachers in curriculum transition use Schlossberg's (1981) transition theory as a theoretical framework would be beneficial (Jonker, März, & Voogt, 2018). Other recent doctoral candidates have applied transition theory to the field of education studying the transition of troops to teachers, secondary teachers teaching English language learners for the first time, and educators transitioning from classroom teacher to instructional coach (Brown, 2019; Carmen, 2019; Graham, 2019).

Research Questions

The research questions for this study are based on the theoretical framework of Schlossberg's (1981) transition theory. The transition model has three major parts that include "approaching transitions, taking stock of coping resources: the 4 S system, and taking charge:

strengthening resources" (Anderson et al., 2011, p. 38). Approaching transitions focuses on defining the transition, and this is covered in the introductory first three chapters of this study: the overview, the literature review, and the methods chapters. For the research portion of this study, the focus is on "taking stock of coping resources: the 4 S system" (Anderson et al., 2011, p. 38). The analysis and recommendations of this research can enable educators going through future transitions to a new or revised curriculum to take charge and strengthen their resources. Schlossberg's (1981) 4 S system consists of four factors affecting how a person deals with change: a) situation, b) self, c) support, and d) strategies. These four elements were used to frame the research sub-questions.

Central Research Question

The central research question was: How do elementary educators at an organization of international schools transition to using a revised mathematics curriculum? The central research question restates the study's purpose and focuses on international schools' transition to using a revised curriculum and instructional methods in mathematics. The purpose of this question was to better understand how elementary educators change to using a different way of teaching in their classroom. This question focuses specifically on educators in international schools and was meant to understand how teachers in international schools are in a unique setting to experience this transition. Schools frequently change curricula and instructional methods practices, and teachers need to learn how to teach in new ways when these changes are made. Curriculum change has become a global occurrence as governments worldwide are making education reform a priority (Alvunger, 2018; Meyer & Benavot, 2013). Successful reform involves new thinking and acting for educators (Anagnostopoulos et al., 2018). Teachers are given a new teaching idea and often feel they are left to implement it without resources or support (Clapham & Vickers,

2018). Teachers are generally reluctant to make curricular changes (Harris & Graham, 2019). However, motivation to change is connected to a willingness to change (Zeid et al., 2017). The purpose of the central research question was to explore how teachers process through transitions regarding curriculum and instruction, which is important for providing future motivation and support for teachers going through similar transitionary times.

Sub-Question 1

Sub-Question 1 was: How did situational factors affect teachers' transition to a revised math curriculum? This research sub-question stems from the 4 S element of "situation". According to Schlossberg (1981), situation includes factors as how the transition is viewed, sense of control, previous experiences, role change, and other stressors happening in addition to the transition. For the focus of this study, these elements translated into questions establishing teachers' perceptions of the transition, whether positive or negative, sense of control over the transition, previous connections, training, or implementation of elements of the revised curriculum. The exploration of the situation included determining how involved teachers were in the transitionary process, how the goals of the transition were articulated, and how the transition was introduced to teachers. Knowledge of the reasoning behind the change has been influential on the effectiveness of the process of change (Hemmi et al., 2019; Kondakci et al., 2017). The purpose of this question was to determine how the situation affected the curriculum rollout.

Sub-Question 2

Sub-Question 2 was: How were teachers supported throughout the transition to a revised mathematics curriculum? This second sub-question looked at how teachers were supported in reflective observation, abstract conceptualization, and active experimentation portions of Kolb's (1984) experiential learning cycle while implementing the curriculum. Additionally, this sub-

question is aligned with the 4 S factor of support. Support includes the options of help available to the individual in transition (Schlossberg, 1981). In transition theory, support consists of affect, affirmation, and aid, to which honest feedback was added (Anderson et al., 2011). Key elements included for the purpose of this study were, from affect, the idea of respect as support, and from affirmation, agreement, and appropriateness, and from aid, information and time, and then getting feedback. The questions for teachers from these points sought to ascertain the assistance available through such resources as professional development and training, feedback, and advice. These factors help teachers receive the affirmation that they are transitioning effectively and aid them in transitioning. The types of support, the support system, and whether teachers got what they needed were explored through this question. Based on the findings of other studies on the topic of teachers using a new instructional strategy, collaboration, professional development, and reflection have helped support teachers (Al Salami et al., 2017; Dilkes et al., 2014; Gerstenschlager & Barlow, 2019; Kaiser, 2013; Lotter et al., 2018; Nevenglosky et al., 2019; Porter et al., 2015). Professional development opportunities can also help teachers use a new instructional strategy (Lotter et al., 2018; Nevenglosky et al., 2019). Further discussion is provided in the literature review. This research sub-question sought to determine whether this remains true for teachers in this study and what other supports were helpful for elementary teachers transitioning to a revised mathematics curriculum at international schools.

Sub-Question 3

Sub-Question 3 was: What coping strategies did teachers use to transition to the revised mathematics curriculum? This question aligns with Schlossberg's (1981) 4 S factors strategy and self. Transition is navigated and coped with differently by different individuals. This

question sought to determine the strategies used by individual teachers to transition to using a new curriculum. This question looked at how teachers move through Kolb's (1984) experiential learning cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation in a more personal, individual way. Although the teaching profession is becoming increasingly more collaborative, teachers must still transition as individuals and work to implement new curricula in their classrooms. According to Schlossberg, the self variable focuses on how the individual is different from others, their belief in the effectiveness of their actions, and their sense of purpose and meaning regarding the transition. This was combined with determining the strategies teachers use as they transition to using the new curriculum. Strategies are the coping mechanisms used, and this question focused on the resources teachers chose to use when they experienced difficulty and the collaboration and advice-seeking they engaged in during the transition process and working through the learning cycle.

Definitions

Several terms are valuable to define for this study.

1. *Curriculum* – The word curriculum has been around since the early 1800s from the Latin root word "currere," meaning "to run" or "to run the course," it is the learning plan including the experiences and intended outcomes for a course of study (Wiles & Bondi, 2011, p. 3). The curriculum is what is taught (Parkay et al., 2014).
2. *Growth Mindset* – Thinking that even though everyone is different, we can all change and grow through efforts and experience (Dweck, 2016).
3. *Instruction* – Instruction is how the curriculum is taught and is the application of the curriculum adjusted to fit within the variables of individual learners and classrooms (Parkay et al., 2014; Wiles & Bondi, 2011).

4. *International School* – A non-profit school not in an English-speaking country where the majority of students are children of a mix of culturally diverse expatriate parents who are working in the location for an assignment of a year or more and where English is the primary language of spoken and written instruction and communication at the school (Bunnell et al., 2016).
5. *Mathematical Mindset* – An understanding that the student's role in mathematics is as a learner, growing and thinking in new ways (Boaler, 2016).
6. *Traditional Approach* - A method of teaching that focuses on the teacher providing the information and explanations to the students, and students play a passive role of reproducing what they have been taught (Boaler & Selling, 2017).
7. *Transition* – Transition is a change that involves leaving a set of assumptions and developing new assumptions to assist in coping with something new (Parkes, 1971).

Summary

The purpose of this single instrumental case study was to research how teachers at an organization of international schools transitioned to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. The problem is, when schools transition to using a new curriculum, the majority of curriculum failure occurs during the phase of implementation in the classroom. This chapter has informed the reader of this study's background, problem, purpose, and significance. It also addressed the research questions, with the central research question being: How do elementary educators at an organization of international schools transition to using a new mathematics curriculum? The answers found in this study contribute to the body of knowledge on change in schools and can affect administrators, teachers, students, and parents by assisting in making the

transition process of implementing a new or revised curriculum a more streamlined and effective one.

CHAPTER TWO: LITERATURE REVIEW

Overview

This literature review focuses on the research related to changes in curriculum and instruction in schools. The specific focus of the changes in curriculum and instruction is on the subject of mathematics. The theoretical framework for this study was developed using Schlossberg's (1981) transition theory and Kolb's (1984) experiential learning theory. These theories are discussed in detail regarding their relevance to the proposed research. This chapter first discusses the theoretical framework involving these theories. Next, a synthesis of the related literature is provided. This includes discussions of the literature on international schools, changes in curriculum and instruction, the role of leaders and teachers in that change, literature on math reform specifically, and the successes and challenges of change in schools. Finally, the literature specific to the changes being made at the site of the study is discussed. These include the incorporation of a growth mindset and a mathematical mindset into the math classroom. The body of knowledge on curricular and instructional change in schools is extensive, is a relevant topic in education today, and helps provide an understanding of how to best implement change. However, the literature available lacks a discussion of changes in elementary schools and an effective portrayal of the elementary educators' voice, particularly in international schools. Additionally, there is a gap in the literature regarding instructional methods shifts, as the focus of the literature is on curriculum changes specifically.

Theoretical Framework

The theoretical framework for this study was based on transition theory developed by Nancy Schlossberg (1981) and experiential learning theory developed by David Kolb (1984). The following section on the theoretical framework of this study provides an overview of

transition theory and experiential learning theory along with a brief introduction of the literature on these theories including a discussion of how they have been applied to the field of education. A discussion of how curriculum change is a transitionary process is also included. The aim was to show how transition theory and experiential learning theory are applicable to this study.

Transition Theory

Transition theory, developed by Schlossberg (1981), examines adults' transitionary process to adapt to change. Schlossberg's (2011) desire to research transition began with her experiencing a challenging geographical move. Her work studying transition has come to focus on work transitions (Schlossberg, 2011). Schlossberg (1965) first presented the framework of her transition model in 1965 during a conference for counselors of adults, and she continued to refine and develop the model leading to transition theory. The theory outlines the influences that affect an adult in transition and shows how transition is an ongoing process with phases (Anderson et al., 2011). Transition can be defined as "any event or non-event that results in changed relationships, routines, assumptions, and roles" (Anderson et al., 2011, p. 39). Today's culture is one of change, and this has influenced many sectors of society, including education (Goodman et al., 2006). Teachers' instructional strategies become routine to them as they are based on their own culture and pedagogical traditions (Andrews, 2007). Thus, changing the traditions of ingrained instructional strategies becomes a transitionary process when teachers must change from one type of instructional method to another. Transition theory applies to this study because teachers were asked about their experience transitioning from one curriculum to another, their perceptions of the transition, and their past and current experiences.

Every transition requires those going through the transition to find ways to cope with the transition (Anderson et al., 2011). According to transition theory, the influences on the

transitionary process include the individual's perception of the transition, characteristics of the pre-transition and post-transition environments, and the characteristics of the individual (Schlossberg, 1981). These constructs have been formulated into 4 S's: Situation, Self, Support, and Strategy (Anderson et al., 2011). The following four paragraphs describe the 4 S's in more detail, as these elements were used to form the questions for this research.

In transition theory, situation addresses what is happening concurrent to the transition (Anderson et al., 2011). Situation can include experience with a similar transition, a change in roles, and how informed and involved the person is in the transition (Anderson et al., 2011). Developing an understanding of the situation involves analyzing the individuals' attitude and how the person assesses the transition: positive, negative, or benign (Anderson et al., 2011). For example, for two adults going through the transition to retirement, one could see the transition positively due to increased freedom, but the other could see it negatively as a step closer to the end of life (Anderson et al., 2011). Teachers in this study had positive, negative, and benign perspectives towards the transition to the revised mathematics curriculum. Exploring the details of the situation also consisted of understanding the other stresses happening simultaneously with the transition (Schlossberg, 2011).

Next, the construct of self in transition theory addresses the specifics of the individual going through the transition (Anderson et al., 2011). When seeking to understand how the "self" affects a person coping with transition, questions are asked around whether the individual feels in control and whether they think their actions will affect the outcome (Anderson et al., 2011). Another construct of exploring self is discovering if individuals feel they have a meaning and purpose in the transition (Anderson et al., 2011). The individual's level of involvement in the transition also affects optimism and resiliency in transition (Schlossberg, 2011).

Thirdly, support relates to the resources available to the individual (Anderson et al., 2011). In seeking to understand support, counselors ask questions about what a person receives in their support system (Anderson et al., 2011). Sources of support can include aid and assistance, expressions of liking, admiration, respect, love, affirmation, and honest feedback (Anderson et al., 2011).

Finally, the element of strategy involves looking at how the individual copes with and navigates through the transitionary process (Anderson et al., 2011). Even when the transition is seen as positive, it can still bring on stress and require coping mechanisms (Schlossberg, 1991). For strategy, counselors look at a person's self-reliance and advice seeking, what they do with challenges, and how they express and vent their feelings (Anderson et al., 2011). Self-efficacy plays a role in coping effectively, as optimism regarding solving a problem assists in coping more effectively (Anderson et al., 2011). Understanding past experiences and current resources is important in determining an individual's self-efficacy and coping abilities (Anderson et al., 2011).

This research showed that as teachers change from using one curriculum to another, they are progressing through a transition that takes time. As seen in Schlossberg's (1981) transition theory, people in transition can benefit from support and coping strategies, and the findings of this research further develop the understanding of the process of how teachers make a transition, the support and strategies that benefit during their transition, and how the situation and self affect their responses. These elements are directly in line with Schlossberg's 4 S system of coping with transition: situation, support, strategy, and self (Anderson et al., 2011).

Although developed by and for counselors, transition theory has been used in studies in the field of education (Flowers et al., 2014; Karmelita, 2018). Transition theory was used as a

framework to study the role of institutions in veterans' transition to higher education (Griffin & Gilbert, 2015). The study identified transitional barriers and resources needed to help facilitate better transitions for this population of students, in addition to finding that student perceptions of the transition affected their needs and interests towards outreach efforts (Griffin & Gilbert, 2015). In another study, university student athletes' perceptions of their transfer experiences were studied using Schlossberg's transition theory as a framework (Flowers et al., 2014). Karmelita (2018) used transition theory as a framework to explore the social interaction of adult learners transitioning to college and found that participation in a transition program served to build relationships for social support and led to a positive shift in self-perception.

As mentioned in the introduction, other recent doctoral candidates have successfully used transition theory in their dissertations in the field of education (Brown, 2019; Carmen, 2019; Graham, 2019). Brown (2019) used the 4 S's of transition theory to analyze participants' experiences in the Troops to Teachers program. The researcher found the challenges and strategies applied towards success and suggested how the challenges could be mitigated in the future (Brown, 2019). Carmen (2019) applied Schlossberg's theory to understand the experiences of general education teachers transitioning to teaching English language learners and found relationships between students and fellow teachers, utilization of strategies, and further training to be important to these teachers during the transition process. In a phenomenological study of teachers transitioning to becoming instructional coaches, Graham (2019) found relationships mattered, the transition was challenging but rewarding, there is a need for change, and teachers need support.

Further, in a study on teachers transitioning from a face-to-face curriculum to a blended curriculum, researchers suggested that future research based on teachers experiencing curriculum

transition could use of the framework of Schlossberg's transition theory to guide the focus of the research questions (Jonker et al., 2018). The study, done at a teacher training college in the Netherlands, focused on the effects of curriculum change on teacher educators' professional identity (Jonker et al., 2018). Findings included teacher identity is under tension during curriculum change, flexibility is important, teachers who felt they had the knowledge and skills needed, or felt they were able to develop them, were more likely to accept the change in curriculum, and teachers use different strategies to cope with change (Jonker et al., 2018). Suggestions from this study include not holding all teachers to the same timeline because people respond differently and support is needed in curriculum transition but does not have a "one size fits all" solution (Jonker et al., 2018).

Furthermore, Schlossberg's transition theory was used to study the transition of second-career teachers into the field of teaching (Gordon & Newby Parham, 2019; Haim & Amdur, 2016). Gordon and Newby Parham (2019) used the 4 S's of transition theory to frame and interpret the experiences reported by two first-year teachers transitioning from the military and found their mentors provided valuable professional support and they both missed the structure and teamwork of the military. Haim and Amdur (2016) used transition theory as a framework to understand second career teachers' shared perceptions of the challenges, concerns, and support provided during their first year as teachers. The workload, emotional toll, relationship building with students, and classroom teaching were among the main concerns expressed (Haim & Amdur, 2016). All of these studies support the use of Schlossberg's theory in studying the transition of teachers.

Experiential Learning Theory

Experiential learning is a philosophy of education based on Dewey's (1938) theory of experience (Kolb & Kolb, 2017). The term experiential learning theory (ELT) was first published in 1984 by David Kolb having its roots in Dewey's (1938) exploration of the influence of experience on learning and an experience continuum where one experience generates another. Another influencer of Kolb and ELT was Piaget (1952) and his work on experience and cognitive development. Kolb was also influenced by Kurt Lewin's (1951) learning cycle that had more steps than the four in ELT (Dyke, 2017). Later, Zull (2002) researched how the learning cycle of ELT aligns with natural neurological structure and physical changes in the brain when learning occurs. Kolb's research has focused on post-schooling and how learning continues in the workplace, which is full of opportunities to improve and refine practice (Kolb, 2015). Since ELT is in the category of adult learning theory, or andragogy, it applies to this study of adult teachers learning to apply a revised curriculum in their workplace, the classroom.

The experiential learning cycle is a cycle of transforming experience into knowledge with four reoccurring steps of experiencing, reflecting, thinking, and acting, otherwise described as concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb & Kolb, 2018). The experiential learning cycle of the ELT contrasts with the traditional linear model of learning, where knowledge is transferred from teacher to learner (Kolb & Kolb, 2018). It gives a process of learning by doing as it links theory and practice by showing how learners make meaning from new experiences (Li et al., 2019; Reshmad'sa & Vijayakumari, 2017). The cycle shows how knowledge is constructed through direct experience and focused reflection (Li et al., 2019). This process of knowledge construction goes through the four stages of concrete experience (CE), reflective observation (RO), abstract conceptualization

(AC), and active experimentation (AE) as seen in Figure 1 (Kolb, 2015). Learners have a new experience (CE), next they review and reflect on the experience (RO), then this reflection brings a new idea or a modification (AC), and the learner applies this new idea or modification planning and trying it out (AE) (Reshmad'sa & Vijayakumari, 2017). The ideal cycle of learning involves all four parts of the learning cycle (Kolb, 2015).

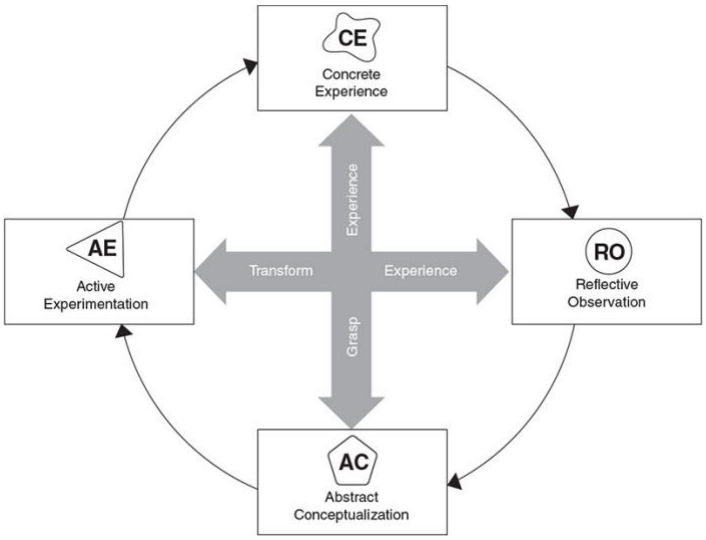

*Figure 1.*The Experiential Learning Cycle (Kolb, 2015)

Reprinted by permission of **Pearson Education, Inc.** (See Appendix I.)

Experiential learning theory has been used widely in education settings, from individual classrooms to curriculum design and national education policies and standards (Kolb & Kolb, 2018; Luciano et al., 2016). Higher education has had a recent high demand for experiential learning (Heinrich & Green, 2020). Experiential learning theory has been used in many fields, including instructional design, business education, health and medical education, vaccine management, eco-education, developing religious and cultural heritage, service learning, and teacher education (Angelopoulou & Kavvadia, 2018; Dyke, 2017; Farber & Bishop, 2018; Gross & Rutland, 2017; Hill, 2017; ; Hoffman & Silverberg, 2015; Huang et al., 2016; Kartoglu et al., 2017; Luciano et al., 2016; McCarthy, 2016; Perusso et al., 2019). The use of ELT as a model of

learning has been successful in health education in course design and clinical skill acquisition, resulting in increasing pass rates and facilitating lessons not able to be taught in the traditional classroom (Hill, 2017; Hoffman & Silverberg, 2015). Experiential learning has been shown to increase learner engagement, provide deep, constructive learning, and support robust learning outcomes (Dyke, 2017; Gross & Rutland, 2017; Heinrich & Green, 2020; Hoffman & Silverberg, 2015; Li et al., 2019; Ng et al., 2019). It was effectively built the pedagogical skills of pre-service teachers and has helped teachers be more reflective and proficient in various teaching tasks (Reshmad'sa & Vijayakumari, 2017).

Reflection is a vital piece of the cycle, which unlocks learning when it is purposefully directed (Hughes & Scholtz, 2015; Kuk & Holst, 2018). Cowan (1998) provided details of a reflection process, including reflection for, in, and on action. Reflection for action is a process of reflection done prior to an experience, reflection in action is reflecting during the experience, and reflection on action is the reflection done after the experience (Cowan, 1998; Hughes & Scholtz, 2015). For the purpose of this study, the process of reflection was applied specifically to the journaling piece of data collection, where teacher participants reflected for, in, and on action as they worked through the experience of teaching a revised curriculum. Reflecting for, in, and on action also applies to the three research sub-questions that pertain to curriculum introduction and situational factors (reflection for action), support during the transition (reflection in action), and coping strategies used to make the transition (reflection on action). Participants cycled through all four parts of the learning cycle during their transition to using the revised mathematics curriculum, and questions and prompts reflected the cycle described in experiential learning theory.

Related Literature

This review of the related literature begins with a discussion of international schools and then how curriculum and instruction have changed in recent years. This section also discusses how curriculum and instruction are defined and connected. Within this discussion of change, research on the roles of the various players involved in transitioning to a new curriculum or instructional method, including leadership and teachers, is presented. The literature presented is not only on mathematics curriculum transition but from the many fields of general education, which is often done in research in mathematics education (Nortvedt & Buchholtz, 2018). Finally, the literature on the reform in mathematics is looked at and is categorized by successes and challenges. This review of the literature shows that there is a significant amount of literature on the topic of changes in curriculum in schools, but the literature is minimal regarding specific subjects, such as math. The literature is also limited regarding elementary educators and their experiences implementing new instructional methods in the classroom and lacks a discussion of these experiences in international schools.

International Schools

After WWII, there was an expansion of English-speaking international schools as American and British families went abroad for job opportunities in government, United Nations, and multinational corporations (Hobson & Silova, 2014). International schools are growing exponentially with increasing globalization and the ease of relocating overseas (Bunnell, 2016; Hrycak, 2015). According to International School Consultancy (ISC) data, over 11,000 international schools worldwide have over 500,000 staff serving close to 6 million students (ISC, 2020). In the current competitive, changing world, international schools need to implement

change for their continued success (Morrison, 2018). Despite the growth of international schools, there is no research on implementing curriculum change in this category of schools.

The international school is somewhat difficult to define (Bunnell, 2014; Hill, 2016). The ISC provides a broad yet simple definition of a school not in an English-speaking country, providing a curriculum at least partly in English (ISC, 2020). However, Hill (2016) defined an international school as "an organization that offers its students an international education through the medium of its curriculum, its planned learning" (p. 8). In further expanding the definition, Bunnell et al. (2016) included membership in an international association of schools in their criteria for defining an international school. FIS is accredited through the Middle States Association of Schools, a U.S.-based accrediting agency, and the schools in this study are members of the Central and Eastern European Schools Association (CEESA), an organization of schools sponsored by the United States Department of State, Office of Overseas Schools. Fairhart International Schools meet the ISC (2020) definition of an international school as English is the primary language of instruction and no schools are in English-speaking countries but does not meet the Hill (2016) definition of an international school as its curriculum is based on an American-style curriculum.

FIS may be better classified as American schools in an international setting. The majority of administrators and classroom teachers are American. The curriculum is based on American education standards, and the school system of kindergarten to 12th grade is based on the American system. Fairhart International Schools use a standardized test where students' results are compared to those in the United States. Additionally, the organization of schools is accredited by an American accrediting agency, the Middle States Association of Colleges and Schools. For the purpose of this study, an international school has been defined as a non-profit

school not in an English speaking country where the majority of students are children of a mix of culturally diverse expatriate parents who are working in the location for an assignment of a year or more and where English is the primary language of spoken and written instruction and communication at the school (Bunnell et al., 2016). Given this definition, FIS can be labeled as international schools.

Changes in Curriculum and Instruction

Curriculum change is affected by policy, programs, and philosophical ideas and involves many players, including politicians, policymakers, media, educators, and experts (Nordin & Sundberg, 2018). Curriculum reform has become transnational, and governments worldwide are making education reform a priority (Alvunger, 2018; Meyer & Benavot, 2013). Organizations such as the Organization for Economic Cooperation and Development (OECD, 2018) and the World Bank (2019) provide statistics comparing countries' education levels and mathematics, literacy, and science outcomes. This globalization of education has affected curriculum reform internationally as countries try to keep up with one another economically and adopt the best education practices of other nations that are excelling in these international comparative assessments (Liljedahl, 2015).

The Program for International Student Assessment (PISA) test results are affecting government policy and reform decisions throughout the world (Baird et al., 2016). Students in Singapore consistently scored in the top rankings in international mathematics assessments, including PISA (Jaciw et al., 2016). These successful results led the United States educational textbook company, Houghton Mifflin Harcourt, to base the *Math in Focus* textbooks and curriculum on Singaporean standards of teaching mathematics (Jaciw et al., 2016). These textbooks have been adopted by over 400 schools in the United States (Jaciw et al., 2016). As a

direct reaction to PISA scores, the United Kingdom sought to implement Singaporean and Shanghai styles of mathematics curriculum into its education system, which included adopting a Singaporean textbook, teacher participation in professional development related to the new textbook, and teacher exchanges between British and Shanghainese teachers (Clapham & Vickers, 2018). These are only two examples of the changes being made due to international pressure, but education reform has also occurred in Ireland, Chile, Zimbabwe, Canada, and Taiwan (Jarvis, 2016; Li & Styliandes, 2018; Liljedahl, 2015; Ngwenya, 2019; Saadati et al., 2019; Treacy, 2017).

Countries throughout the world are seeking to change their educational practices, highlighting the importance of researching how to best implement new teaching methods. South Africa has sought to change its education system since the end of apartheid, and Ghana is also working through the challenges of implementing a new curriculum (Ampadu & Danso, 2018; Molapo & Pillay, 2018). Sweden has been experimenting with various educational reforms borrowing best practices from other countries and has sought to adjust them to their culture (Alvunger, 2018). Schools in Australia are implementing the first National Curriculum of Australia (Lowe & Appleton, 2015; Manuel et al., 2018). Changes in education can be seen across age levels from early childhood to higher education and spanning across subjects.

Many of the recent changes in education in the United States have revolved around raising standards and adding higher-order thinking to curricula, including the introduction of Common Core State Standards (CCSS) in 2010. One of the intentions of creating the CCSS was to promote equality by having a common set of standards of learning used throughout the nation with clearly defined expectations (Parkay et al., 2014). Many U.S. international schools overseas have found success implementing Common Core Standards (Mahfouz et al., 2019). Higher-

order thinking skills are a key component of Common Core and are an example of a valued skill of the 21st century (Parkay et al., 2014). Developing these higher-order thinking and 21st-century skills has also been applied in changing the focus of mathematics education. Many countries have revised their curricula to develop 21st-century skills (Hemmi et al., 2019; Treacy, 2017). New standards have necessitated a change in the instructional strategies used in the classroom and required changes and transitions for educators.

Several organizations have sought to inform the public about the skills seen as necessary to succeed in the 21st century. These include the Organization of Economic Cooperation and Development (OECD), the North Central Regional Educational Laboratories of Illinois, and the Metiri Group of Los Angeles. The OECD (2005) compiled the Definition and Selection of Competencies (DeSeCo). The competencies comprised three broad categories: using tools, such as language and technology, interactively, group interaction, and autonomous action (OECD, 2005). The goal of these competencies was to help push education beyond the goal of simply reproducing knowledge (OECD, 2005). These are skills believed to be necessary in the 21st-century workplace and contribute to civic order (OECD, 2019). The purpose of promoting the teaching of these skills includes increased productivity and decreased unemployment by preparing an adaptive and qualified workforce (OECD, 2019).

The North Central Regional Educational Laboratories of Illinois and the Metiri Group in Los Angeles discussed six technological skills needed by students entering the workplace (Lemke, 2002). These included digital age literacy, inventive thinking, and effective communication (Lemke, 2002). The disconnect between achieving these skills has been in how to apply them in the classroom (Bernhardt, 2015). These 21st-century goals become translated to

the simple action of implementing technology in lessons (Bernhardt, 2015). Additional research into teaching 21st-century skills is warranted (Campbell & Kresyman, 2015).

Change in education has become increasingly important with high-stakes testing internationally, and even more so within the nation with national and state testing (Holmes et al., 2013). Modern education revolves around measurements and their related metrics (Stevenson, 2017). The National Center for Educational Statistics (NCES) uses the Assessment of Educational Progress (NAEP) to provide a report of United States educational progress of students in reading and math. States also have their own standardized tests. Regardless of the curriculum, these tests impact teachers' decisions regarding what to focus on in the classroom (Harris & Graham, 2019). High-stakes testing is an example of an outside force applying pressure on teachers that may not be what was intended by a roll out of a new curriculum or instructional methods. This is an example of an effect on the situation element described in Schlossberg's (1981) transition theory, as it affects the environment of the individual, in this case, the educator, who is going through the transition.

Defining Curriculum and Instruction

Curriculum is what is to be taught, and instruction is how it is taught (Egan, 1978; Parkay et al., 2014). In a study on curricular resources, Polly (2017) suggested that future studies use teacher interviews to focus on and discover how curricular resources are being used in instruction. The curriculum and the materials associated with a curriculum are helpful; however, teachers can use various means to engage students with the material and maintain the fidelity of the aim of the curriculum through the instructional methods chosen (Baumfalk et al., 2019). Kim (2019) argued that curriculum reform in mathematics needs investigations into how new material is used. The role of the teacher in implementing new curricula is critical in ensuring that the

intent of the curriculum is implemented (Stouraitis et al., 2017). This intent is often met through the instructional strategies employed by the teacher, which must change along with shifts in curriculum to meet the goals and objectives the curriculum writers had intended.

In an article comparing how the educational systems of Japan and the United States approach change, researchers discussed the importance of creating a system for teaching and not simply focusing on teachers (Hiebert & Stigler, 2017). The writers argue that if there is a system in place, the teachers will have something to follow (Hiebert & Stigler, 2017). These ideas highlight the connection between curriculum and instruction, the importance of studying curricular changes, the outside forces on teaching, and how instruction in the classroom changes to match the curriculum's intent.

Roles in Curriculum Implementation

There are a few key stakeholders in the implementation of a new curriculum at a school. The following section will examine the literature on the roles of these players in the transitionary period of new curriculum implementation. The roles examined are the roles of leadership, teachers, and the learning community.

The role of leadership in change. "The work of leaders is change" (Posner & Kouzes, 2017, p. xiv). Leaders play an integral role in developing the culture in the school where they lead. Leadership and strong leadership teams matter greatly in school improvement (Jarvis, 2016; Wood-Garnett & Greene-Bryant, 2018). Best practices for positive school transformation include adaptive, multi-dimensional leadership (Waheed et al., 2018). Part of being adaptive means learning, and school leaders need training and support to understand the transitions taking place in curriculum and instruction, as observation and feedback to teachers will not be significant without administrators learning about the changes (Rigby et al., 2017). In one study,

training in identifying high-quality mathematics instruction to give helpful feedback to teachers brought about initial change in administrators' feedback, but support and follow-up were needed for the change in their practices to be sustained (Boston et al., 2017).

Another quality of a good leader is trust. Teacher well-being is related to teachers' trust in their leadership, and teacher trust in their principal is related to school performance levels (Berkovich, 2018; Van Maele et al., 2014). Developing trust between leadership and teachers and providing a structure of support for teachers to focus on instruction are vital elements during the slow process of implementing change in schools (Holmes et al., 2013; Kondakci et al., 2017). Holmes et al. (2013) looked at implementing changes in school culture in Australia, and Kondakci et al. (2017) focused on developmental change in schools in Turkey.

Leaders and teachers often find that implementing change becomes a point of contention in the principal-teacher relationship (Aas, 2017). Additionally, in a Swiss study, principals were surveyed, and a link was suggested between their emotions and their openness to the implementation of curriculum reform (Ittner et al., 2019). Aas (2017) recommends further research on the tensions that arise during school change to defuse conflicts, improve learning, and make change efforts long-lasting.

Providing relevant and applicable professional development and training opportunities for teachers is often the responsibility of school leadership, especially when instructional changes are expected to be made in the classroom. Evidence has been found that providing teachers professional development and collaborative opportunities increases their use of a new instructional strategy (Lotter et al., 2018). Indeed, teachers at a private school implementing a new phonics curriculum were surveyed to determine how to maintain implementation fidelity, and teachers requested additional professional development opportunities to better implement

curriculum changes (Nevenglosky et al., 2019). Lack of administrative support and lack of collaborative opportunities were challenges for teachers seeking to implement and sustain inquiry-based science instruction after professional development on the topic (Sandholtz et al., 2019). Lowe and Appleton (2015) studied primary school teachers implementing a new science curriculum in Australia and from their findings suggested two areas of change for future curriculum rollouts: extending the implementation period to include more opportunities for professional development and having a "person of expertise" at each school for long-term planning and mentoring teachers. Researchers seeking to understand the workload of secondary school English teachers in Australia found quick reform and changes to policy and lack of resources and support, including lack of support for implementing a new curriculum, as some of the factors contributing to an excessive workload for teachers (Manuel et al., 2018).

Additionally, school leaders should understand that teachers differ in what they would like to learn from professional development sessions (Avidov-Ungar, 2016). Giving teachers a choice of professional development activities allows teachers a level of control and agency. Teacher agency, or choice, in professional development around curriculum reform, was an important element in a study at a Chinese university (Tao & Gao, 2017). Providing teachers with a sense of agency is an increasingly discussed topic regarding success in providing students with a meaningful education (Biesta et al., 2015). There is tension between trusting teachers as professionals and the movement towards standardization of practices, which can decrease teachers' autonomy or sense of agency and control (Hadar & Benish-Weisman, 2019). Finding a balance between enforcing implementation and allowing teacher choice may be a struggle for administrators.

In addition to building trusting relationships with teachers, administrators also have the role of empowering the parents to understand school reform and promote parental engagement in education (Ishimaru, 2013; Thomas & Cooper, 2016). Primary school educators participating in a questionnaire as part of a Greek study on the effects of school culture on change to a curriculum to develop 21st-century skills indicated their primary concern was the attitude of families towards change (Chalkiadaki, 2019). There has been a lack of resources available for parents to understand recent school reform (Thomas & Cooper, 2016).

Leadership is not limited to the administrative staff, as leaders in schools can include department heads and math and literacy coaches. In a review of literature on the influence of department heads, Leithwood (2016) found them to be more influential on student learning than school-level leaders and more impactful on school improvement. In another study, department heads were critical to implementing reform in schools (Hanuscin et al., 2016). Math coaches also play critical roles in implementing change in schools (Hopkins et al., 2017). Leadership plays an essential role in change in schools, but teachers implement the change in the classroom.

The role of teachers in change. Teachers are the most influential people in the implementation phase of education reform (Salminen & Anneverta, 2016). It is important that teachers focus on implementing the curriculum during their planning time (Salminen & Anneverta, 2016). Teachers interpret the contents of the curriculum when lesson planning and implementing it in the classroom, and their knowledge of the curriculum will support the proper use of the curriculum resources (Remillard & Kim, 2017). Deliberate attention is needed during lesson planning for the intended content to be taught in the lesson (Chan & Yung, 2018; Salminen & Anneverta, 2016). In studying teacher planning in Finland, researchers found some teachers were not using the new curriculum in their plans at all, which brought up the question of

whether the purposes of the curriculum change were being ignored (Salminen & Annevirta, 2016). Teachers plan mathematics lessons based on their knowledge and available resources, however, in one study, even if teachers included curricular elements in their lesson plans, they were not always used in the actual lesson (Amador, 2016).

Teachers were autonomous and competitive at one time and now must be collaborative (Holmes et al., 2013; Napan et al., 2018). Researchers found that collaboration and dialogue among teachers increase their understanding of a new program and assist with the implementation process in the classroom (Al Salami et al., 2017; Dilkes et al., 2014; Kaiser, 2013; Porter et al., 2015). Among higher education colleagues, collaborative inquiry was instrumental in building trust and was transformational for educators (Napan et al., 2018). In several studies, teachers requested additional support through peer collaboration to better help with implementing a new curriculum, and collaboration has helped teachers cope with curriculum reform (Dilkes et al., 2014; Nevenglosky et al., 2019). It has taken form in communities of practice and professional learning communities. These can be in-person or online social communities of teachers sharing ideas and best practices. One online professional learning community used Twitter to exchange ideas between physical education teachers and led to teachers using new practices to obtain their objectives (Goodyear et al., 2019).

In addition to participating as a team and having conversations with colleagues, teacher attitude and knowledge for the reasoning behind the change have also been found to be influential forces on the effectiveness of the process of change (Hemmi et al., 2019; Kondakci et al., 2017). A new curriculum that is personally meaningful, which would be associated with a positive attitude, will support the ease of implementation for teachers and administrators (Ittner et al., 2019). Another influencer of attitude is efficacy, and educators with high teacher efficacy,

or the belief that their teaching is impactful in improving student learning, are more likely to try new instructional methods and implement change in the classroom (Allinder, 1994; Eun, 2019; Guskey, 1988). Also affecting attitude, teachers generally tend to be reluctant to make changes in curriculum meaning change would not be associated with a positive attitude (Harris & Graham, 2019). Even if teachers have a positive attitude and are motivated to teach a subject, it does not make up for a lack of instructional time allocated for learning that subject or a lack of administrator support (Sandholtz et al., 2019). Being motivated to change is connected with a willingness to change and a positive attitude and leads to greater diversification of teaching methods used in the classroom (Zeid et al., 2017).

Teachers' prior experiences with curriculum changes affect their engagement in new curriculum innovations (Salminen & Annevirta, 2016). A teacher's knowledge regarding learning theories also affects their education interventions (Campbell et al., 2019). Additionally, teacher agency, or their choice and voice in curriculum changes, impacts the success and sustainment of innovations (Wilcox & Lawson, 2018). Hadar and Benish-Weisman, (2019) found that teachers will feel they have more agency during innovation if they are open to new experiences and can maintain a sense of independence during a transition.

The role of the learning community. In addition to the vital role of leadership and teachers individually in implementing curriculum reform, a learning community working together is also crucial in the process of change (Golding, 2017). A professional learning community (PLC) is a social learning model for professional development where teachers meet together with supportive leadership to share, converse, reflect, and work towards a common goal of improving student learning and teaching practices (Chauraya & Brodie, 2017; Golding, 2017). A PLC can provide support and nurture through transitions in teaching mathematics (Golding,

2017). In a study on advice-seeking when transitioning to using new teaching standards for mathematics, researchers found middle school teachers went to colleagues who experienced increased academic achievement in their classrooms over other colleagues (Wilhelm et al., 2016). The middle school teachers' success in improving student achievement was significantly related to the degree they sought advice (Wilhelm et al., 2016).

Researchers recommend that professional learning communities be focused on developing a specific tool or practice (Thompson et al., 2019). PLCs are suggested to be most impactful when using an inquiry-building cycle as a guide and focusing on students remains the primary purpose of the learning (Van Themaat, 2019). A study in the Netherlands found that PLCs that have structure, shared goals, and motivated participants improve the PLC's outcomes (Prenger et al., 2017). PLCs can increase teacher capacity for change as strengths and talents are shared in a collaborative community (Hairon et al., 2019). An Australian study suggested that collaboration might ease teacher burnout and fatigue by helping to re-energize teachers around implementing reform measures (Dilkes et al., 2014).

What teachers believe about mathematics affects their implementation of reformed instruction (Spillane et al., 2016). However, teachers' beliefs about math changed over time based on their interactions with peers, as would happen in a PLC (Spillane et al., 2018). Teacher agency can also be aided through discourse, which happens in PLCs (Biesta et al., 2017).

Although often a passive form of learning for teachers, professional development is another opportunity for educators to learn as a community and work through times of transition. Professional development workshops can decrease teachers' ideas about mathematics being a ridged, structured, formal process, reduce gender and ethnic stereotypes associated with math learning, and increase feelings of competence in educators (Cerda et al., 2017). Teachers learn

about new teaching methods through professional development sessions, but it often leads to minimal change and application in the classroom (Cuban, 2013). Time to reflect on their current practices and participate in experiences that can support them in making instructional changes is important for teachers and teacher-leaders during professional development time (Gerstenschlager & Barlow, 2019). Anderson et al. (2018) suggest that professional development should enable teachers to see themselves as mathematical learners. Collaboration and opportunities for reflection should be provided to bolster the positive effects of professional development (Lotter et al., 2018).

Mathematics Teaching Reform

The goals of education are changing from having students retain large amounts of knowledge to "the ability to create, innovate, critique, evaluate, and integrate the vast amount of information now available" through technological resources (Richland & Begolli, 2016, p. 160). The advent of 21st-century skills reform in education has affected mathematics curricula and instructional methods. These 21st-century skills involve innovation, design, creativity, and invention (Scardamalia & Bereiter, 2016). Reformed mathematics now includes communicative and literacy-based approaches that involve reading, writing, and speaking to build mathematical understanding (Brozo & Crain, 2018). Students are now expected to explain their mathematical reasoning and their chosen strategies, and math problems are focused on real-world issues (Common Core State Standards Initiative, 2019; Hopkins et al., 2017). The study of how this transition is being made has become an important topic of research.

Higher-order thinking, including analysis and reasoning, is important for students to be ready for the workplace as technology increases and data and information are readily available on the Internet. Computational thinking necessary for understanding coding includes deducing

structures and patterns, decomposing, and finding the unit of repeat (Miller, 2019). The practices of analogical reasoning, the process of understanding a system of relationships and the ability to manipulate and compare, have been added to mathematics and science standards, as the acquisition of knowledge is no longer the sole aim of education but rather the ability to reason and understand the system of mathematics (Richland & Begolli, 2016). The workforce needs employees who can determine what the data means and how to apply it. Therefore, teaching should change.

Another reform in mathematics is that there has been a trend towards understanding what determines success beyond cognitive ability, such as growth mindset, grit, and self-regulation. The work of psychologists Angela Duckworth (2017) and Carol Dweck (2016) have influenced a change in mindset towards the study of mathematics evidenced in Jo Boaler's work on the mathematical mindset and the idea that everyone can learn math (Boaler, 2016). As a teacher tunes into the stressors affecting students' ability to self-regulate, a child can get into their learning brain and learn more effectively (Hoffman, 2016). There is a link between teachers' beliefs regarding math and their mathematical content knowledge, and there is a connection between their content knowledge and student achievement (Campbell et al., 2014). This is particularly important in elementary school teachers who teach various subjects and may have varying attitudes towards mathematics compared to high school or middle school teachers who specialize in teaching mathematics.

Challenges in Math Reform

Although professional development has been a positive measure in implementing change in some schools as they have made transitions, it also needs improvement in others (Hill et al., 2018; Martinie et al., 2016). An early elementary professional development training for

educators on providing new opportunities for students to engage with math and science did not significantly increase mathematics learning opportunities in the classroom or have a direct impact on students' learning (Piasta et al., 2015). Many of the professional development trainings revolving around education reform have not had an effect on student achievement, which may be due to a lack of consideration of teachers' needs, weaknesses in the training itself, and differences in guidance between district goals and professional development aims, as well as the overall difficulty in implementing new instructional practices in schools (Hill et al., 2018).

High school math teachers had a variety of responses regarding their experience transitioning to Common Core mathematics (Martinie et al., 2016). These responses were broken down into four categories of "adopters": hardcore, anxious, cautious, and critical adopters (Martinie et al., 2016). This response to transition aligns with Schlossberg's (1981) transition theory in that people respond differently to transition.

Another difficulty particular to implementing change to teaching mathematics is the anxiety many elementary educators feel towards mathematics in general. Math anxiety leads to math teaching anxiety, is experienced by many elementary educators, and decreased with teaching experience only slightly (Adeyemi, 2015; Gresham, 2018; Novak & Tassell, 2017). This influences student learning as it can be passed on to students (Anderson et al., 2018). For students, math anxiety and performance in math are negatively correlated (Namkung et al., 2019). In educators, math anxiety can make the transition to new teaching practices from more traditional ones more challenging (Hughes et al., 2019). In the Hughes et al. (2019) study, elementary teachers who experienced anxiety used less standards-based math practices than those with a problem-solving view of mathematics. A qualitative study by Novak and Tassell (2017) involving student teachers taking a series of math tests and a mathematics anxiety scale

showed math anxiety as the highest predictor of negative mathematics performance compared with spatial skills and working memory. However, math method courses were found to help alleviate math anxiety in pre-service teachers (Novak & Tassell, 2017).

An additional challenge in making curricular transitions is when the materials provided do not match the standards and objectives of the new curriculum (Polikoff, 2015). The textbooks available may focus on traditional forms of teaching mathematics (Polikoff, 2015). For example, in a study by Polikoff (2015), textbooks used by schools focused on memorization and procedures, which contrasted with the goals of Common Core teachers were implementing in mathematics classrooms. A general lack of available materials aligning with the standards has been a challenge for teachers as they have sought to change their teaching methods to align with the new standards (Swars & Chestnutt, 2016). Instructional methods play an important role in implementing the intent of the curriculum. Swars and Chestnutt (2016) mention the limited amount of research available on the recent reform in mathematics with the introduction of Common Core. Teachers need to study how new curriculum materials are being used in the classroom (Kim, 2019). It is challenging to find literature specifically on math reform and educators' successes and challenges with the implementation process (Swars & Chestnutt, 2016).

Transitions in Math Teaching Philosophies

Boaler (2016) continues to study the effects of active and engaging mathematics teaching compared to traditional, teacher-centric mathematics teaching, where students are passively engaged. Core ideas for teaching students to have a mathematical mindset include the belief that everyone can learn high levels of math, valuing mistakes and questions, math as a creative subject, using communication and making connections in math, focusing on learning not performing, and building depth not simply speed (Boaler, 2016). Boaler (2016) explores

teaching mathematics as an exciting, creative subject with rich conversations and challenging yet accessible tasks involving solving puzzles, visual thinking, developing patterns, respecting ideas, and working together. Boaler's (2016) ideas of a mathematical mindset are closely aligned with Carol Dweck's (2016) studies on fixed and growth mindsets (Anderson et al., 2018). Carol Dweck (2016) postulates that people have one of two mindsets, either a growth mindset where challenges are accepted with excitement as opportunities for growth and failure is seen as a chance to improve or a fixed mindset where intelligence is seen as predetermined and being smart means not failing and therefore, challenges are avoided. Applied to mathematics, a fixed mindset or belief that math ability is fixed contributes to low math performance and a lack of interest in math (Boaler, 2013).

Defining Traditional and Reform Mathematics

Traditional mathematics teaching has been described as "an inch deep and a mile wide" (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). Teaching methods used prior to the shift in teaching mathematics were teacher-centered, where students passively received knowledge (Jarvis, 2016; Li & Stylianides, 2018; Ni Fhloinn et al., 2018). This traditional approach typically involves using one predetermined strategy to answer a problem (Sun, 2019). Student engagement with the material focused on memorization and repeated practice (Hughes et al., 2019).

In contrast, the reformed teaching methods are student-centered, with the teacher's role becoming a facilitator or guide of student learning (Barwell, 2016; Li & Stylianides, 2018). Problems are open-ended, and students are actively engaged in knowledge constructing and meaning-making (Jarvis, 2016). Learning is hands-on, and students are responsible for their learning (Jarvis, 2016). New methods of teaching mathematics include higher standards and the

development of deeper meaning (Clapham & Vickers, 2018; Liljedahl, 2015). Students are encouraged to reason and discuss, make connections, and reflect on their learning (Boaler, 2016). The discussions in the learning environment of the reformed mathematics classroom include explaining one's mathematical thinking and critiquing or building on others' ideas (Kim et al., 2017; Wagganer, 2015).

Evidence of Student Achievement

The vision of the revised curriculum being implemented at FIS promotes teaching a growth mindset. A mathematical mindset is a growth mindset applied to mathematics, a belief in the malleability of characteristics with effort (Sisk et al., 2018). Having a growth mindset towards teaching and learning mathematics has evidence of increasing students' achievement (Anderson et al., 2018). Teaching students a mathematical mindset increases student motivation in math (Daly et al., 2019; Paunesku et al., 2015). In addition to building motivation, student enjoyment and achievement increased when the concept of a mathematical mindset was taught (Anderson et al., 2018; Boaler & Sengupta-Irving, 2016). Research is showing increased student academic achievement among learners who are taught a growth mindset (Anderson et al., 2018; Bonne & Johnston, 2016; Yeager et al., 2019).

A one-year study showed teachers taking a course in using a mathematics mindset approach resulted in statistically significant improvements in students' math test scores (Anderson et al., 2018). These teachers joined an online course on neuroscience and effective math teaching methods that changed their views of their own math learning potential and their students' (Anderson et al., 2018). Improved grades were seen among lower-achieving students and increased enrollment in advanced mathematics courses among secondary students who were shown a short online growth mindset intervention video (Yeager et al., 2019). Pedagogical

strategies meant to increase math efficacy, such as using peer models rather than teacher models and teaching strategies for how to cope with mistakes, were incorporated into math lessons by teachers of seven to nine-year-olds in New Zealand and resulted in a significant increase in math achievement (Bonne & Johnston, 2016). Self-confidence has been strongly linked with achievement in mathematics (Ker, 2017). Learning with a growth mindset increased achievement, particularly in girls, English learners, and students from economically disadvantaged backgrounds (Anderson et al., 2018; Claro et al., 2016; Degol et al., 2018). Students from Shanghai have been among the top scorers in mathematics on the PISA (Liljedahl, 2015; Steiner-Khamsi & Waldow, 2018). In Shanghai, mistakes are celebrated in math classes, a major component of the growth mindset (Boaler, 2016). From a meta-analysis, Sisk et al. (2018) warn against high expectations of significantly increased academic achievement on a wide scale due solely to growth mindset interventions. The recommended conservative approach is based on Sisk et al.'s (2018) findings of inconsistent effect sizes and small or null effects in studies on the topic. However, research on sub-groups has shown significant effects on academic achievement for students from low-income homes who are high-risk regarding academic achievement (Sisk et al., 2018).

Students in classrooms that used more cognitive-processing language (explaining and questioning to solve problems) had greater mathematics achievement than their peers (Grammer et al., 2016). Higher achievement was seen in students in classrooms where teachers employed greater use of the new standards-based mathematics instructional methods (Ottmar et al., 2015). The researchers also concluded that increased use of responsive classroom methods that focus on building social and emotional aspects of teaching related to higher use of new standards-based teaching practices (Ottmar et al., 2015). Students who disliked math had higher mathematics

achievement when teachers did at least one of the following in each lesson: had students describe their own procedures for solving problems, gave students challenging problems to solve, and helped students engage in mathematical discussions (Hwang & Choi, 2020).

Changes in Education Involve a Process

Golding (2017) and Jarvis (2016) found that making curricular and instructional changes is a transition. The teacher's mindset must change to successfully implement a reform mathematics curriculum as intended (Sun, 2019). The education reform process can even be a "messy" transition time (Jarvis, 2016). Despite best intentions, extensive training, and classroom experience, follow-up and continued support are needed (Golding, 2017). Principals did not sustain the use of ideas learned in training on supporting mathematics teachers even after successful initial implementation (Boston et al., 2017). Teachers often feel they are given a new idea or philosophy of teaching and are left to implement it without resources or support (Clapham & Vickers, 2018). Although the process of implementation can be seen as messy and requires follow-up and support, in a study that developed a curriculum strategy framework, teachers' use of reform-based materials followed a pattern of reading, evaluating, and adapting as they interacted with the curriculum (Sherin & Drake, 2009). Implementation, capacity, and outside support were identified as three factors for implementing a curriculum in a proposed curriculum implementation theory, further solidifying the idea that there is a pattern to implementation of change in schools (Rogan & Grayson, 2003).

Implementation of new teaching methods is challenging because teachers often change curricula and make decisions about instruction based on their own contexts and connect their teaching practice to their beliefs (Horn & Kane, 2015; Munter & Correnti, 2017; Richards, 2017; Saadati et al., 2019; Sun, 2019). Many teachers still believe they should teach how they were

taught and prefer the safety of past practice (Hughes et al., 2019; Jarvis, 2016). When teachers have math anxiety, it increases the difficulty to change practices from traditional teaching methods to new ones, and this anxiety is passed onto students (Anderson et al., 2018; Hughes et al., 2019). Teachers' beliefs affect their instructional practices and influence the messages they communicate to their students about mathematics (Sun, 2019). Successful reform involves new thinking and acting for educators (Anagnostopoulos et al., 2018). Culture is a barrier that arises when transitioning instructional styles to being collaborative and using group work (Ampadu & Danso, 2018; Schoenfeld & Kilpatrick, 2013; Weinstein et al., 2010). Students must make a shift as well, once teachers begin to teach in this new way (Jarvis, 2016).

Changing the way one teaches, thinks, and acts is a transitionary process. In one study, the school with the most success in implementing change had a gradual and structured process of change (Miedijensky & Abramovich, 2019). Meaningful change happens when a culture has been built over several years to support the change (Fullan, 2016). Researchers found that this process of transitioning to a reformed way of teaching is not random (Sherin & Drake, 2009). Sherin and Drake (2009) formed a curriculum strategy framework for curriculum implementation, and Remillard (2005) designed a flow of the relationship between the teacher and participation in implementing curriculum. The curriculum strategy framework involves a process of teachers reading, evaluating, and adapting materials before, during, and after instruction in their transition of implementing a new curriculum (Sherin & Drake, 2009). Remillard's (2005) framework shows a participatory relationship between the teacher and the curriculum, where the teacher is influenced by their pedagogical and content knowledge, beliefs, experience, perceptions, tolerance for discomfort, and identity regarding the enacted curriculum.

Successful implementation of a new curriculum is not only influenced by teachers. Setbacks can also occur due to certain structures and policies, including standardized testing (Sun, 2019). Implementing a new curriculum is more successful when there are clear guidelines, involvement and ownership for the key stakeholders, and an understanding and consideration of the attitudes of those implementing the changes (Galloway & Numajiri, 2019).

Summary

Change is inevitable in education and is happening in schools throughout the world. Teachers and educational leaders at all levels play important roles in the process of change in education. The site for this research, Fairhart International Schools, formed the writing of their new curriculum around the work of Jo Boaler (2016) and aligned its standards with Common Core Standards for Mathematical Practice. Previous curricula, standards, and resources tended towards the more traditional mathematics teaching methods, and, in addition to the change in the way the curriculum is worded and written, there was a change in materials with new textbooks and online resources. As changing from one instructional strategy in mathematics to another is a transitionary process, transition theory by Schlossberg (1981) provided a valuable theoretical framework for this study. From Schlossberg's theory, the 4 S's of situation, self, support, and strategies formed an important framework for developing the questions for this study. Researchers found that transition to a new curriculum is aided through it being a socially interactive process, and various forms of collaboration help provide support, increase enthusiasm, and provide a positive influence in times of transition in education (Al Salami et al., 2017; Dilkes et al., 2014; Hopkins et al., 2017; Kensington-Miller et al., 2014). Literature is still lacking as schools continue to implement new standards, curricula, and instructional shifts fully. There is also a lack of research at international schools and in the specific area of mathematics.

Therefore, this study adds to the body of knowledge on instructional change. Key challenges identified in a study researching nine teachers and coordinators implementing a new problem-based learning program in middle school were a lack of expertise, pressure to cover the curriculum, and anticipation of classroom management issues with the change of instructional methods (Jarvis, 2016). Jarvis (2016) recommended that additional teachers and coordinators be interviewed to increase collaborative effectiveness and compare with the ideas found regarding implementing reform curriculum and ideas. All of this is further evidence that this study was a warranted and valuable pursuit.

CHAPTER THREE: METHODS

Overview

The purpose of this single instrumental case study was to understand how elementary teachers in an organization of international schools transition to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. The two theories that provided a framework for this study were transition theory by Schlossberg (1981), as the focus of this research was transition, and experiential learning theory by Kolb (1984) because teachers were moving through the learning cycle of new experience and reflection. This discussion of methods begins with a description of the design of the study. This study was a qualitative single case study, and the justification for this choice is discussed. After that, the research questions are listed, followed by a rich description of the setting and participants. Then, the procedures involved in the process of research are described. After this, the role of the researcher, the potential for research bias, and the plan for avoiding these biases is reflected upon. The data collection methods employed in this study were interviews, focus groups, and journaling. All data collection methods were conducted online to protect participants by adhering to social distancing measures during the time of uncertainty regarding COVID-19. The rationale and suitability of these data collection choices are discussed, and interview, focus group, and journaling questions are listed. The data analysis process is then shared. Finally, trustworthiness and ethical considerations are discussed, and a summary of the methods completes this discussion.

Design

The core purpose of conducting a qualitative case study is to conduct "an in-depth study of a phenomenon in its real-world context" (Yin, 2018, p. 127). Qualitative research explores a problem in its natural setting and interprets the problem establishing patterns or themes through the participants' voices and the reflexivity of the researcher (Creswell & Poth, 2018; Patton, 2015; Creswell, 2013; Denzin & Lincoln, 2011). The research method was a qualitative case study because the study explored in-depth the issue of schools transitioning from using one curriculum and instructional methods to another. Qualitative research involves personal experiences that help refine a theory (Stake, 2010). Twelve elementary educators were interviewed regarding their personal experiences using the framework of transition theory and experiential learning theory.

A case study is practical when a study aims to explore how people and programs function (Stake, 1995). This research describes how an organization of international schools (the case) transitions from using one curriculum and set of mathematics instructional methods to another (the phenomenon). The transition was made from a more traditional approach of teaching mathematics where the teacher would give information to students who then repeat and memorize to a more hands-on, project-based, growth mindset approach to teaching mathematics. This focus on understanding the phenomenon that can be studied by looking at a specific case contrasts with the focus of a phenomenological study. A phenomenological study seeks to describe the meanings, essences, and experiences associated with a phenomenon (Moustakas, 1994). This research aimed to understand better the phenomenon of transitioning from one

curriculum to another, rather than focus solely on understanding the perceptions of those experiencing the transition.

This research explored how the process of curriculum transition worked in a specific setting. Yin (2018) describes several uses for the case study design that align with this topic, including exploring organizational and managerial processes and studying operational processes over time. Yin (2018) describes case study research as relying on multiple sources of evidence, and this study will employ three different data collection methods: one-on-one interviews, focus group interviews, and journaling.

This study was a single case study, as the bounded system of the case were educators at an organization of international schools who were all involved in the process of transitioning from one mathematics curriculum to another. Elementary teachers transitioned to using a new set of instructional strategies that focused on participation from students. Teacher participants in the study were all transitioning to using these new methods in their classrooms based on the guidelines in the revised mathematics curriculum.

Research Questions

Central Research Question

How do elementary educators at an organization of international schools transition to using a revised mathematics curriculum?

Sub-Question 1

How did situational factors affect teachers' transition to using a revised mathematics curriculum?

Sub-Question 2

How were teachers supported throughout the transition to using a revised mathematics curriculum?

Sub-Question 3

What coping strategies did teachers use to transition to the revised mathematics curriculum?

Setting

This study was conducted at Fairhart International Schools (a pseudonym), a worldwide organization of international schools with an internationally diverse student population. The rationale for this site selection includes but is not limited to convenience and access. Convenience and access are often among the key reasons for selecting cases (Yin, 2018). The researcher worked in a school within this organization during the research, thus providing access to the educators there. Furthermore, the educators in these schools were implementing a revised mathematics curriculum with a change in focus of instructional methods making the teachers ideal key informant participants for this study.

The organization of schools utilized for this study has schools throughout the world in Asia, Africa, Europe, and South America. They all belong to Fairhart International Schools, a consortium of international schools following the same curriculum. This organization of international schools is accredited through the Middle States Association – Commissions on Elementary and Secondary Schools (MSA-CESS). MSA-CESS originally offered accreditation to the Mid-Atlantic states of the U.S. but now offers accreditation to schools in over 30 American states and 106 countries globally. The schools of Fairhart International Schools are similar in organization, typically with a director, director of instruction, and counselor as key

members of the leadership team at the school level. The schools include international students from countries throughout the world. Many of the students are children of diplomats or international businesspeople. This includes a significant population of English language learners averaging around 25% per class and students who speak several languages. For example, a student may be fluent in English and French, or English, Russian, and a local language, or English and Chinese. Each school is made up of a minimum of 70% international students, as local students are limited to 30%. Local students are students who are solely citizens of the country where the school is located. International students, in this case, are students who have citizenship in any country other than where the school is located and includes students with dual citizenship.

At FIS, curriculum revision is done on a rotating basis among subjects, which results in a new or revised curriculum every seven years for each subject. A selection of teachers from the consortium of schools and the curriculum director work together to write the curricula. The rollout of the revised mathematics curriculum occurred in the 2020-2021 school year. The revised mathematics curriculum included ongoing mathematical practices aligned with the Common Core Standards for Mathematical Practice (CCSS, 2019). The vision and philosophy of the revised curriculum was based on Jo Boaler's (2016) ideas of mathematical mindset. Resources included the Saavas online platform with demo lessons, animation videos, and games for learning. Fairhart International Schools do not have math coaches but are working on developing professional learning communities for collaboration.

Participants

The 12 participants were teachers who had experience making the transition to using the revised mathematics curriculum in their elementary classrooms. Teachers were sent an email

inviting them to participate in the study (See Appendix C). The email asked that teachers be in at least their second subsequent year teaching at various Fairhart International Schools. Teachers who were teaching at FIS for the first time or returning to teaching after a hiatus were not selected to participate as these teachers would not have been able to provide as rich an experience of the transitionary process from using the previous curriculum to the revised one. Using purposeful sampling allowed for an information-rich group of participants to be gathered to highlight their experience regarding the topic being researched (Patton, 2015). Key knowledgeable participants were selected who could "inform our inquiry when we tap into their knowledge, experience and expertise" (Patton, 2015, p. 284). The same 12 teachers participated in all three aspects of the data collection: interviews, focus groups, and journaling.

Eleven of the 12 educators in this sample were U.S. citizens, and one was a citizen of the U.K. Seven teachers were female, and five were male. Teachers had their relevant licenses. All participants had at least their bachelor's degree, two had at least one master's degree, and two were close to completing their master's degrees. The average age of participants was 40 years old, with the average years teaching 13, and the average number of years working at international schools at eight years. Table 3.1 below summarizes the participant information. More details and a rich description of individual participants are provided in Chapter 4. Table 3.2 provides the grade level taught by teacher participants at the time of the study.

Table 3.1

General Participant Information

Data Point	**Number**
Female	7
Male	5
U.S. Citizen	11
U.K. Citizen	1
Average Age	40

Average Years Teaching	13
Average Years Teaching Internationally	8
Bachelor's Degree Only	8
Master's Degree	2
Working on Master's Degree	2

Table 3.2

Grade Levels Taught by Participants

Grade Level	Number of Teachers
Kindergarten	1
First Grade	3
Second Grade	2
Third Grade	3
Fourth Grade	2
Fifth Grade	1

Procedures

First, approval of the proposal defense was granted by the dissertation committee. Upon approval, FIS leadership approval was sought, and then site permission was requested from individual schools. This was done by sending an email to the relevant leadership and administrators with the authority to approve research (See Appendix B). The next step was applying to the Liberty University Institutional Review Board (IRB) and approval was granted (see Appendix A). The IRB application form was completed and submitted with all necessary documentation, including site approvals, consent forms, interview questions, focus group questions, and journal prompts. Next, participants were contacted through a participant invitation email (See Appendix C), and then consent was obtained. Participants were contacted through an email invitation explaining the purpose of the study and were provided with a consent form to sign, date, and return (See Appendix D).

After consent forms were received, the process of data collection began. Data collection methods for this study included interviews, focus group interviews, and journal entries. All data

collection methods adhered to social distancing to protect participants during the time of COVID-19. Participants participated first in an individual interview, then one of three focus groups based on availability. Additionally, participants engaged in a journaling exercise independently with reminders sent out to allocate full participation from the 12 teachers.

Demographic information was collected electronically before the interviews or at the beginning of interviews if teachers did not fill out the questionnaire. The questionnaire was sent to initial participants through Microsoft Forms. However, for teachers who did not fill out the form, the questions were asked verbally at the beginning of the interview. The questions asked to collect demographic information were:

1. How many years have you been an educator?
2. How many years have you worked at international schools?
3. In what country do you have citizenship?
4. What is your gender?
5. Please describe your licensure for teaching including grade levels and where you are licensed (country and state).
6. What is your highest educational degree?
7. What grade are you teaching this school year?
8. What other grades or subjects have you taught?
9. Please briefly describe why you became a teacher, share a few thoughts on your philosophy of education, or give a statement or personal motto that defines you as an educator.
10. In a few sentences, please describe your educational experience and feelings about mathematics.

Interview questions, focus group questions, and the journal prompt were peer-reviewed by an elementary educator who was not a research participant. The interview and focus group questions were piloted with one elementary educator who was not a research participant. Interviews and focus groups were held online through Zoom. Zoom is an online video conferencing platform allowing up to 100 people on a video call. All Zoom sessions were recorded on the researcher's computer. Once participants agreed to the interview portion, an email was sent to schedule the interview. A Zoom link, sign-in information, and a password were sent to participants by email and confirmed in an Outlook calendar invite. Appendix E lists the interview questions, and focus group questions are in Appendix F. The interviews and focus groups were transcribed using NVivo. When participants completed their interview, the journal prompt and instructions were sent by email (See Appendix G). Research has shown that some teachers feel more comfortable expressing themselves in writing, and journaling allows for greater flexibility for busy teachers (Hatch, 2002).

The Researcher's Role

At the time of data collection, I was working as a teacher at one of the schools where I was interviewing teachers, so I was interviewing colleagues. I previously went through a similar transition at a different overseas school, so I was already familiar with some of the goals of this curriculum change. I have seen teachers, parents, and administrators struggle through these changes. Additionally, I have been a part of the celebrations of successes that have occurred due to the implementation of revised instructional methods in mathematics. My general experience with the transition to these revised mathematics teaching methods has been positive, and I worked to not let this bias my questions, responses, or analysis. The teachers at the site represent a wide range of experience and backgrounds, from second-year teachers in their first overseas

living experience to educators with 20 or more years of experience teaching in multiple international settings.

Everyone has biases that will affect the way information is perceived and data is analyzed. It is important to be aware of biases and assumptions because no one can be completely neutral (Knight, 2006). Many of my biases come from experience. I am an elementary educator who has gone through transitions to change math teaching methods. I have experienced a great deal of transition and change in life as I move every one to three years and start at a new school, sometimes with vastly different instructional methods and curriculum. I have lived internationally for ten years in six different countries, so my perspective is affected by this experience. Additionally, much of my experience in education has been working with English language learners, as I have worked at international schools. I remained aware throughout the research process of how my experiences may cause bias. I memoed and bracketed my experiences by writing down my thoughts as I collected data to set them aside and not be influenced by them. Furthermore, I sought to ask questions to the participants in an unbiased way (Yin, 2018). I sought to be aware of how questions were formed and my responses to answers given so as not to lead participants by agreeing or disagreeing with the answers given.

Data Collection

Many sources of evidence can be used in conducting a case study (Yin, 2018). Case study researchers use multiple forms of data collection to ensure an in-depth exploration of the case (Creswell & Poth, 2018). This study employed three types of data collection: one-on-one interviews, focus groups, and journaling. Journaling provided participants a reflective method for expressing their ideas and experiences (Marshall & Rossman, 2016). One-on-one interviews

and focus groups both fall under Yin's (2018) list of types of interviews. Interviews provide a voice for each participant because it cannot be known what people are thinking and feeling merely through observations (Patton, 2015). Focus group interviews are another venue for educators to tell their stories (Patton, 2015). Case study interviews can be conducted electronically, according to Yin (2018). Creswell and Poth (2018) reason that using web-based platforms is beneficial when there are "practical constraints" (p. 160). COVID-19 concerns for participant safety fell under this category of a reasonable limitation to doing in-person interviews.

Interviews

Interviews are an important data collection method in case study research and are commonly found as a data collection method in case studies (Yin, 2018). In interviews, participants can explain the how or why questions of the study (Yin, 2018). According to Rubin and Rubin's (2011) model of responsive interviewing, also endorsed by Yin (2018) for case study interviews, researchers should select participants who have knowledge regarding the research problem, then carefully listen to their answers, and ask further questions to understand the participants. Educators involved in transitioning from one math curriculum to another were interviewed regarding the process of transition. Despite the natural fluidity of the questioning, the line of inquiry was adhered to, and the questions asked pertained to specific research sub-questions. Interview questions were based on the theoretical framework provided by Kolb's (1984) experiential learning theory, Schlossberg's (1981) transition theory, and related literature on learning through experience and reflection and change in schools. The 4 S system of transition theory includes exploring four areas that begin with the letter S: situation, support, strategies, and self. These were used to guide the development of the interview questions.

Questions 1-2 sought to develop the situation and related to research sub-question 1: How did situational factors affect teachers' transition? Questions 3-5 addressed available avenues of support for teachers connecting to the second research sub-question: How were teachers supported throughout the transition? Questions 6-10 focused on two of the 4 S's of strategies and self and helped answer the third research sub-question: What coping strategies did teachers use to transition to the revised curriculum?

Interview questions were also aligned with findings from the literature. Question 1 asked about teacher involvement in the introduction of the revised curriculum, as Salminen and Annevirta (2016) found participation in curriculum change influential on teacher engagement with the changes. Question 2 inquired about teachers' prior experience, as experience and teacher knowledge was found to be influential on engagement and use of resources in curriculum change (Salminen & Annevirta, 2016; Remillard, 2005). The third question asked about leadership and transition. The participant answers to this question were compared to the research on the effect of leaders on school improvement and change (Wood-Garnett & Greene-Bryant, 2018; Holmes et al., 2013; Ittner et al., 2019; Kondakci et al., 2017). Question 4 addressed professional development based on Hill et al.'s (2018) findings that mathematics professional development can change teachers' perceptions of math and increase their feelings of competency. Hill et al. (2018) and Martinie et al.'s (2016) research was also used that found professional development needs new approaches and should to fit teachers' needs to be effective. Question 5 asked how the materials were helpful. Polikoff (2015) found textbooks were not aligned with new standards and Swars and Chesnutt (2016) found teachers had limited material resources to implement new standards. Questions 6 and 7 sought to understand how teachers collaborated or worked on their own during the transition. Many sources support the idea that

collaboration among teachers leads to increased success in classroom implementation of new programs (Dilkes et al., 2014; Golding, 2017; Kensington-Miller, 2014; Lotter et al., 2018; Wilhelm et al., 2016). Question 8 aimed to connect math anxiety in elementary educators to their implementation of the revised curriculum. Novak and Tassell (2017) found that math anxiety was higher among elementary education majors than the average college student, and Hughes et al. (2019) found a relationship between math anxiety and lower use of standards-based instructional practices. Question 9 was on how teachers coped with the transition. Martinie et al. (2016) found that teachers experience times of transition differently, and Dilkes et al. (2014) found that teacher collaboration was used as a strategy for coping with change. Question 10, on impact seen in the classroom, connects with research that a teacher's view of the effectiveness of a new teaching method has been seen to improve teaching by the connected new methods (Hemmi et al., 2019). Interview questions are listed below (and in Appendix E).

1. How were you involved in the introduction of the revised mathematics curriculum?
2. How did your prior experience affect your transition to using the new curriculum?
3. How was leadership helpful in the transition?
4. What professional development resources were helpful in making the transition and why?
5. How were materials associated with the new curriculum helpful?
6. How were opportunities for collaboration with colleagues helpful?
7. What did you do on your own to make this transition?
8. How did your feelings towards mathematics affect your implementation of the new curriculum?
9. What helped you cope with the stress of this transition?
10. How have you seen the new curriculum to have a meaningful impact in your classroom?

Focus Group

The procedure for the focus group was gathering a small group of three to six participants to discuss and confirm information obtained from the individual interviews (Yin, 2018). Focus group interviews were conducted for validation and clarification of the individual interviews (Patton, 2015). The focus group involved the elementary teachers available to participate in an online video conference on Zoom. This gave a different perspective to hear from those involved in the transition as a larger group. Despite being a larger group, the views of each participant were sought out as questions focused on the line of inquiry of the study. The same 12 teachers participated in all three data collection methods. Questions for the focus group followed the pattern of the questions for the individual interviews, with questions addressing the sub-questions that reflected the 4 S system of transition theory. However, the focus group questions addressed the first two sub-questions of situation and support with the journal prompt in the next section addressing the final sub-question on strategies and self. Questions 1-5 addressed the question of the situation, and questions 6-10 helped further understand the support available to teachers. All the questions come directly from aspects detailed in the transition theory (Anderson et al., 2011).

Each question was also aligned with findings from the literature on the topic. Question 1 asked about teachers' involvement in the decision-making process. Researchers found that teachers' active involvement in innovative education policies contributes to higher quality education for students and more sustainable innovation practices in the classroom (Biesta et al., 2015; Galloway & Numajiri, 2019; Wilcox & Lawson, 2018). A "bottom-up" approach where teachers are partners and co-designers has been found to be effective (Galloway & Numajiri, 2019; Wilcox & Lawson, 2018). Questions 2 and 3 sought to understand how other stressors

affected the curriculum rollout. Sun (2019) researched how contextual factors affected teachers' practices and suggested tracking systems and standardized assessments may have impeded change. Richards (2017) found teachers individualize curricula to suit their contexts. Questions 4 and 5 asked about challenges and advantages to transitioning at an international school and were tied to Gardner-McTaggart's (2018) research stating that change has a history of being unhelpful at international schools as consistency is highly important for this student population. Question 6, on teacher understanding of the objectives was related to the connection between beliefs and practice and the differing patterns of change based on teachers' vision regarding instruction and practice (Saadati et al., 2019; Munter & Correnti, 2017). Finally, questions 8 and 9 aimed to determine what was helpful and what would be helpful can be compared to a curriculum strategy framework and curriculum implementation theory (Sherin & Drake, 2009; Rogan & Grayson, 2003). Sherin and Drake (2009) attribute a cycle of reading, evaluating, and adapting to their curriculum strategy framework, and Rogan and Grayson's (2003) curriculum implementation theory states successful implementation depends on sufficient support in the form of training and resources. Focus group questions are listed below.

1. How were teachers involved in the process of decision-making regarding the revised curriculum?
2. What other stressors were happening at the school besides the new curriculum change in mathematics?
3. How did other stressors happening at school complicate the roll out of the new curriculum?
4. What unique challenges are there transitioning to a new curriculum at an international school?

5. What unique advantages are there to transitioning to a new curriculum at an international school?
6. How did you come to understand the objectives of the new curriculum?
7. How did colleagues work together through the transition?
8. What was most helpful during this transition?
9. What would have been helpful during this transition time?

Journaling

The use of journaling is widespread in case study research (Creswell & Poth, 2018). Journals "can provide a direct path into the insights of participants", as reflection on the topic can be done apart from the researcher (Hatch, 2002, p. 141). Journaling allows participants flexibility and comfort in expressing their ideas regarding the case (Hatch, 2002). This study used one-way journaling instead of an interactive journaling format where the researcher interacts and responds back and forth with the participants (Hatch, 2002). Hatch (2002) recommends several points for ensuring a quality journaling product. In accordance with Hatch (2002), first, participants were provided with clear expectations regarding the amount of writing expected, the purpose of the journal entries, and the importance of obtaining their genuine reactions. Secondly, clear directions were given, and a specific incident, time, period, or topic was identified for teachers to focus on (Hatch, 2002).

Teachers participants were asked to submit two journal entries reflecting on a new practice they planned to try in their classroom and how it went. Journal prompts with cloze sentences were provided to participants to provide a clear expectation of the information expected. The journal prompts were framed on the four stages of the experiential learning cycle (ELC) of the ELT (Kolb, 1984). The journal prompts asked teachers to choose a new

instructional strategy or goal of the curriculum to try implementing in a single day's math lesson. Limiting it to a single day's lesson was intended to help define the time period and specific incident to be reflected upon. Choosing a new experience to focus on correlated with the experience portion of the ELC. The prompts were to support teachers by directing the topic of their journal entries and providing a time period to focus their reflection, as suggested by Hatch (2002). Actively reflecting on the lesson through writing followed the reflection piece of the ELC.

For the first prompt, teachers were asked to share what resources they used to prepare for the lesson, which contributed to the support portion of the transition theory framework. For the second prompt, teachers reflected on how that day's lesson went and what resources they could draw from to improve next time. This is connected to abstract conceptualization in the ELC when teachers think about revising and improving their teaching. When teachers planned and implemented these changes, they were engaging in the active experimentation phase of the ELC. These stages of reflection also correspond to Cowan's (1998) model of reflection for, in, and on action, as reflection was done prior to, during, and after action. The journaling process supported the other two types of data collection, interviews and focus groups, by adding corroborating evidence for analysis. The journal prompts were designed to address the third research sub-question regarding self and strategies and touched on support. A sample journal response entry can be found in Appendix H. The journal prompts were as follows:

Instructions:

Try using an instructional method that was unfamiliar to you before being introduced to the revised math curriculum. For example, try doing a 3-act task or a math talk. Prior to implementing the lesson, discuss your preparation of the lesson, including the resources

used to plan. After doing the new lesson, reflect on how it went and what you might to differently next time. The cloze sentences below can be used to guide your reflection. Please note whether you applied this in an online home learning environment and the platform you used, such as Zoom, Seesaw, etc., or if you conducted this in a face-to-face classroom environment.

Pre-lesson reflection:

I am planning to try (enter new instructional strategy or goal from the curriculum). I learned about this strategy from (enter where you learned about this strategy). In preparation for this lesson, I (how did you prepare for the lesson). Resources that were helpful in planning were (what resources did you use). I obtained these resources from (enter who assisted you in finding these resources). I feel (enter confidence level) about doing this lesson because (enter why you have this level of confidence).

Post-lesson reflection:

Today I tried (enter new instructional strategy from the curriculum). This lesson was done (in person, on Zoom, as a video post on Seesaw). It went (enter reflection on how it went, what went well, and what could have gone better). I was surprised by (enter any unexpected happenings during the lesson). Before I try it again, I will (enter resources and support to be sought). Next time I plan to (enter a strategy to try next time based on what was learned from the experience).

Data Analysis

Interviews and focus groups were video-recorded using the setting in Zoom for recording sessions and saving them to the computer. The audio recordings were uploaded to NVivo for transcription. Member checking took place with participants reviewing and reflecting on the

accuracy of their responses. Responses from the three data collection methods were used to compare with each other for data triangulation to see how the sources were similar and different and to find what themes emerged from the data. Triangulation can be obtained in several ways in qualitative research, and one way is through using a variety of sources (Creswell & Poth, 2018). The three sources of data collection provided rich information regarding the perspectives of educators on the topic.

Through analysis of the collected data, the overarching themes and ideas of the data were determined by the researcher. Coding the data pulled information into categories to begin identifying themes. This was a process of compiling evidence to support the themes and findings (Yin, 2018). NVivo, a computer-assisted qualitative data analysis software (CAQDAS) was used for transcription and to assist in organizing the data from the transcriptions of the interviews, focus groups, and the written responses. The data collected were entered into NVivo to assist with saving highlighted text in a separate file for comparison with other text on the same topic. I highlighted the text, chose the associated codes, and analyzed the data, but the CAQDAS provided a helpful tool for supporting that analysis (Yin, 2018).

Yin (2018) discusses four general strategies for analyzing data in a case study. The first of the four general strategies is using the theoretical propositions determined in the design stage, which should have helped form how the data was collected (Yin, 2018). This can use a pattern-matching logic comparing the findings with predicted findings (Trochim, 1989). In this case, the predicted findings were grounded in the literature and theoretical framework of the study. Using this pattern-matching logic strengthened the internal validity of the study (Yin, 2018). A second strategy employed was “playing with the data” for patterns and concepts to emerge, which took the form of creating themes and subthemes, placing the data in categories and calculating the

frequency of certain events (Yin, 2018, p. 169). This strategy was used to catch if there was a frequency of a certain event that formed a theme apart from the predicted findings, as it is important to ensure that attention is given to all of the data collected (Yin, 2018).

Notes and memos were written starting in the fieldwork stage. This is a strategy of grounded theory and can be used to help with data analysis (Corbin & Strauss, 2015). After each interview and focus group, an analytical memo was written to record initial observations. Connections with the literature and theoretical framework were written to include confirmations, enhancements, and disagreements. Salient quotes and insights were written along with a summary of the interview. The memo also included any personal biases to bracket this information out of influencing my opinion in the analysis stage. This bracketing included acknowledging past experience and refocusing on the information given from the participants and the phenomenon of the case (Patton, 2015). Memoing and data categorization were ongoing throughout data collection (Yin, 2018). Ongoing memos were kept in NVivo for easy access and organization, and each entry to a memo was date and time-stamped.

Trustworthiness

Establishing the trustworthiness of research is an important process. The following sub-sections will discuss the credibility, dependability, confirmability, and transferability of the proposed research. These elements of trustworthiness are based on Schwandt et al.'s (2007) writings on ensuring rigor in research.

Credibility

Data triangulation was achieved by using three different methods of data collection. Data triangulation gives credibility to a study through cross-checking different sources (Schwandt et al., 2007). Establishing credibility also includes being current on the literature on the topic,

being forthright regarding the study's limitations, and making sure that reports are accurate (Yin, 2018). A thorough review of the literature was conducted, limitations listed in chapter 5, and accuracy was maintained through transcription of exact words and verbatim participant quotations in the report. Member checks where feedback is obtained from participants are additional methods to establish credibility (Schwandt et al., 2007). Participants had the opportunity to check and revise the transcripts of interviews and were invited to comment on and confirm the analysis and findings of the study.

Dependability and Confirmability

Dependability for this study comes from keeping an audit trail. An audit trail was maintained through memos and reflexivity notes, including a log with dates as the analysis progressed (Creswell & Poth, 2018). Additionally, the research process was reviewed by several experts, my chair, research methodologist and the director of qualitative research. Data were collected until data saturation was achieved and similar themes were repeated. Two or more sources confirmed the evidence presented in the research (Yin, 2018).

Transferability

Demographic, geographic, and other site-specific information is provided. This gave a rich description that is characteristic of qualitative research (Miles et al., 2014). Other researchers and educators can determine whether the findings apply to their situation, given the description of the site and participants of this study.

Ethical Considerations

Approval was obtained from the IRB. The role of the IRB was to screen the proposed study to determine whether human participants would be protected (Yin, 2018). After IRB

approval was granted, approval was sought from the site, including top organizational leadership and the individual leadership of the schools involved. Consent was obtained from all participants. This process included informing participants about details of the study and setting forth an understanding of their voluntary participation (Yin, 2018). Confidentiality was maintained through the use of pseudonyms for the site and participants. Pseudonyms were used for all research participants and the individuals mentioned by participants in their interviews. A code for participants' names was be kept on a password-protected computer in a password-protected document. Names were randomly generated from a list of biblical names. This random generation of names guards participants against feeling uncomfortable (Yin, 2018). Data was kept secure by keeping paper files in a locked cabinet and keeping electronic files password protected and then will be deleted after five years. The researcher did not have a supervisory or authoritative relationship with any of the participants during the study or previously.

Summary

The purpose of this single instrumental case study was to research how teachers at an organization of international schools transitioned to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. The problem is, when schools transition to using a new curriculum, the majority of curriculum failure occurs during the phase of implementation in the classroom. This chapter provided a discussion of the methods that were used in this single instrumental case study. Justifications for the methodological decisions made by the researcher have been made with supporting citations. Details of the site and participants were provided for other educators to decide on the relevance of this study to their own situation. The procedures of the study were outlined, and details of the methods of interviews, focus groups, and journaling were given. This

study's procedures should be able to be followed by another researcher if replication of this study is desired. Trustworthiness procedures were established, and ethics were considered and discussed to inform readers of the validity and reliability of this study.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this single instrumental case study was to research how teachers at an organization of international schools transitioned to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. Three data collection methods were employed: individual interviews, focus groups, and journal prompts to answer the central research question and three research sub-questions. In this chapter, first, a rich description of the participants is given, followed by a discussion of the themes and their codes with participant quotes, concluded with how the data provided answers to the research questions. Participant quotes are written verbatim, and journal entry quotes are given without alteration except for the font.

Participants

Participants in this case study were elementary teachers in at least their second year of teaching at the organization of international schools, FIS. The age of the 12 participants ranged from 24 to 67, with years of teaching experience ranging from two to 35 and years teaching at international schools from two to 22. Seven participants were female, and five were male. The chart below shows the demographic information of the participants.

Table 4.1

Participant Background

Name	Age	Years Teaching	Years Teaching Internationally	Grade Currently Teaching	Teaching Credentials	Degree
Abigail	34	9	7	1st	K-6, Florida	Pending Masters
Anna	24	2	2	3rd	Elementary, Middle School, TESOL, Wisconsin	Bachelors
Eve	37	13	4	2nd	K-8, Middle School Math, Alaska	Bachelors
Jacob	27	2	2	3rd	Elementary, Iowa	Bachelors
James	61	27	22	5th	Elementary, Secondary Special Ed, Texas	Bachelors
Leah	39	15	7	1st	Elementary, Minnesota	Bachelors
Levi	48	6	6	3rd	K-6, Hawaii	Pending Masters
Luke	42	11	8	Kindergarten	Early childhood-4th grade, Texas	Bachelors
Lydia	37	18	11	1st	K-12, United Kingdom (UK)	Bachelors
Maria	35	12	7	4th	Elementary, Texas	Masters and Specialist
Paul	67	35	8	4th	K-6, Colorado	2 Masters
Sarah	29	8	8	2nd	K-6, Tennessee	Bachelors

All 12 teachers participated in the individual interview, focus groups, and journaling. Interviews and focus groups were scheduled through Microsoft Outlook Mail and Outlook Calendar. An email was sent to participants with suggested times, and a calendar invite confirmed their availability. Interviews and focus groups were conducted through the online video conferencing tool Zoom for convenience and due to the social distancing aspect from the

COVID-19 pandemic. There were three focus groups. The first focus group had three participants, the second group had six, and three joined the third group. Conveniently, because the focus groups were done online, the sessions could be rescheduled if participants could not attend. Seven participants were initially scheduled to join the first focus group, with only three attending due to various reasons, including internet connectivity issues. The remaining four participants from the first group joined the second focus group. Then the third focus group had to be rescheduled twice due to last-minute cancellations, including an injury of one of the participants. All participants were given pseudonyms, which are used throughout this study. Participants were chosen through convenience sampling. The following is a rich description of the individual teacher participants.

Abigail

Abigail is 34 years old and is teaching first grade during the 2020-2021 school year. She has been a teacher for nine years with seven years of experience teaching at international schools. Abigail has her K-6 teaching certificate from Florida and is working on finishing her master's degree. She likes math and tries to put much energy into teaching it. She values connecting math to the real world because she wanted to understand these connections when she was a student. Abigail often looks for ways to incorporate math into other subjects, such as art, and appreciates how the math curriculum provides opportunities for cross-curricular application. Through the transition process, Abigail coped by encouraging herself, "This is new; we're learning," and when she felt overwhelmed, she told herself: "No, it's all out there, you need to sort through it and if you can't, go talk to a colleague or admin or what have you."

Anna

At 24, Anna is the youngest teacher participant. She has taught third grade

for two years. After receiving her bachelor's degree and a teaching certificate for elementary and middle school and Teaching English to Speakers of Other Languages (TESOL) in Wisconsin, she moved to Asia to teach at an international school. Anna has an interest in linguistics and teaching English language learners. After being a part of professional learning communities during her student teaching, and with her outgoing personality, Anna has become a natural at collaborating with colleagues. She appreciates having a solid support system and being able to talk through concerns and successes. Despite her focus on linguistics in college, Anna loves math and is excited about teaching it to her students. Anna shared appreciating having time to explore the math curriculum over the summer, saying, I think the timing, like, before the school year started, although teachers don't like to maybe dive into some of that curriculum in the summer. For me, it really helps to just mentally get in that mindset again and get like focus when I'm not thinking about everything else, school related.

Eve

Eve has been teaching for 13 years and is 37 years old. She has taught all grades from first through sixth and is teaching second grade this school year. She has taught at international schools for four years. Eve has her teaching license from the state of Alaska for K-8 with a middle school math cognate. While teaching swimming lessons in high school, Eve discovered she enjoyed teaching and working with children and decided to pursue her degree in education. She believes children need to be taught with more than one approach. In Eve's classroom, dependable routines provide the foundation for student growth and risk-taking. Math is an enjoyable subject for Eve, and she finds mathematics easier to understand and teach than other subjects. Since math was her chosen cognate in college, Eve received in-depth training in how to teach math. She engages in deep conversations about math with her husband, who is a

high school advanced math teacher. Eve had a strong understanding of the previous curriculum and shared, “So at first I was nervous. I was like, why are we changing? But then when I looked and saw the similarities, for me, it was nice to see that like, oh, it's, it's not a completely new way of progressing the child's understanding.”

Jacob

Jacob is 27 years old and is teaching third grade for the second time. He has been a teacher for two years, and both years have been at an international school. Jacob has his bachelor’s degree and elementary teaching certificate from the state of Iowa. He believes one of teachers’ priorities should be helping students acquire a desire for lifelong learning. He does well with technology and supports his colleagues in that area. Jacob shared how his knowledge of technology was helpful, saying, “I'm just quite a bit younger than most the other teachers, and so I'm just more used to technology, which doesn't hurt.” Jacob enjoyed learning new ways of thinking about mathematics by reading the book *Mathematical Mindsets* written by Jo Boaler. He loves algebra because it is like fun puzzles to solve. Transferring his enjoyment of math and a positive attitude towards the subject to his students is essential for him. Talking about how everyone makes mistakes and pointing out his own mistakes is another topic he values teaching students. He found the new experiences of living internationally intimidating initially but has loved his experience living and teaching overseas.

James

James is 61 years old and has been teaching for 27 years, 22 of those years in international schools. His teaching certificate is from Texas in elementary education. He also has his teaching certification in secondary special education. This year, James is teaching fifth grade. He has also taught ninth and tenth grade in a self-contained classroom teaching students

with severe emotional concerns. He described it as not being easy but gratifying to see his students develop confidence. James found he had always been teaching from a young age. For example, he enjoyed teaching his classmates math tricks, such as the quick trick for multiplying nines. James is a former military service member so when he got out of the army, he became a teacher. He taught Sunday school to give back to his small-town farming community where he grew up. He feels a responsibility to pass on knowledge to contribute to a meaningful, orderly civilization. James worked hard to implement the online components of the revised curriculum. He shared, “Wow, this is incredibly more intricate than anything else I have used before, and that's, that's a good thing. But it's a bad thing also as far as a learning curve.”

Leah

At 39-years-old, Leah has been teaching for 15 years with seven years at international schools. Her teaching certificate is from the state of Minnesota and this year she is teaching first grade. Leah’s teaching philosophy includes incorporating movement for children to learn best. She believes math should be interactive and engaging for students. She is a planner and typically plans her lessons three weeks out at a time. Leah described herself, saying, “I'm a visual learner. I'm like, a doer.” She explained that she does not get stressed out about things easily. Leah shared often getting teaching ideas from websites, saying, “I mean, there's me and Pinterest and Teachers Pay Teachers, that is. We are collaborating very well together.” Despite using technology to search for teaching inspiration, Leah describes her first-grade teaching style as somewhat “old school” as she prefers not to use technology when teaching young learners. Leah likes math but prefers finding ways to teach math without increasing screen time for students.

Levi

Levi is 48 years old and is teaching third grade. He has taught for six years, all at international schools. He is a former U.S. military service member and previously traded foreign currencies. Levi started volunteering for after-school activities and found he enjoyed being around people more than working independently. He has his bachelor's degree, his K-6 teaching certificate from Hawaii and is almost finished with his master's degree. Levi appreciates being able to plan and stays actively engaged in professional development. He likes learning from others, especially colleagues at his school and said, "Observing someone who is more in your shoes is very valuable for me. I try to do it as much as possible." He likes the autonomy that international schools must make curriculum decisions. His teaching philosophy aligns with ideas of universal design for learning, objective-based curricula, and inclusion. Levi describes himself as an "early adapter" and likes to research on his own and jump right in. He loves teaching, and if he had to pick, math would be his favorite subject to teach.

Luke

Luke is 42 years old. He has been teaching for 11 years total with eight years of experience teaching at international schools. He is teaching kindergarten this year. Luke has also taught pre-kindergarten, first, and second grade and taught high school English as a Second Language (ESL). Becoming a teacher started from being bored at his job in the United States and deciding to move to Spain to teach English for a year. He liked the experience and decided to get his teaching certificate. He is a certified teacher in Texas for early childhood through fourth grade and ESL in early childhood through twelfth grade. Luke's feelings towards math are primarily positive, although he did have one negative experience teaching mathematics. While teaching high school ESL, he was asked to support his students with math, and neither he

nor his students could understand the math. Luke prefers and enjoys teaching math to lower elementary students. He shared that he was already doing many of the critical components of the revised curriculum and said, “For me, it wasn't so extreme. Okay, you know, it's changed, but not so much. And for me, it changed for the better. So, I like it.”

Lydia

Lydia is 37 years old and is teaching first grade this year. She is in her eighteenth year of teaching and her eleventh-year teaching at international schools. She is British and has her teaching license in secondary math from the UK, which qualifies her to teach all ages up to 18. In addition to first grade, she has taught second grade, sixth grade, and secondary math. She graduated with her bachelor's degree in math with honors. Lydia’s parents were teachers, and when she saw the challenges they had, she said she would never be a teacher. However, she knew she wanted to do something helpful and make a difference. After taking an education course when it was her only option during her final year of university, she found she enjoyed the teaching practice. She then took a year-long teacher's course to become a teacher. She thinks math is “cool” and is “passionate” about helping students understand math because she was not taught what math meant when she was a child. She appreciates being able to collaborate with colleagues and said, “I feel like if you can collaborate with someone, you get a much better outcome than if you just try and think through things by yourself.”

Maria

Maria is 35 years old and has been a teacher for 12 years. She has seven years of experience teaching in international schools. Her teaching certificate is from Texas for elementary, and she has a certificate for teaching reading for K-12. She has taught all grades from kindergarten to fourth grade. She has her master’s degree and specialist license. Maria’s

childhood dream was to be a wedding planner, but she started taking education classes in college because that is what her father agreed to pay for her to take. When she reached her senior year of college, she realized she loved teaching. She now agrees with the adage "father knows best". She believes every child can learn and a hands-on approach is best for children to learn. As a teacher, she seeks to balance being understanding and showing "tough love" to push students to accomplish what they are capable of and bring out the best of their abilities.

Paul

At 67 years old and with 35 years of teaching experience, Paul has the most teaching experiences of anyone in the study. He has eight years of experience teaching at international schools. Paul's teaching certificate is from the state of Colorado in K-6 and he has taught elementary and middle school. He has two master's degrees in communication and education. Paul values focusing on having students communicate their learning and explaining why and how something works. Early in his career, Paul chose to focus on math and be a part of the math department. He has always liked math and found it to be easy. Paul feels good when he can hear students say, "Oh, I get it!" when teaching them math. Paul shared, "Sometimes I'm hesitant to embrace something new when I know I don't feel completely comfortable with it, and that happens to even veteran teachers." Despite sometimes feeling uncomfortable with change, Paul likes meeting people from different cultures and how their varying perspectives shake up his thinking. He shared enjoying how "just being in a different environment helps you become more aware…and appreciate where you came from."

Sarah

Sarah has been teaching for eight years, all at the same international school. She

is 29 years old and has her K-6 teaching license from the state of Tennessee. This year, Sarah is teaching second grade with prior experience teaching pre-kindergarten and fifth grade. As a child, Sarah moved frequently, and this drew her to international teaching. She feels she can relate to her students, who also move a lot during their childhood. Teachers played a significant role in her life from a young age, and she saw them as providing knowledge, safety, and security. Sarah enjoys being a pillar in her student's lives, exploring new things with them, and seeing them make connections with their learning. Sarah talked about being a teacher leader during the process of transition, saying, "I've kind of become an unofficial, like elementary leader...I'm the voice of reason and encourage the other teachers." Sarah loves mathematics. She likes how math can be a universal language among her international students.

Results

This section will cover the theme development from the codes in the data. It will explain how the data answered the research questions. First, the themes will be discussed with quotations from the interviews, focus groups, and journals. Next, the codes will be sorted and discussed according to how the data answered the research questions.

Theme Development

Themes were developed from the codes that emerged from the data from interviews, focus groups, and journal prompts. The eight themes determined from the data were First-Year Implementation, Collaboration, COVID-19, International School Differences, Teacher Perspectives, Professional Development and Training, Materials, and Leadership. The themes were determined from the codes being grouped into similar categories forming the themes. Table 4.2 lists the themes with salient quotes and the codes associated with each theme.

Table 4.2

Themes and codes

Theme	Salient Quotes	Codes
First-Year Implementation	"It takes you like, a year, to understand exactly what it's about." "It's always the second year...the second year is like, okay, here we go, let's teach this new curriculum." "I want a year of actually testing out the curriculum and kind of playing with it before going further with deeper objectives."	adjustment for students beginning of the year still learning year 1 differences trial and error not using it just do it other curriculum mental prep teacher guilt self-talk
Collaboration	"I think that would really help getting together or just meeting with other teachers." "Most impactful are the ones that are close at hand with coworkers close by...who are willing to support and answer questions that you might have." "Being willing to share ideas like, that's so, so helpful."	with teaching assistants with grade-level teachers online collaboration with other teachers personal Teams site
International School	"Limited access to like [grade level] team" "Sometimes the website is a bit slow, but I think that's more of a [host country] thing." "When they don't have much English, you know, how can you explain things in math?" "Reasons I stay in international schools...I have a small class. I have an assistant." "There was opportunity for teachers to be involved, to have input"	autonomy budget cultural differences ELL words/vocabulary political tension safety netting teacher input
COVID-19	"I wasn't necessarily giving all my energy to it because I was focusing over here on surviving." "[The online system] came in handy already during that lockdown." "If it wasn't in a pandemic, I think we would be able to collaborate a little bit more."	gaps in learning helpful materials PD and collaboration (effects on) tech/online (COVID-19) timing
Teacher Perspectives	"At first, I was nervous. I was like, why are we changing?" "Very intense learning curve for me."	different way of teaching math math feelings

	"I'm hesitant to embrace something new when I know I don't feel completely comfortable with it." "I was kind of excited when I saw the curriculum." "For me, it changed for the better." "You don't really know if you're doing it the way it's supposed to be done."	order/pacing/scope and sequence prior experience similarities uncertainty about implementation no stressors
Leadership	"I feel like I was heard in that area." "So many of our questions, they didn't know." "They were like willing to try whatever they could to implement this curriculum and help." "Have somebody designated whose been trained to then train us."	general head of curriculum school leadership teacher leaders training for teacher leaders
Professional Development/Training	"I have a deep appreciation for that initial just the basics." "It didn't do much more than what you can figure out for yourself." "Could have been better if they were more focused."	comparisons with previous training in-service training introductory training prior training outside training
Materials	"Every elementary teacher's dream, you know, all these materials." "I personally think it would have been nice to get [the manipulatives] with the curriculum." "I thought it was great that it was online, that it was available." "I have been using my own resources."	alignment assessments manipulatives online resources teacher platform teacher videos student videos other outside resources tech/online (general) own stuff not using

Theme 1: First-Year Implementation

As teacher participants began sharing through the interviews, many spoke of the significance of the first year using a revised curriculum. Discussion about the first year appeared in all three focus groups and ten of the twelve individual interviews. The exact phrase "first year" was used 22 times in nine separate interviews. Teachers discussed the struggles of the first

year using a revised curriculum, including figuring out the pacing, using trial and error, working through guilt, and filling in the gaps in student learning as the math vocabulary, objectives, and scope and sequence differed from the previous year. They discussed adjustments for teachers, adjustments for students, and how curriculum implementation was a work in progress during the first year.

Adjustment for teachers. Transitioning to a revised curriculum is an adjustment for teachers. Leah shared in focus group 1:

> I think it just takes time, honestly. I think as a teacher, it takes you a year to understand exactly what it's about, what is a part of it. And after the year, after you've readjusted, I think it's kind of smooth sailing.

Similarly, Levi shared in another focus group, "It's always the second year, no matter what it is, language arts, cultural studies, math, the second year is like, okay, here we go. Let's teach this new curriculum. Yeah, it's going to be fine." Additionally, Paul reflected, "Some things can be less emphasized or eliminated, and that only comes with the first year of doing it, right?"

Some teachers discussed disliking the revised curriculum but also reflected on how curriculum revision is always a challenge and takes time to adjust to using it effectively. Sarah said in her focus group, "It gets better. All year I've been saying to the teachers who are like nervous or struggling with the math curriculum, like, it's the first year. We would have said this about any new math curriculum." In her individual interview she also shared:

> The first time we do it isn't necessarily going to be the best time or the best way that it happens. And so, I think, especially looking at the first year of curriculum, I keep kind of repeating like this is our first year with it. There are going to be bumps. This happens

> every time. And like, let's give it time. We'll figure it out. We can change this next year if it's still a problem, those sorts of things.

Lydia shared how the expectation was for a three-year curriculum implementation and not for complete implementation in the first year. She said,

> I know a lot of people have been struggling so much this year and like...remember, this is the first year and this year is not going to look like it's meant to look. Three years down the line is our goal, that three years down the line we're able to have the kids, you know, working collaboratively and exploring and, you know, being fine with mistakes or whatever. That's the goal. But don't worry if that's not what you're seeing straight away.

Adjustment for students. Participants shared how, in addition to teachers, it also takes time for the students to adjust to a revised curriculum. Sarah reflected,

> Well, we didn't teach them the same curriculum last year. So, there will be gaps because of assumptions made in the new curriculum. But then once we've had it for a year or two years, the gaps will be lessened because they did get the previous year's curriculum.

Anna likewise shared about the difference during the first year for students,

> Some of the language and vocabulary that comes with math...by the end of the year, the kids get it and are better with it. But it is nice when they have some of that experience of like this curriculum starts a certain way in 8-year-old class because it expects the kids to end a certain way in a 7-year-old class, and if they didn't end that way because they were on a different curriculum, then their gaps kind of grow...So, when we transition from one year to the next with the same curriculum, there's definitely advantages with that. And that was something that is definitely a challenge.

Work in progress. In addition to teachers sharing how the transition was an adjustment during the first year, teachers also spoke about how they were not fully implementing the curriculum during the first year. Eve shared, "I want a year of actually testing out the curriculum and kind of playing with it before going further with deeper objectives." Following Eve's comment, Paul said, "I feel like, okay, let's get a feel for what the bedrock of the curriculum is and then trying to see the bigger objectives and work on those a little bit more next year." Maria agreed, sharing, "We are also doing the bedrock…I'm acknowledging those other things and I'm dipping my toe into some of the other points...I'm trying to get confident in my part of it so that we can slowly grow." Other teachers in the focus group agreed and continued to use the imagery of "dipping your toes" and added the image of being on a "maiden voyage". Abigail found relief in what her colleagues shared and joined into the discussion saying:

> I think everything that was just said right now on a personal level is very comforting because I know I have a lot of teacher guilt of like, oh, my gosh, am I like, what's happening? Am I doing the best I can? Are they learning? So, it's nice to hear from you guys that, like, we're all still learning, right?

In individual interviews, four teachers used the phrase "trial and error" to describe their experience in the first year with the revised curriculum. Teachers also discussed needing time to get the pacing right. Individually, Levi shared, "We don't cover every single problem because...I can't get through it all in a time frame and being it's the first year...you're kind of feeling it out...We don't really have a feel for it yet." Paul shared a similar experience in his interview, saying,

> At first it was a little stressful, but it's like, okay, now I can get my framework in my mind of like, how can I meet this within this time frame? So, it's almost like backward planning. I've got this much time. How will we...pace it to meet that goal?

Theme 2: Collaboration

The word "collaboration" was used 40 times in the data. Regarding collaboration, teachers discussed collaborating with grade-level teachers, teaching assistants, other teachers in their school, and online. Some teachers collaborated more than others, and teachers collaborated in different ways. Teachers discussed sharing resources and appreciating being able to converse with other teachers through the transition.

Sharing with grade-level teachers. Most teachers had one other colleague teaching their grade level at their school. However, Leah and Sarah shared being the only ones teaching their grade level. Teachers voiced how they collaborated with teachers at their grade level as they could compare and share how the revised curriculum was working. Lydia appreciated how her grade-level teacher shared activities that worked well. She said:

> Sharing resources and saying, oh, this is what I'm thinking for this activity, and you have such good activities, and I'm really like, oh, I love that! I'm totally using it. Being willing to share ideas like, that's so, so helpful.

Comparatively, James commented, "I would check in periodically, it's like, how is your group dealing with this topic? You know, just trade tips about how to make it easier or more interesting or what's going to help them." Similarly, Jacob commented about his grade-level teacher, "We've been working together a lot talking about the curriculum, discussing what we're doing," and "We're talking after a unit and discussing the pros and cons of what we liked about it."

Leah articulated how she would appreciate more opportunities for collaboration and how she did not have a grade-level teacher with whom to compare notes. She said,

> I think that would really help getting together or just meeting with other teachers and kind of making it mandatory, or voluntary, maybe teachers do things voluntarily. But yeah, because I'm the only six-year-old teacher here, too, so it's kind of like whatever I do is, works.

Although each voiced these thoughts in individual interviews, Maria agreed with Leah, saying, "That's a difficult question just for this school. It's a small school and it's one or two classes per grade level." Maria explained there was one other teacher teaching her grade level at her school but said, "Unfortunately, my partner teacher and I are not partners. And, so, we are doing everything individually." Eve shared, "My team teacher is completely online. I'm completely in person, so the way we're approaching using the curriculum is very different this year, and then, also, I have chosen not to." Conversely, Paul said,

> Well, it's always nice to compare notes. I mean, I like that there's two classes of my same grade so I can touch base with my coworker and what's going on? How's it going? Are you on track or blah, blah, blah? And we literally talk about, I emphasize this or I emphasize that. So, that's great.

Sharing with other colleagues. Lydia relayed the importance of being able to share struggles with colleagues, especially during curriculum transition. She explained,

> I think in terms of like this year, it has been able to be talking to people about it, and like, you know, hearing if they're struggling too, you know, you can be in it together, not feeling alone in it or like you're the only one struggling.

She voiced desiring more structured time for collaboration with colleagues, suggesting,

> I think there's not enough opportunity for it...For example, we have these staff meetings once a week, and like, the number of staff meetings we have where we can actually just sit down and talk to people and say, 'Okay, you know, I was really struggling with this, what do you think?' is very minimal. And then we do have prep periods, and that's great. But, at the same time, like, you're busy doing things and you don't prioritize it necessarily. So, I think it would be great if there could be some kind of like collaboration period where you maybe have a free period, the same as your partner teacher.

Eve presented the importance of collaborating with the next grade-level teachers, stating, "I also think it's important to kind of talk up and down between the grade levels just to get a little understanding of where the kids are and where they're going." Anna brought up the same point in her interview, explaining,

> Getting to talk through some of the things, and as well as talking to teachers that are the right below you or right above you, as in like where do you want your kids to be next year? Or like where did you leave off this year? What was the skill that some of your students, like, struggled with?

Additionally, Anna found that she could collaborate with her teaching assistant (TA) in her classroom. She recalled,

> In order to kind of wrap my head around, like what I want to do, I just have to talk through it. So, a lot of times I will just talk to my TA, talk, talk, talk...I'm just talking through it to wrap it around in my head. So, by explaining it to someone else, just like we tell our kids, right? If they're able to explain it to someone else, it grounds their learning. And that's what I have to do in the classroom as well.

Likewise, Sarah described collaborating with her TA, saying, “She and I have had a lot of good conversations about, like, why is it saying this or what does this word mean? Why is it using this language?”

Paul expressed his gratitude for having colleagues who were willing to help, saying, “I really appreciate that level of camaraderie. And immediate support is something very nice about the school we're working in.” He continued,

> Other people that aren't in my upper elementary area, they're more than willing to offer advice if I go to them for help. So, yeah, that's always very helpful...I never feel like I have to do too much in the dark on my own, right?

Jacob shared collaborating with colleagues regarding the technological aspects of the revised curriculum, explaining, “I've helped the other people in my grade area figure out how to use the Savvas website more.” Levi commented on how he enjoys collaborating with colleagues by observing their lessons, “Observing someone who is more in your shoes is very valuable for me. I try to do it as much as possible.” He further described his collaboration with colleagues, explaining, “Most people are like, who could do this, who could help me, and yeah we share it; we help quite a bit.”

Online collaboration. Online collaboration was also available and utilized more by some teachers than others. During a professional development day, teachers were able to meet online with colleagues from other schools. Eve commented,

> There was one time, which was a good type of collaboration I guess for teachers, was when our district had a district-wide collaboration time with grade levels. That was one of the topics our grade level chose to talk about what we were doing and not doing.

She further described the usefulness of the session: “It was helpful just to see that a lot of teachers were, not necessarily doing the same thing, but noticing the same things or appreciating the same things.” Levi also mentioned this session in his focus group, sharing he had thought at the time, “We should do this more often, and it never happened.” Following Levi’s comment, Jacob jumped in, saying,

> I don't think anybody really knew who was to coordinate it and make it happen. Because we were like, maybe we could see if they'll replace one of the PDs a month with a conference meeting or whatever, but the pieces didn't come together.

There was an online collaboration platform set up within FIS for sharing ideas. Abigail shared, “There's a lot of collaboration, conversational, in all of those, but I kind of like, bounced around in different grade levels last summer to get more information.” She later continued, “The Teams chats like, they get really hot sometimes like, especially the elementary ones, like some people will be, you know, sharing ideas and collaborating and then it will just be quiet.” Furthermore, Levi related,

> I think it's a great idea that we have the Teams. But again, that's hard to keep that going. I've tried to. Every once in a while, I see a question, and I'll try to answer one six weeks later. I never think to go to the Teams page to look at, hey eight-year-old teachers, what are you doing for cultural studies? It's a great idea for [FIS] to start, but it's just hard to remember that it’s there.

Maria shared her experience with Teams, saying,

> We have a chat group available and channels open for it, but that just magically appeared overnight. There wasn't communication that it was there and how to use it, so the majority of the nine-year-old teachers don't know it exists. So, right now, the channel has

> three people in it. And naturally, collaborating with the three people isn't working as well as it could.

She expressed an additional concern with Teams, saying, “I don't need to keep going back and forth to different ones. So, maybe one channel can be awesome. Multiple channels are just overwhelming.” Leah shared her thoughts about the online collaboration platform, saying,

> I think people just get so used to working by themselves that then you have to, like, collaborate with other people or like, throw in like, this is what I'm doing for this, but it's just like, a hard kind of transition. And to collaborate with people you don't see or know is tricky too.

Luke felt the same way and shared in his individual interview about the online collaboration group: “You can get in and see what's going on and look. So, there's that. But it's not the same as, you know, when you meet up with other teachers.” Similarly, Paul opined,

> For me, the things most impactful are the ones that are close at hand with coworkers close by, and we do have generous colleagues who are willing to support and answer questions that you might have.

Theme 3: International School Differences

Working at an international school can have advantages and disadvantages compared with working at a school in one’s home country. One of the themes that emerged was how these benefits and downsides affected the transition to a using a revised math curriculum. Codes under this theme included autonomy, budget, cultural differences, English language learners, political tension, safety netting, and vocabulary. Disadvantages included fewer opportunities for collaboration, differences in training, visa issues, and internet issues. Advantages included

smaller class sizes, less stress, more freedom, being used to having to adapt, and having teaching assistants supporting in the classroom.

Differences in Collaboration. Teachers discussed some of the differences they experienced regarding opportunities for collaboration at an international school compared with schools in their home countries. Anna shared about her experience in the U.S. regarding professional learning communities (PLCs) contrasting it with her experience at FIS:

> In my experience, at schools in Wisconsin, PLCs are huge, really pushed. There's usually about two to four...grade-level teachers. So, I'm used to having a team of four people that we all sit down with once a week and we talk about, like, just little assessments or benchmarks that we're doing or lessons that were really cool...So, when I went to an international school where like, last year, my teacher partner, with my grade level team teacher, was used to being the sole teacher, right, and not collaborating, and I was used to only collaborating, like everything is very collaborative. So, it was like finding that balance.

In the third focus group, Sarah expressed her desire to hear from colleagues more and articulated,

> I think as far as challenges go, being at an international school, even though we are such a connected school system, we have such a limited...access to like team level, team grade...whereas, in the States or in a public school, you'd have more access to like, oh, what are you doing in your second grade class and your second grade class? In fact, this is really cool that we're getting to talk to people that are in schools that we would never interact with otherwise.

Also, on the topic of teacher collaboration among schools, Luke explained further,

> That doesn't normally happen because the schools are far apart. You know, it's different when you're teaching in the United States or in England or France or anywhere, when you can meet people from other schools very easily. That's not really an option here.

Differences in training opportunities. Teachers reflected on how opportunities for training were different at FIS than the training they received in the U.S. Regarding training, Eve shared,

> I feel like I had a much better grasp of Go Math than a lot of teachers [here] did because I realized none of the teachers were given actual training on it. They were just more given: this is the curriculum; you can read about it or adjust it to how you want to use it in the classroom. So, a lot of teachers were like kind of confused about, you know, the different parts of it.

Similarly, in focus group 1, Leah shared, "I don't feel like here, and I know this another time, I don't feel like there is real training." Following Leah's comments, Luke reflected on training opportunities, saying,

> It's nothing like in the U.S. where you were sat down, at least, again, my school, it was the same three or four days...Whereas here, yeah, we didn't have near as much, but I could do it in small increments, and I spent time, and for me, I don't know, for me hybrid is the best, best because if it's left only up to me, it probably won't get done, if I'm being honest. I have to be made to sit in some kind of training. Otherwise, I probably won't. I know I won't do it properly.

Internet issues. Teachers discussed how the inability to access online elements of the curriculum was a challenge when teaching internationally. In focus group 2, Lydia shared, "I remember [Abigail] tried Savvas with her kids from the iPads, and it was not working and it

wasn't loading. And I remember that being quite frustrating." Abigail responded to this in agreement stating, "Like I'm trying to use this new curriculum, but nothing's working!" Lydia and Abigail had also both related these concerns in their individual interviews. Lydia articulated, "I really like actually the online resource. I think it's useful. It has had some issues with loading on like iPads for the kids." She shared that she stopped using the online resources for the students due to connectivity issues. Abigail likewise stopped using it and found a different online resource for her students to use due to this concern. She said regarding the online resources:

> We were really into it at the beginning of the year, but then there was something going on with the internet, and we were all using it, and the games weren't loading. And then at that time, I don't know what happened, but we ended up getting a different program.

Akin to their comments, Jacob talked about having issues with the internet, deducing,

> Sometimes the website is a bit slow, but I think that's more of a [host country] thing than necessarily us. I know from experience in the United States, it's not typically that clunky. I just think it just is probably coming through some servers that it's not used to.

He later said regarding the transition to using the revised curriculum: "I didn't find it really stressful, except when, like, the internet wasn't working."

Visa issues. One participant shared an experience about having an issue with obtaining her visa to enter the country in time for starting the school year. Leah shared how it affected her introduction to the revised math curriculum. She said,

> For me that was stressful to come in like a month and a half after school started just because we were waiting for visas. Because at first, we were like, yes, we'll be there. And then they're like, no, visas take 30 days. So, that's stressful. And then coming to a

> new place and not really quite knowing who is here and who you talk to about certain things and just not really knowing anything and kind of being out of the loop of communication for the first part of the year because we weren't a part of any email trainings or anything. Like, we just showed up and said, "Hey, you're going to work tomorrow!" That was stressful.

Political tension. Two teachers talked about the effects of political turmoil in the country where they worked and how it was an added stressor during the school year for teachers, students, and their families. Maria shared,

> And not only for us here...of having just COVID, we're also having a lot of political problems...losing a lot of our students as the government is closing embassies. So, all students are also dealing with the feeling of, "Am I going to have to move next? Which of my friends that I just made is now going to have to move?" So, will absolutely, amen the fact that the math is the lowest on the stress list of this year.

Sarah, who is at the same school as Maria, remarked separately,

> We've had an extra stressor of political tension in the country this year. We've had two kids who have basically just, their families have been kicked out of the country. So, that has been an extra, kind of, yeah, just stress and dealing with that.

Cultural differences. Eleven of the 12 teachers discussed the impact of having a culturally and linguistically diverse group of learners in their international school classrooms. In the second focus group, Maria shared, "Making it relevant to their life and having just that extra two, sometimes three steps can be a little bit challenging in an international school." Anna expanded on this by explaining,

> Our textbooks are U.S.-based curriculum, so it's like things...like a map, right? It's only a map of the United States. They talk about cities only in the United States. Like, they talk about baseball. A lot of times they talk about U.S. dollars and coins. And there's a lot of things that we have to, if we want to teach that lesson from the book, we first have to preface and help our kids acknowledge and understand and have that context, that shared context and able to be successful in that given unit or activity.

Maria followed up by saying, "Instead of teaching dollars and cents, I'm teaching euros and the change and then I'm looking at the local rubles and the kopek, so we're still doing the same skill but making it relevant to their life." Abigail joined the conversation, saying further,

> It is really challenging to not only have to have them have that base knowledge before going into a lesson, but then also learning what that learning target is. I don't feel like it's inclusive for all of my students and how diverse they are culturally. And I think that's sometimes isolating for some of my other non-U.S. students. And so, there is that need to try to find the balance...of making those connections with the money and the current culture or country that you're living in. So, I find that a huge challenge.

Jacob also reflected on the topic in focus group 3. He mentioned the positive aspect of getting to use mathematics as a platform for additional vocabulary and cultural learning, saying,

> It can be a little bit of a blessing and a curse that there's a lot of things that kids aren't familiar with. There's all kinds of words and stuff you teach them in English that they may not necessarily be exposed to otherwise, which I think is often great.

James said of the ELL students in his classroom, "I had to explain things really slowly to them...It's like two totally different groups in the classroom...but, yeah, I agree with the low English thing, that was that was challenging." Relatedly, in focus group 1, Luke phrased his

concerns on the topic, saying, “When they don't have much English, you know, how can you explain things in math? It's quite difficult to explain your reasoning behind it when you don't have the words.” He later reflected in his journal entry how student collaboration is easier when they can all speak English well. Jacob described the accommodations he used on assessments for the English language learners in this classroom. In his individual interview, he said,

> I have definitely done a lot of editing of the tests because the tests are so American-centric, and so they're not really designed for kids whose English is a second language. It'll ask questions about sports the kids aren't familiar with, like baseball and football. It will ask questions in yards and inches, measurements that they simply never use here, and it just results in a great deal of confusion in that regard.

He continued later, expounding,

> Just some of the word problems tend to be so overstated because they're meant for people who...[are] very fluent in English... My students just come up to me and they're just like, Mr. [Jacob], I just can't understand what they're trying to ask me, so...we tone those down a bit.

Leah also expressed similar challenges, saying,

> I don't like the questioning and the wording of things; I think it’s a little off. So, I've kind of been picking and choosing. Like, what questions I actually use to grade. Does that make sense? Yeah, especially with my kids. Some of them are still trying to figure out wording. And so, even if I read it to them, they're still not quite sure what that word is.

Levi expressed the challenge of certain vocabulary words in this way:

> The word problems are sometimes a little confusing and they have some vernacular that they have no clue what they're talking about. What's a coupon? ...And also some weird stuff, like a farmer's market... So, we spend some time going over vocabulary.

Paul also talked on this topic, and said of his students,

> I give them a lot of support, some of them. Again, with an international school, we have English language learners and English challenges. So, I give them support in terms of, you know, asking them: "What do you think the problem means?" The basic components: "What do we know, what do we have to do?"

Autonomy and Teacher Input. Luke shared appreciating the independence for teachers at international schools, saying, "We have freedom to choose. You know, when you look at the curriculum, it all, everything is a suggestion." He explained,

> In the United States, at least in my school in Texas, when you had your math bulletin board, it literally came with a printout and told you where you had to put everything. So, this is where the problem of the day goes, this is the review, this is, I mean, everything was so scripted. So, here, yeah, when I find something that I feel that is too difficult for them, I just take it out.

Likewise, Levi shared,

> I love not being in a giant school district...like a giant school district where okay, you're all going to teach this now because, you know, it's what we're doing... I feel like...you are able to ask questions and be like, "Hey, what about this? What about that?" And without feeling like you're going to be blacklisted if you're not agreeing one hundred percent.

He also discussed how he appreciated that teachers are involved in the curriculum writing at FIS, saying,

> We're small enough that we have access to the writers, and it is in house, so it's us. It's not like some author from D.C. that's redoing our curriculum. They know how to teach eight-year-olds, and it's in house, and I like that.

On the topic of teacher involvement in curriculum, Lydia shared,

> I would say teachers did write the curriculum. So, not all teachers had influence, but some teachers did have an influence, and I can't speak for other people, but I did sort of talk to people around like, the age group that I taught...the people that were teaching near the age of the curriculum that I was making.

After this, Maria vocalized her thoughts,

> I personally wasn't involved, but there was opportunity for teachers to be involved, to have input. And I really appreciate that the teachers that chose to be involved and had the correct credentials were able to see, does it work in a real-life classroom as opposed to just on the showroom floor.

Other Advantages. Regarding additional advantages of teaching at an international school, Luke articulated,

> One of the main reasons I stay in international schools, the amount of stress compared to a U.S. public school, especially a Title 1 school is, I don't know, it's a difference. So, it's like comparing Michael Jordan's basketball skills to mine. I mean, it's, for me, it's off the charts. I have a small class. I have an assistant. I have, at this school in particular, at this location, more than enough planning time. So, when I hear things about, oh, there's a new curriculum, it doesn't bother me honestly in the least. Not at all. Where in the United States, you know, well, I didn't teach that long, so it only happened once, but it was it was not pleasant, we'll put it that way.

Paul affirmed the benefit of small class sizes, saying, “A big advantage is small class sizes in general at the elementary level to make it kind of easier to zoom in on each kid and their levels.” Luke also commented on small class sizes. He said,

> I have a small class. I have an assistant. I have, at this school in particular, at this location, more than enough planning time. So, when I hear things about, oh, there's a new curriculum, it doesn't bother me honestly in the least.

Regarding teachers’ comfort level with adaptability at international schools, Lydia remarked, “We're already a little bit used to students who haven't done the same curriculum the year before because you get more new students coming in from a different system.” Additionally, teachers commented on the usefulness of “safety netting” periods at FIS, an extra period to be used for enrichment or review. Lydia shared it being helpful in mathematics “for teachers to be able to review with the students”. Paul affirmed this, saying of his safety netting time, “We literally do an extra math lesson or work time because my kids need it to, you know, really get what we're doing.”

Theme 4: COVID-19

Teachers inevitably discussed the effects of the COVID-19 pandemic on the transition to the revised mathematics curriculum, which formed a central theme of the study. The topic of COVID-19 arose in conversations on the timing of the curriculum revision, the usefulness of the materials, differences in professional development and collaboration, and changes in the way teachers approached teaching math in their classrooms. Additionally, there was a discussion of the gaps and gains in students' math abilities based on home support while online. Sarah summed up the situation with these thoughts: “I like the new curriculum. It hasn't felt too overwhelming in general. Probably not at my like, not at the top of the list of stressful things this

year." In focus group 2, Eve worded her sentiments this way, "The new math is like one of the least stressors on this totem pole." Abigail answered that the major stressors for the school year were "the world shutting down, the pandemic, learning new technology platforms." Paul continued this conversation connecting it to the curriculum transition, saying, "It was fearful to me, like, we could go online at any moment, and I don't have a grip on this website, and the kids are supposed to use it. All that didn't help."

In focus group 3, Levi shared how he did not have the opportunity to set up routines in person with the students for using the revised curriculum. He said, "I would have liked to have had some time with them to teach them the routines of it all and then go online." He also articulated, "I was one of the ones [that] actually followed the rules. And so my students never work together." He continued saying, "It's insane, but I don't feel like I really got to practice that as much as I wanted to. I think the curriculum lends itself that way more but we just didn't get to practice it that way."

Timing. Abigail commented that the timing of teachers being given the information about the revised curriculum was not ideal given the effects of the pandemic. However, she appreciated having the information and the flexibility to return when she was ready to process it. She explained:

> When it was really getting rolled out, if I remember correctly, was the height of our shut down, and so it wasn't aligned very well. And so, when it was coming down and the information was there, I wasn't necessarily giving all my energy to it because I was focusing over here on surviving... Looking back, I mean, the information was super helpful. But, I also think, not only was it maybe the wrong time but for me as a teacher personally, I wasn't mentally there yet to dive into it. And so, as I think I said earlier,

> that's why it was nice all the information was here so that when I was ready, I can kind of go back in.

Materials and COVID-19. Several teachers addressed the usefulness of the revised curriculum during the COVID-19 pandemic because of the materials. Teachers valued the well-developed online portion available as part of the revision. Having curriculum resources online helped as schools moved back and forth between online and in-person learning and worked through hybrid learning with some students in-person and some online at the same time in the same class. James' narrative went as follows:

> It was paramount that we understand the [online] system, be ready to use the system. And I think that they were just kind of, you know, just get in there and use it, you know, and get familiar with it and then you'll figure it out… And it definitely came in handy already during that lockdown.

Eve shared how math was the subject students had the most ease transitioning to using when moving to online learning due to the online resources included in the revised math curriculum. She opined,

> I think the best part is the online aspects of it...We've had to move into online learning a few times, so we practice using that and the transition from going face-to-face to online. My students were most successful at getting the math done on a daily basis without a lot of confusion. So, that was good.

In his journal entry, James also shared how the online resources were helpful in transitioning from in-person to online learning, writing:

> Most of the work was conducted this year in a face-to-face classroom environment. But in light of the COVID-19 lockdowns, I was aware that the chalk and talk discussion with

> sample questions (provided in Savvas) made the lessons online seem fairly similar to our normal ‘face to face’ routines.

Maria expressed how the digital worksheets and the online teacher’s key was helpful. “I'm really enjoying having the electronic worksheets, as well as the electronic teacher key. That makes it a lot easier as well, going back and forth online.” She also said,

> Having the online access enabled makes the practical part of math so much easier so that my students that are in the classroom and my students that are not in the classroom, I don't have to reinvent the wheel or make copies or exams or find worksheets. I can just download, post, and go.

Lydia also shared how she appreciated having the workbooks for online learning because they allowed students an opportunity to do work offline, “It's also good for like online learning because like they have a physical thing which they can look at and it's not always at the screen.”

Paul explained the online videos available, saying,

> If the kids were online, I could assign to watch the video, make it an assignment, and then they would get to do what I do when we are in class together and it's being projected...My kids are really into different kinds of video for learning or for entertainment. So, this particular group this year, it's working wonderfully.

Professional Development and Collaboration During COVID-19. Teachers shared about differences in professional development and collaboration due to the COVID-19 pandemic. Mostly, they spoke of fewer opportunities for training and meeting with colleagues. However, there was some discussion on the increased opportunity to collaborate in online formats.

Several teachers shared how the COVID-19 pandemic was affecting teacher communication and collaboration. Leah said,

> Our school's open, but I think people are so terrified of getting COVID or getting our school shut down, that even if you walk into someone's room to ask for help, it's like: "6 feet!"...So, this year, I don't think there's a lot of collaboration just because of the current situation.

She continued, further describing the situation,

> I imagine if it wasn't COVID then, usually in the past, we have more collaboration for the fives, sixes, and sevens together…We're really not supposed to mix with anyone else, and teachers are also trying to take that to heart…So, I think if it wasn't in a pandemic, I think we would be able to collaborate a little bit more, like, I would hope. I don't know, I'm new. I don't know the environment quite yet. Because everyone kind of still is, "This is my room, I come, sit in my room, and then I go home," right? Like because of COVID.

Similarly, Luke said,

> I imagine if it wasn't COVID, then, usually in the past, we have more collaboration...I could be wrong, but I would think there'd be a lot more mandatory face-to-face time, whereas this year it was optional. I chose not to do it, so I can't really blame anyone but me.

Comparatively, Jacob shared, "This year has been kind of a weird one because like last year, we had staff meetings in person and that sort of thing, [and] it was a bit easier to get support." Eve agreed in her statement, "That's probably one thing that's been lacking is collaborating with other educators and working with them and seeing what they're thinking or what different students are actually doing."

Speaking on professional development, Luke remarked, “We spent some time, but there wasn't a lot of professional development this year. But again, that's down to COVID.” Relatedly, Lydia said,

> PD this year has been stumped a little with the whole situation. I don't know that there has been much, to be honest, since we started it, like in terms of like, okay, now you've got the curriculum, how's it going?

In her individual interview, Leah shared that professional development was done online, which was not a preferred method for her: “I know we have COVID, so we're doing a lot of [staff development] online, which is not ideal.”

Theme 5: Teacher Perspectives

Teachers discussed their feelings towards the revised math curriculum and the codes under this theme included feelings about mathematics, different way of teaching math, order, pacing, scope and sequence, prior experience, and uncertainty about implementation. Some teachers viewed the changes more positively than others. Teachers were open about sharing their feelings regarding the transition.

Approaches to Change. Some teachers were hesitant as they approached the transition, whereas others embraced the changes and were eager to begin. Concerning the previous curriculum, Eve said, “I was very familiar with it and understood exactly what was coming next and, you know, things that worked well in each lesson or didn't. So, at first, I was nervous. I was like, why are we changing?” James talked about how the online aspects were a challenging part of the transition for him to adjust to, saying:

> It was pretty daunting to get into this, the whole online aspect, because it's very different than anything else I've used...It's very intricate, and it's got like a million different aspects to it that you just keep finding new things...Very intense learning curve for me.

Paul also remarked on the difficulty of change in general in education, saying,

> You know, people, or at least I, sometimes I'm hesitant to embrace something new when I know I don't feel completely comfortable with it, and that happens to even veteran teachers. You may share that experience, but it's...helpful to sort of put a context on what's going to happen or could happen with the new curriculum.

Regarding the challenge of change, Jacob relayed, "You kind of teach based off, a little bit off of how you were taught growing up." Leah portrayed her thoughts on the topic this way:

> As a teacher, you go through university and college, you learn how to be the greatest teacher ever. And then you get into a classroom and you're like, right? And I think that's kind of what it is with new curriculum. You get so used to one book and one curriculum and one way for like six or seven years...And then you get a new curriculum and then you're like, yay, I get to do it again.

After the sarcasm, she continued:

> I know they test curriculum places, but I don't know, like it makes me wonder why? Go Math was working, why did you switch it? You know, it's like that kind of thing, like, I know you do new curriculum, but why not just buy the new Go Math book? Like what was wrong with Go Math that we had to switch? But I mean, like, it's part of teaching, right? Like, we just kind of have to be like, hey, this is what we're doing. We'll go with the flow. But yeah, it's not my favorite, but Go Math was not my favorite either like the first year, right?

Paul looked at the positivity of change in bringing improvement. He commented on how the curriculum for each subject is on a seven-year revision rotation at FIS, saying, "That seems reasonable to me as far as the evolution of improving teaching and or content." Following Paul's comment, Maria shared,

> I like doing it every seven years and only one subject a year as opposed to having everything to do all at once. And really appreciate that we are continuing to revise and update so we're not teaching the same thing that we've always taught for the past 50 years because that's the way we do it. I love the new changes.

Lydia, who graduated as a mathematics major with honors, phrased her opinion, saying,

> For me, the new mathematics curriculum is probably the best new curriculum for me because...mathematics is my subject and I enjoy everything mathematics related. And I really enjoyed this transition because of the kind of more conceptual bringing like 21st century skills of mathematics into the classroom and it not being all about rote memorization or whatever...I really enjoyed that fact.

Sharing his excitement regarding the revisions, Levi recalled, "I remember getting emails quite early and taking a look at it and getting interested. I had already been studying those ideas and looking at that already. So, I was kind of excited when I saw the curriculum." Luke presented his thoughts, saying, "For me, it wasn't so extreme. Okay, you know, it's changed, but not so much. And for me, it changed for the better. So, I like it." He continued:

> When I first looked at it, it was difficult because I had never...learned like that. I hadn't been taught to teach like that. Yeah, but I definitely, for the most part, prefer the new way. It makes sense, and the kids get it. I mean, it seems to, to really help.

Uncertainty about implementation. Teachers shared about being uncertain whether they were implementing the revised curriculum in the way it was intended. For example, Sarah said,

> I think that's one thing that's definitely a negative with implementing new curriculum is that you don't really know if you're doing it the way it's supposed to be done. There's no one telling you like, yeah, that's exactly what we meant for you to be doing with it like you kind of have to interpret it the best you can and hope that that is, in fact, what was meant.

Similarly, in a separate focus group, James said, "A lot of times we go through some huge process and then there's not really any feedback about how could we have done this better next time." Paul shared, "We met the threshold of the goal of the [objectives]. This was as far as I'm concerned." In focus group 1, Luke said, "Hopefully I'm following the curriculum the way I'm supposed to." Later he added, "I just assume I'm doing what I'm supposed to be doing," and "I'm hoping that I'm doing it correctly." In the same focus group, Leah later commented, "And in all honesty, truth, I don't really feel like there's someone here that I could go ask." Regarding the wording of the new ongoing mathematical practices, she said,

> I pulled up the one I'm doing now, and it's like, "The student will explore and communicate math strategies to solve problems," and honest truth, like I read it, and then, I mean, I figure we'll do it eventually because how is a kid like, "Explore?" What does that mean to me? Like, we're six. How are you going to explore thirteen plus twenty-two? Like, what does that mean? I honestly have no clue because I teach six-year-olds, and I feel like if they can solve the problem, then we're good, right?

She also wondered about whether specific resources, such as enrichment activities existed, saying, “I don't know if it exists or maybe it does, or we don't have it.” Then, in her journal entry, Leah shared, “They DO have enrichment and remediation pages. I didn’t know!!!”

Theme 6: Leadership

Another critical theme in the study was leadership. Various levels of leaders were discussed, including the head of curriculum, school administrators, and teacher leaders. Teachers explained how leaders were supportive and suggested ways for additional support in the future.

Head of curriculum. The head of the curriculum at FIS, Esther (a pseudonym), was mentioned eight times in the data. Sarah shared the following, which provides an introduction for Esther:

> Everybody knows [Esther’s] name and everybody knows that she's in charge of all the curriculum stuff. And so, I, even one day was having an issue, and I like ranted to her about it, “But this doesn't make sense. What were you thinking?” And then she explained. I was like, “Well, it does make sense.” And, so, I think that's a huge advantage because otherwise you're just given statements and objectives, whatever, and do it, and you can't ask questions. It's just the expectation that you'll understand it. So, I think that is definitely a benefit.

Leah expressed more of a hesitancy to reach out to Esther, sharing,

> During our fall PD, like [Esther] was like, “Email me if you have any questions, ask me your questions.” But I'm like, you're in charge of so many things. For me to sit there and send you an email, that's like, “Hey, this isn't quite right.” To me, I'm like, no, I'll just

> kind of skip that, or like, if I ever meet you and quarantine's over, I might throw it out there.

Regarding Esther, Luke stated,

> When I don't know something, I would ask our principal or the assistant director, and then he usually, if he doesn't have an answer, ask [Esther]. But now with the SharePoint, you can ask her directly. But again, I don't ask, almost ever.

Later he added, "[Esther] always responds right away, super-fast." Contradictorily, Maria shared when she asked her school administration for help, they tried to assist, but directed her to email Esther because, "the curriculum director had all that information. But when you're responding to multiple people, it takes time." In her individual interview Sarah also mentioned the need to go to Esther for information, and deduced, "So, I guess the only leadership really that's been helpful is kind of having [Esther] to, like, send a message to her and be like, this isn't making sense." Similarly, James said of Esther, "Sometimes I don't know who else to ask."

Sarah shared that she felt supported and that her voice was heard by the head of curriculum when she gave feedback on the previous rollout of the science curriculum. She articulated,

> I even said that to [Esther], last year when...science was new and how it was really stressful because we had all these like components that we had no training on besides just our science teacher sort of trying to help us. And so, I feel like I was heard in that area, and I like to think I had a hand in making sure there were those webinars to show us, like how to use the online resources, how to incorporate them in the new curriculum, and using the new curriculum.

School Administrators. Another important level of leadership discussed by teachers was their school administrators. School leadership was coded 20 times in the data. Eight teachers commented on having supportive school administrators. Six teachers, including two of the teachers who described supportive leadership, discussed room for improvement and how school leadership was learning along with the teachers.

Abigail shared how the director of instruction at her school "is very open and...anytime I had a question we could go directly to her." Similarly, Anna said, "We heard a lot from our leadership at school." James also remarked, "I think that at the school level, leadership was...encouraging." Although on the technology side, he shared, "It's all brand new and it's full of the glitches and stuff, and nobody seems to know how to do it." Also on technology, Jacob said,

> The tech leadership have been helpful if we've had issues with connecting and using it. But for the most part, I don't really feel like there's been too much administratively going on to help with that sort of thing....For the senior teachers in my grade bracket, they're just as new...in fact, newer to this than me. So, while they have lots of experience that's incredibly helpful...they don't know any more about it than I do.

Leah shared her concerns regarding knowing who to ask for support in finding resources, saying,

> I'm like, "Where are my books? Where are my books?" And we ended up finding them. But the people I asked were in leadership positions. And they, I don't think we're familiar with the curriculum either. So, when I asked, "Hey, where's the homework books," I was told, "There are none." So, it's, I think it's too just getting used to what is here and what's not here.

Luke said,

> I didn't really have any issues with administrations. I also didn't ask them much at all. They just disseminated the information so that if you have any questions, here's the people you can talk to. Then also emails from other people outside my school, you know, checking in, asking, reminding. So, I felt it was, it was perfectly sufficient. I had no complaints about that.

Lydia shared the way she thought leadership could have been more supportive, suggesting,

> It just seems like that connection between the curriculum leaders and then the leaders of the school could have been formed a lot earlier and a lot more like communication as to like this is the route we're going down.

Maria also shared her concerns about the level of support from leadership and said,

> I guess if we had a do over for the year, I would hope that directors would be a little bit more informed and at least have a starting plan. Obviously, since we don't know what we're doing, we're going to have trial and error with it...but I would have preferred a firmer, more consistent plan to start with.

Levi shared appreciating how much time he was given by school administrators to become familiarized with the revised curriculum. He said,

> Giving us information early and then I think [our director and director of instruction] both came back to it a couple of times like, hey, remember, there's, reminders like, there's this new curriculum coming out next year that we're doing. Check this out.

Leah, at another school, had a different experience and said of her and her husband,

> We've been at a few [FIS] schools. I feel like you're kind of like, here it is, you know, and then if you have a question, like if I have a question, I ask like a colleague. I'll be like, “Hey, what do you think of this?” Or, “Do you have something for this?” Or I feel

> like with the schools we've been in, it's kind of, teachers' kind of figure things out for themselves, maybe?

At the same school, Maria shared along similar lines:

> I don't think leadership was as helpful as they could have been. I think they tried to be helpful, but most of the answers that were given were, "Well, I don't know," and to email the curriculum director and the curriculum director had all that information. But when you're responding to multiple people, it takes time. And so, all directors who are learning this at the same time that we were, and so many of our questions, they didn't know. And so, we have to do trial and error opportunities, as well as...just, "I don't know, go ask somebody else." So, I guess if we had a do over for the year, I would hope that directors would be a little bit more informed and at least have a starting plan. Obviously, since we don't know what we're doing, we're going to have trial and error with it...but I would have preferred a firmer, more consistent plan to start with.

Luke, also at the same school said, "Here, at our school, to be honest, I haven't really asked anything of the director, but I mean, every time I did, he was there, and he responded quickly." He further shared, "They just disseminated the information so that if you have any questions, here's the people you can talk to."

Lydia shared her perspective regarding leadership at schools, saying,

> It just seems like that connection between the curriculum leaders and then the leaders of the school could have been formed a lot earlier and a lot more like communication as to like this is the route we're going down.

She continued,

> We need the leaders to be on board with this, because...nothing's going to happen in the school unless you can get the directors and directors of instruction on board. But I would say in our school, they really were on board, and they were like willing to try whatever they could to implement this curriculum and help.

Teacher leaders. Teachers shared how other teachers at their schools were helpful as leaders, and some shared how they were helpful to others as a leader. The topic of teacher leaders was coded 17 times in the data. James shared of Tabitha (a pseudonym), a secondary mathematics teacher at his school,

> The helpful thing to me was knowing that we had someone on campus like [Tabitha] who knew she was going to be using this all day long, every day... She was very quick to figure out the essentials of the program, which was most important to me.

Later he added,

> Having her helped because like that a very trained person who is willing, very willing and able to help. We have lots of people who are well trained in different stuff, but they're not always accessible and or make time to make time for you.

Sarah shared how she had taken on the role of a teacher leader in the transition: "I've kind of become an unofficial, like elementary leader. So, I guess I was the help. I'm the voice of reason and encourage the other teachers and they get sent to me from the leadership." Paul talked about how teacher leaders would hold professional development sessions to teach other teachers:

> There are people, I guess, that you could consider curriculum leaders or support people or the most knowledgeable folks, and they're the ones that would do training, volunteer, I think, to do staff professional development. And they're supported by the admin.

Further developing the idea of teacher leaders, several teachers mentioned the idea of having special training for certain teachers to assist in supporting others. James reflected,

> I mean, ideally, we would have somebody who is just like a super math person. And, yeah, you could devote just lots of extra hours to learning this inside and out and giving us training by campus or maybe by a group of campuses at one time.

Lydia discussed the same idea in focus group 2 about the online training received:

> Maybe they could have even had certain people that would have been trained on the Savvas by the Savvas people. Like, maybe the Savvas people couldn't do that many. Maybe they could, I don't know, but like, then they could have had certain people trained, and then they could do a session for their region or something like that.

Later, Abigail also agreed that this would be helpful to "have somebody designated whose been trained to then train us or have that open dialogue time set aside for that."

Theme 7: Professional Development and Training

Codes under the theme of professional development and training were introduction, in-service training, outside training, prior training, and desire for more training. Here, introductory training is the initial training received by teachers regarding the revised curriculum. In-service training is conducted by a member of the FIS school staff. Outside training is conducted by someone outside of FIS. Finally, prior training is training received before joining FIS that applied to this transition.

Introductory Training. Teachers were initially introduced to the revised curriculum through a series of Zoom video conferencing calls with a representative from the primary curriculum resource, Saavas Learning Company, on using the online resources for curriculum implementation. The sessions were recorded, and teachers could go back to watch later if they

missed them or to review the material again. Abigail shared, “Yeah, I go back, I could fast forward. Yeah, I never attended the live ones, but I went through the recordings which was helpful.” She further shared in her focus group:

> I thought it was super helpful, especially under the circumstances of the pandemic, was that all the information was given to us, and it was like, when I'm ready for it, I can step into that arena. Like, it was all there, which I thought was nice. Again, I, at the time, it was way over here. And when I was there, it was like cool, everything's online. I can cross-reference. I can ask questions on the Teams. And so I thought that was helpful.

Similarly, Luke said, “I went back, and I re-watched some of the video.” Jacob shared, “I did not attend the Zoom meetings though I know they existed.” Paul shared how he didn’t remember much from the introductory sessions, and deduced, “If it wasn't so memorable, I'm not sure how much help it was.” James said, “It didn't do much more than what you can figure out for yourself, really.” However, Anna shared,

> So, having those resources available all the time, as even a refresher for us, like, okay, yeah, I taught that. But I turn my brain off this summer, and I was not thinking about Savvas. And now...how do I sign in to Savvas again? How do I set up my classrooms again? So, like having those available, I really hope that, like, I mean that's something that I like, and maybe have a concern about, but only because I don't know if that's going to be available.

Sarah also viewed the introductory sessions positively, describing, “I have a deep appreciation for that initial just the basics: this is how you log on; this is how you access your book, this is how you can download pages if you need to, etc.” On the topic, Eve shared,

> I appreciate that they offered outside training with someone who actually understands all the components and can answer some questions. And so, I think that was really helpful to get everyone on the same page for the different parts of it. They also did a follow up training later on that teachers could join in to once they understood and got to play around with it, go a little deeper into understanding the curriculum. So, that's been helpful.

However, James' opinion differed on the training. He said,

> And it's like the people at Savvas didn't know. Yeah, every time they were asked, like, how do you print out that the page and...they said, "Okay, well, we'll ask." You know, everything was, "We'll get back to you." And so...it seemed like a total waste of time. I didn't feel like that's a training.

Leah expressed a desire to have a more hands-on training saying about the online introductory training,

> I am not going to lie, those are awful. Like as a teacher to sit and then like you just watch people click things over and over and like I feel like for me I need to do it. And I don't have like two screens with me. So, I was watching her, and it was like, I don't know, like an hour and a half. And at the end, I was still like, what?

She also expressed a desire for the training to be more focused: "I've attended the online things, but it's also for like Kindergarten through 11, and the 11-year-old teacher doesn't have the same issues that I have as a six-year-old teacher, you know?" In focus group 2, which Leah was not a part of, others similarly expressed a desire for a more focused training, saying the training was too broad as it included all schools in the organization and all age groups. Maria shared

appreciating the training, “I liked having someone that was familiar and confident going through the different features, and I got a lot out of that.” However, she also said,

> I think it could have been better if they were more focused when the Savvas person did all of it. She focused on first grade, first grade, first grade, and as a fourth-grade teacher, I couldn't care less what first grade was doing. And so, it would have been a little bit more helpful if we could have done a lower elementary and upper elementary focus.

Continuing with the focus group 2 discussion, Paul agreed with Maria, affirming,

> Why are they talking about first grade? Looking back now, what could have been better is if they didn't try to do a global [training]...and have maybe two or three of those and invite different parts of the [FIS] world to that or even more; maybe have breakout sessions within it, you know, smaller chunks.

Abigail added: “Exactly, what you guys were just saying is breaking down those groups into smaller chunks so that it's more relatable.” Paul responded, “I think that would have been better to introduce us to it. It's like, okay...here's a new big thing. Let's take this one third and feel good about it, maybe things like that.” His later statement in focus group 2 sums up teachers’ sentiments on the topic. He said, “I know it's a love hate thing with the online Savvas training.”

Comparisons with Prior Training. Some teachers shared their opinions regarding the training they received for this curriculum transition and compared it with their past training. In focus group 1, Leah shared,

> So, when I taught in the States, we had like three or four days of PD before we started the school year, and we were trained on each program.

Luke joined the conversation, remarking,

> To me, just about like everything in life, there's pluses and minuses. When I had to go for a full day of eight hours of training after half the day, I don't know how much I was retaining and how helpful it was.

Also on the topic, Lydia said,

> I don't think there's been much PD, really, since we started the new curriculum other than probably on those first few days before. Which I like, I say, I don't actually remember, but I'm sure, I think there was, was something then. I just can't think what it was. But since then, I don't think that there really has been much.

Eve shared about the previous curriculum and her experience with training before joining FIS:

> Well, before we were using Go Math, which I feel like I had a different approach to it than a lot of [FIS] teachers did, mainly because in Alaska, our school districts had already implemented Go Math, and they did a huge like, you know, 3-day training for teachers to actually understand the reasons behind it and like the actual flow and how to incorporate it for different learners and teaching styles.

Outside Training. Three teachers mentioned helpful training done by people outside of FIS. James said of a professional development session run at his school,

> It was very useful for the older kids where we can do all this mind-bending communication about how we're going to use this stuff in the future and all of these different ongoing practices about exploring the universe with these math concepts. And it sounds much more complicated than really I think it is. But it was very useful. If you have a chance to look at that document that she produced for, I think for older kids, it was very, very useful because I was trying to wrap my head around how, how are you going to do this?

Sarah shared about a different training she and teachers at her school attended, saying,

> We...had a man come to us for our fall PD last year who is like, his mathematical practices are really reflective within this curriculum. And [Esther] even like changed her schedule so she can come to our PD to listen to him speak. And so, because of that, we were, the general concepts of like getting the kids to understand their thinking rather than caring about the answer that like doesn't really matter. Like the answer isn't the most important thing, it's how can you explain how you got there? And one thing that I really enjoyed that he did was, have someone give the answer but then or show their work, and then someone else ask a different student to then explain, like, what do you think so-and-so was doing or how do you think they solved the problem based on the work shown? I use that a lot. And it's fun to see, like can they follow the pattern or the way that they've done it, or did this child do a way that none of the other kids understand? And so, then they do have to explain their own thinking to their classmates. So, that specifically has been really helpful.

Luke also mentioned this training, and said, “The year prior we had a someone in for math and it...wasn't helping us transition, but I felt it was a really great presenter.”

Theme 8: Materials

Teachers talked about the resources available to them with the revised curriculum and materials they found on their own or used from prior experience. Teachers discussed math manipulatives and online resources at length. The topic of online resources was coded 61 times and was included in all three types of data. Four teachers specifically addressed manipulatives in their interviews and the teachers in the second focus group had a conversation around

manipulatives. Manipulatives refer to the hands-on materials or tools students use to practice mathematics.

Manipulatives. Teachers expressed how manipulatives are an essential resource for elementary mathematics teachers. In focus group 2, the discussion on manipulatives began with Anna describing,

> Last year, right, there is like this big like dream and hope that were put into my head that like we'd get like a cute little organizer. It'd be labeled. And every elementary teacher's dream, you know, all these materials. And then....I don't know what happened. I don't know if it was something that like I needed to take initiative on, or obviously, maybe, COVID affected like orders and things. But I'm still like waiting for my little hope and dream.

Lydia addressed Anna's concern, saying, "We wanted to get the manipulatives, but we were told, well, schools have manipulatives already from the previous curriculum and they probably have enough." Lydia continued, explaining,

> I really appreciate that we have a lot of manipulatives, we do. But when you're trying to look for them, the huge boxes, you're sort of searching through all these boxes trying to find the right thing. And it takes a lot of time and energy to do it. And I think, I personally think, it would have been nice to get them in with the curriculum. And yes, you might have previous manipulatives that could be added to that, great, fine. But if every seven years you get a new curriculum, I think you should also get the new material to go with the new curriculum.

Maria, from a different school, finished the conversation by sharing how she did have a supply of manipulatives in her classroom this school year. She voiced,

> So, having something, anything, in the classroom works amazing. So, hopefully that dream will come true and you have access to stuff at your fingers because it's been, maybe not a game changer, but it's been really helpful because as everyone else in this group call does, I use my prep times for so many things. Hunting down materials for the future lesson, that usually happens five minutes before the lesson and sometimes more than five minutes isn't enough.

In her individual interview, Maria had also spoken on manipulatives, commenting, "The traditional manipulatives are easier to use than the specially designed ones that are going along with this curriculum, and so I have been using my own resources." Additionally, Sarah mentioned using her own resources, saying, "So, for me, I'm trying to find a balance between incorporating some hands-on, maybe from like meshing it with a different, not necessarily curriculum, but like things I've already had with the same topics of the same ideas." Jacob relayed the lack of connection between the curricular materials and the hands-on manipulatives used to teach the concepts and how he would have liked to have those connections made for him rather than needed to search them out or already know about them from experience. He said,

> I would just say that it might have been nice to, especially with this year, with everything going on, and that's maybe also why this didn't happen, but just sort of have some idea of what each individual student needs as far as like mathematical tools.

He continued to explain,

> Just like the idea of having some forethought about what students might need, you know. In the future, going forward, could have been generally beneficial...just because especially in an international school setting, teachers are just coming in and out.

Online Resources. Another category of resources discussed was the online resources available with the curriculum. Teachers' online resources included lesson preparation videos, instructional videos for students, an online teachers' platform including the teachers' key, an online student textbook with examples, and online assignments, manipulatives, and assessments. As discussed under the theme of COVID-19, these online resources were valuable for teachers as they transitioned to using the revised curriculum amid the COVID-19 pandemic. In focus group 3, Jacob said, "I thought that Savvas, and math in general, was a little easier to teach online than some of the other subjects." Sarah agreed and phrased her opinion, saying, "Using Savvas online when we were online is so much easier than using Go Math in the past, and I feel like it's more accessible for the kids as well." Jacob replied, "Yeah, it's definitely better built for online work." Subsequently, Levi voiced how the online resources were even beneficial for parents, saying, "I thought it was great that it was online, that it was available. And some of the parents were actually taking the math as well."

Eve described the "short video, a two, three-minute video that teachers can watch", saying, "One thing that I like is, the curriculum, it kind of gives like a teacher video snapshot of, you know, why you're teaching the lesson this way or what it is you want your kids to get from it. I listened to a few of them when I was first figuring it out." Levi also mentioned the videos, saying,

> There is a training...It was like a professional, someone whose been working with it for a long time just to flow. What is the class flow look like? And not only that, but how do you speak to students and, kind of like the encouraging way, like good things to say that's rewarding effort, not outcome and that kind of stuff. And this guy is just top notch...I

> loved it...[It] was so helpful to be like, okay, this is what the day, the forty-five minutes looks like.

On the topic of the online instructional videos for student learning, Luke said, “The fact that you can project it makes it nice. So, I do like it. I haven't used in a little while, but I like it.” Paul likewise shared the usefulness of the student videos online, and James told about how the student examples online were beneficial, saying, “There were several times, where the students go, ‘Oh, okay, I get it,’ because they were like looking at examples and stuff on the program that they can click, and they can get like a sample question and help me solve this. Stuff like that on the program that was very beneficial.”

In additional to appreciating the videos, Paul appreciated the overall online materials. He shared,

> We also have an online component that's directly connected to the curriculum, which is a great resource. Even if we were not in the situation of having to go online, the Saavas Realize website that's connected to our math curriculum, I think is really, really good in the way it's organized.

Similarly, Sarah compared how supportive the online math resource was with the online science content, saying,

> It's really been a great resource to know how to use because we've been able to provide it so easily for the kids while they're away. Whereas, in contrast, the science online program, I have no desire to even log into it at this point because it is a total disaster. And we didn't really have training on it. And it's so complex that it doesn't make any sense.

In the journal entries, nine of 12 teachers mentioned using the online resources for their lesson planning. Leah, Anna, and Maria, respectively, wrote that resources that were helpful in

planning were “the online Savaas website”, “sections of the teacher online platform”, and the “online SAVVAS teacher key”. James, who also shared using the online resources for planning, typed, “Prior to implementing the lessons, my preparation includes reading the online resources and looking over the assignments that students completed independently (online previously, from at least the day before).” During his lesson, Paul utilized the student videos available online. He reflected,

> Today I tried instructional videos... It went well. I was surprised by how at first students enjoyed the videos. Before I try it again, I will reconsider their use for each lesson. Next time, I plan to ask students to respond more directly to the pause questions in the videos.

Eve used the online resources as “a follow up of an individual quick check on Savvas” for her students after the lesson. Lydia also used the online videos in her lesson, writing, “The structure of the visual video was really helpful on this online platform and introduced vocabulary in a clear way that also allowed students to think about the ideas the vocabulary was referring to.” Sarah wrote about how she used the provided online teacher instructional videos in addition to other resources to prepare her lesson. In her pre-lesson entry, she wrote: “I feel confident about doing this lesson because I was able to access a decent amount of resources pre-lesson to have my own understanding of what a 3-Act Math lesson looks like.” Levi also used the instructional video in preparation for his lesson, and similarly scribed, “I feel very confident about doing this lesson because I was able to see another professional work through the process, and I worked through the problems before trying to teach it.” Paul also relayed his confidence due to the online videos, writing, “I feel very confident about doing this lesson because of how the videos can be interpreted by me to clarify concepts.”

Outside Resources. Some teachers commented on using materials outside of those provided with the curriculum. In his journal entry, James wrote, "Resources that were helpful in planning were the examples of previous years' books (Go Math) and other worksheets that I brought with me from [another FIS school]." He further wrote, "I will again use all of my own resources to build up student confidence in the fraction unit, before I trust the Savvas materials to enable students to be ready for the assessments." Teachers mentioned using a variety of online resources outside the curriculum, such as YouTube, Google Search, Pinterest, and Teachers Pay Teachers.

Research Question Responses

The central research question and sub-questions were addressed by the data collected in this study. The research sub-questions were simplified into the categories of situation, support, and coping based on the 4 S framework in Schlossberg's (1981) transition theory of situation, support, strategy, and self. Strategy and self are combined in the coping question. Codes were divided into these three categories based on which question they answered. The themes that emerged were also divided into the three categories based on which research sub-question they answered. Table 4.3 lists the research questions, their relevant themes, and quotes that helped answer each question.

Table 4.3

Research questions and themes

Research Questions	Themes	Quotes
Central Research Question: How do elementary educators at an organization of international schools transition to using a revised mathematics curriculum?	A combination of all 8 themes supported answering the central research question.	"You get all sorts of students at various backgrounds and various curriculums that they've been learning. So, I guess you're more used to having to kind of help kiddos transition between

		curriculums in a normal year when there isn't a curriculum change as well." "We first have to preface and help our kids acknowledge and understand and have that context [to be] able to be successful in that given unit or activity."
Sub-question 1: How did situational factors affect teachers' transition to using a revised mathematics curriculum?	International School	"We've had an extra stressor of political tension in the country this year." "We have access to the writers, and it is in house."
	COVID-19	"The new math is like one of the least stressors on this totem pole." "It was fearful to me, like we could go online at any moment and I don't have a grip on this website and the kids are supposed to use it. All that didn't help."
Sub-question 2: How were teachers supported throughout the transition to using a revised mathematics curriculum?	Collaboration	"talking through it helps me" "helpful for figuring out what we want to do" "being open if you're struggling is really important"
	Leadership	"I felt leadership was helpful in that I felt like they were just like giving us all the information."
	Professional Development and Training	"I appreciate that they offered outside training with someone who actually understands all the components and can answer some questions."
	Materials	"each lesson is laid out really clearly" "website that's connected to our math curriculum...[is] good in the way it's organized"
Sub-question 3: What coping strategies did teachers use to transition to the revised mathematics curriculum?	First-Year Implementation	"It gets better. All year I've been saying to the teachers who are like nervous or struggling with the math curriculum, like, it's the first year."
	Teacher Perspectives	"I just relied back on old school stuff." "There were parts of the curriculum that I omitted."

Central Research Question

The Central Research Question for this case study was: How do elementary educators at an organization of international schools transition to using a revised mathematics curriculum?

Each of the eight themes contributed to answering this question. Teachers at FIS transitioned to using a revised mathematics curriculum by being supported through collaboration, leadership, professional development and training, and materials. Their transition was affected by being at an international school in several ways. Teachers coped through the transition remembering it was the first year and through their various perspectives that involved their prior experience teaching mathematics.

Sub-Question 1: Situation

Sub-question 1 was: How did situational factors affect teachers' transition to using a revised mathematics curriculum? Teachers were asked about other stressors happening at school apart from the curriculum change and how these stressors affected the transition. Teachers were also queried regarding the unique challenges and the advantages of curriculum transition at international schools. The themes that answered sub-question 1 were COVID-19 and international school differences, as these were two main situational factors in this case study that affected curriculum implementation. The situational factors that affected teachers' transition to using a revised mathematics curriculum were the COVID-19 pandemic, stress over visa issues and political turmoil, and aspects of working at an international school, such as cultural and language differences.

Other Stressors and Their Impact. The major situational factor that affected the curriculum implementation was the COVID-19 pandemic. The word "COVID" was used 21 times and was referenced over 37 times. Apart from COVID-19, other stressors teacher participants discussed were visa issues and political tensions in the country where they were working. One teacher referenced visa issues and two teachers discussed political tension.

COVID-19. Regarding other factors affecting the revised curriculum rollout, Eve, Sarah, and Abigail all made comments about how the transition to teaching due to the COVID-19 pandemic was more stressful than the mathematics curriculum transition. Other teachers chimed in giving specific examples of how the pandemic affected the curriculum rollout, such as Levi not having enough time to set up the routines of the revised curriculum with students before moving to online learning. Paul and James both shared of the stress of needing to figure out the online components of the curriculum quickly due to school lockdowns.

Political tension and visa issues. As mentioned earlier, about the stress of visa issues and transferring to another school within the organization, Leah shared how she was "out of the loop of communication for the first part of the year because we weren't a part of any email trainings or anything." Maria and Sarah discussed political tension in the country where they worked as an added stressor during the school year. Students were concerned if their family would be the next to leave or if another friend would be leaving soon. This added to the concerns teachers needed to address in the classroom with students beyond mathematics.

International School. The curriculum was implemented at an organization of international schools rather than schools in the United States, and this was another situational factor in this case study affecting the transition to using a revised curriculum. Maria and Sarah discussed the stress of political tensions, and Leah shared about visa issues, two stressors regarding living and working internationally that affected them and their students. In addition to this, teachers shared how autonomy, teacher input, and budget at FIS affected the transition. Teachers discussed how cultural differences and having a high percentage of English language learners in their classrooms affected the transition. One further point discussed by teachers was

the “safety netting” time given. Safety netting is an additional period for doing enrichment and remediation activities and can be tailored according to teacher discretion and student needs.

Teacher autonomy and involvement, a robust budget, small class sizes, having teaching assistants, and ample safety-netting time were all factors that positively affected teachers as they made the transition. Regarding teacher autonomy, Luke said, “We have freedom.” Levi said, “You are able to ask questions”. He also shared, “We have access to the writers, and it is in house, so it's us...They know how to teach eight-year-olds and it's in house, and I like that.” Paul said, “A big advantage is small class sizes.” In focus group 1, Luke said, “I've never worked at a school that has such a budget.” Leah agreed, and Luke expanded on his point, saying, “If I need anything, I can buy it, which is really cool.” Jacob shared his appreciation for having teaching assistants to support the ELL students in his classroom, “I do have two assistant teachers in my classroom because I also have all the [ELL] kids in my classroom, and I have 15 kids right now. I can't even imagine that in the States having two assistants.” In focus group 2, Paul said, “I'm really lucky that I've got enough safety-netting time where we literally do an extra math lesson or work time because my kids need it.” Lydia followed his point, saying, “I do think they've done really well the last few years and giving a lot of safety netting time for teachers to be able to review with the students.”

Teachers shared how they adjusted their instruction and curriculum implementation to accommodate English language learners in their classrooms. Eve shared how the word problems in the revised text were “much more difficult for English language learners,” and Leah said, “This book is more wordy.” Levi, Maria, and Jacob also agreed with them regarding this challenge. Teachers spoke of how it added another element to the transition and caused math to take longer to teach.

Sub-Question 2: Support

Sub-question 2 was: How were teachers supported throughout the transition to using a revised mathematics curriculum? Four themes answer sub-question 2 involving how teachers were supported in the transition. The themes were collaboration, leadership, materials, and professional development and training. Questions in the individual interview and questions in the focus group sought to determine how teachers were supported by leadership, professional development, curricular materials, and any other helpful support resources.

Supportive Leadership. Teachers discussed how they were supported by leadership at various levels. They also shared where they felt they could have been more supported by leadership. In terms of her feelings about school leadership, Abigail shared, "I felt leadership was helpful in that I felt like they were just like giving us all the information." Levi was also encouraged regarding the support from leadership and said, "I thought they did a good job and then encouraged us to go to the PD." However, others, including Maria, Lydia, and Leah, shared desiring leadership to be more knowledgeable regarding the transition.

Supportive Materials. Material resources helped support teachers during the transition to using the revised curriculum. The online resources were valuable when schools needed to shut down and go online during the COVID-19 pandemic. Having access to the materials associated with the curriculum supported teachers in making the transition and implementing the changes in their classrooms. Anna appreciated how, "our online platform matches exactly what our like, physical materials are." Similarly, Paul said, "We also have an online component that's directly connected to the curriculum, which is a great resource." Lydia summed up her thoughts on the materials saying, "I think on the whole, I really like the resources that were with this curriculum."

Teachers, students, and parents benefited from the online elements of the revised curriculum. Sarah appreciated how "each lesson is laid out really clearly." She shared how the online platform was less complex and easier to use that the science curriculum. Luke, Levi, and Eve found the online teacher videos helpful, and Paul and Sarah shared liking the online videos for students. Levi mentioned a unique aspect of the online content, saying, "Some of the parents were actually using it. Like doing their own math course, see what they're talking about, like math. But anyway, I thought it was great."

Supportive Collaboration. Teachers shared how collaborating with others provided support during the transition. Lydia shared, "To me, I think collaboration is super important." Anna conveyed it was beneficial by saying, "Having a support system...talking through it helps me." Jacob shared, "My co-workers have been helpful for figuring out what we want to do." In the focus group he explained in more detail, saying, "At the end of the unit, we talk about how it went...We realized, okay, so, maybe we need to retool how we're teaching this. So, we just try to be a bit more introspective at the end."

Other key phrases around collaboration being supportive included the following quotes. Lydia said, "Being willing to share ideas like, that's so, so helpful" and "You can be in it together, not feeling alone in it or like you're the only one struggling." From James, "Trade tips about how to make it easier or more interesting." Leah shared, "That would really help, getting together." Paul reflected, "It's always nice to compare notes" and "Immediate support is something very nice about the school we're working in." Eve mentioned collaboration allowing the opportunity to "get a little understanding of where the kids are and where they're going." Anna expressed her appreciation for "getting to talk through some of the things" and said, "I just have to talk through it." Levi remarked, "We share it, we help quite a bit" and opined, "We

should do this more often." Collaboration was clearly a way teachers were supported in the transition.

Supportive professional development and training. Professional development and training sessions were also valuable in the transition. Teachers appreciated how the curriculum revisions were introduced early on, giving them time to prepare for the changes. In focus group 2, Paul vocalized,

> We had an in-service professional development...that you could choose to go and hear about the perspective of the new curriculum and kind of bringing up the idea of the big objectives from it. And I liked that because that's like we're putting this in your head because it's coming very soon.

Levi had a resemblant opinion, saying, "I feel like we got to go to the website and kind of see what it was going to look like, and that was key for me. I hate surprises. I hate feeling unprepared."

Teachers also valued the ability to go back and review the introductory training. Abigail said, "I felt like the Zoom meetings, the conversations, to be very helpful when everyone is asking questions." She appreciated being able to re-watch the content when she was more mentally prepared for it, and said, "I go back, I could fast forward." Maria shared, "I dove into that math training at the beginning of the year because I needed something that I could control. And so, I did a lot of reading, a lot of practice on that." She further said, "I liked having someone that was familiar and confident going through the different features, and I got a lot out of that." Relatedly, Eve said, "I appreciate that they offered outside training with someone who actually understands all the components and can answer some questions."

Sub-question 3: Coping

Sub-question 3 was: What coping strategies did teachers use to transition to the revised mathematics curriculum? The themes that answer sub-question 3 were first year implementation and teacher perspectives. Teachers coped by reminding themselves that this was the first year using the revised curriculum. They also shared their perspectives and personal strategies for coping with the transition. Strategies included dialoguing with others, reviewing the training materials, using what worked well in the past, and doing their own professional development and research.

Remembering that the first year with a revised curriculum is challenging was a common way teachers coped with the transition and was found across the data in all three focus groups and ten of the twelve individual interviews. Sarah shared, "It gets better. All year I've been saying to the teachers who are like nervous or struggling with the math curriculum, like, it's the first year." Abigail used self-talk and coped by "just taking a break and being like, this is okay, this is new." She shared how, at first, "for me as a teacher personally, I wasn't mentally there yet to dive into it...that's why it was nice all the information was here so that when I was ready, I can kind of go back in." Jacob admitted, "I do find myself using some of last year's resources to supplement this year's resources right now."

Lydia shared how she coped by being supported through collaboration and "talking to people about it." Eve also personally coped through dialogue and shared,

> I live with a mathematician, a high school math teacher. So, we have a lot of like, more in-depth math conversations than I think most elementary teachers do. And so, like, I kind of understand, like the smaller steps and how you bring those small steps into the bigger picture.

James formulated his thoughts on the topic, saying,

> I don't think it was to the point where, I'm like, tearing my hair out. Just sometimes I would give up, and I'd say, okay, I'll just do this in the book because I could not figure this one out...Yeah, I just relied back on old school stuff. It's all I could do.

Leah shared a similar way of coping, saying,

> I'm going back to like what I did for Go Math. And I'm like pulling it because I feel like, again, kids need to move and do things like that. And so, like this year, it's kind of like trying to figure out how they're the same and what I can pull.

She also said regarding collaboration and how she found support from websites, "So, there's not much [collaboration], I mean, there's me and Pinterest and Teachers Pay Teachers, that is. We are collaborating very well together."

Levi shared how, in the revised curriculum, rote memorization is not the focus but is something he still felt is important. He shared how relying on what he knew was comforting. He said,

> I'm still a math facts guy...I still hold on to that. That's like my comfort blanket, you know? Like, we have a new curriculum where it's not supposed to be such a big deal. Like, who cares if they can, you know, speed's not an issue. But I still want them to know that know six groups of five is 30...I'm having a hard time kind of letting that one go.

He also remarked, "I was always researching on my own," and "I do a lot of personal PD." Luke also expressed coping by not using everything available and using his own materials as well. He said, "I have a lot of stuff of my own." He also shared researching on his own to find resources and using what worked well previously, commenting,

> If there is something I didn't really understand, I just Googled it, or...I type it in YouTube, and sure enough, you know, there's usually a video that's like, oh, okay, now they can watch this two and a half minute video rather than me trying to explain it without a proper visual.

Maria also mentioned Google and talked about the process of trial and error during the first year of curriculum implementation. She articulated, "So, mostly trial and error for the transition on my own, and then, of course, the good old Google, sort of, how do I do such and such? And that also answered several questions." She also said, "There were parts of the curriculum that I omitted so that we could start off slow about why did we add fractions." Sarah described her perspective, saying,

> I also have done a lot of like searching for interactive activities to incorporate...So, now my goal is figuring out the balance between...meeting all of the exact things from the book, but also letting the kids have the game to play and the, the fun part while still learning. So, now with the pacing, I'm still working on, like, how can I incorporate both?

Summary

Teacher participants shared how they were navigating the transition to using a revised curriculum at their organization of international schools, FIS. Data was collected through individual interviews with each teacher, focus groups, where teachers joined one of three groups according to their scheduling preferences, and pre-lesson and post-lesson journal entries, where teachers reflected on lesson planning and execution. Eight themes were developed from the data collected by grouping coded phrases into categories. The themes of the study that aided in answering the research questions were First-Year Implementation, Collaboration, COVID-19, International School Differences, Teacher Perspectives, Professional Development and Training,

Materials, and Leadership. As teachers made the transition, they were affected by the situational factors of COVID-19 and being at an international school. They were supported during the transition by leadership at various levels, collaboration with colleagues, professional development and training, and the material resources available with the curriculum. Their attitudes and perspective towards the transition also provided support and led to the strategies they used. Teachers coped with the transition through different personal strategies and knowing that the revised curriculum was in its first year.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this single instrumental case study was to research how teachers at an organization of international schools transitioned to using a revised mathematics curriculum to understand how to replicate or improve the process for success in the implementation phase in the future. This chapter first provides a summary of the findings of the study. Subsequently, there is a discussion of the theoretical framework and an empirical discussion comparing the data to the literature in chapter two. Next, the data's theoretical, empirical, and practical implications are provided, followed by the delimitations and limitations of the study, and concluding with recommendations for future research.

Summary of Findings

This section will provide a summary of the findings of this study. First, the central research question is addressed. Subsequently, the three research sub-questions are answered succinctly, further developing the answer to the central research question.

Central Research Question

The central research question for this study was: How do elementary educators at an organization of international schools' transition to using a revised mathematics curriculum? This question was answered through the eight themes delineated in chapter four's data analysis. The themes were First-Year Implementation, Collaboration, COVID-19, International School Differences, Teacher Perspectives, Professional Development and Training, Materials, and Leadership. Teachers transitioned to using a revised mathematics curriculum at FIS, an organization of international schools, through collaboration with colleagues, encouragement from leadership, and trial and error in the first year of implementation. Additionally, they

adapted their approaches due to the COVID-19 pandemic and teaching at an international school. They combined reliance on the materials of the curriculum with materials that worked in their previous experiences, participating in and re-watching professional development and training sessions, and employing a variety of strategies based on prior experience and their perspectives of the transition.

Sub-Question 1

The first sub-question was: How did situational factors affect teachers' transition to using a revised mathematics curriculum? Teachers were affected by two main situational factors: COVID-19 happening concurrent to the transition and making the transition at an international school. The COVID-19 pandemic had the effect of causing stress for teachers and made the transition to the revised mathematics curriculum less of a focus for teachers. As Abigail shared, "I wasn't necessarily giving all my energy to it because I was focusing over here on surviving." One potentially positive aspect of the COVID-19 pandemic was that teachers quickly implemented online elements more fully using these resources than they may have otherwise. Being at international schools with a large percentage of English language learners created a need for teachers to incorporate language learning and cultural context into their mathematics lessons. This added layer of teaching involved more planning and time spent teaching mathematics; however, teachers were supported in this effort by smaller class sizes, classroom teaching assistants, and safety-netting periods for additional time spent according to teacher discretion.

Sub-Question 2

The second sub-question for this study was: How were teachers supported throughout the transition to using a revised mathematics curriculum? Four of the eight themes established

from the data answered this sub-question. Teachers at FIS were supported throughout the transition to using a revised mathematics curriculum through leadership, materials, professional development, and collaboration. Collaboration formed an essential element of how teachers sought support during the transition. Teacher participants discussed various ways leadership supported them and provided suggestions for how leadership could have better supported them. They were supported when leaders were knowledgeable and available to address their concerns. Participants shared positive and negative elements of training and materials as well, as there were ways they supported teachers, and participants gave recommendations as to how they could be improved in the future. Teachers were supported by professional development and training that was practical and available to re-watch on their own timelines and time zones. Materials that were readily available and useful during in-person and online learning were helpful in supporting teachers as they transitioned.

Sub-Question 3

Finally, the third sub-question was: What coping strategies did teachers use to transition to the revised mathematics curriculum? This question was answered in the two themes of teacher perspectives and first-year implementation. In addition to providing support, collaboration was also used as a coping method for teachers. The coping strategies of teachers varied based on their perspectives and prior experiences. Teachers shared coping through the transition by remembering that the first year of curriculum implementation is the most challenging year filled with trial and error and learning. Teachers used comforting phrases such as “it gets better” and “it's going to be fine” to cope and continue with the implementation process.

Discussion

This section will include a theoretical discussion and empirical discussion of the data. First, the study's theoretical framework is addressed with a discussion of how the data aligns with Schlossberg's (1981) transition theory and Kolb's (1984) theory of experiential learning. Next, in the empirical discussion, the data of this study are compared with the findings of previous studies and the literature in chapter two.

Theoretical Discussion

The findings of this study concurred with transition theory. Transition theory by Schlossberg (1981) formed the basis for the research sub-questions centering around the 4 S's affecting transition: situation, support, strategies, and self. Two main situational factors affected the transition: the COVID-19 pandemic and the international location of the schools. Teachers were supported by leadership, materials, collaboration, and training. Teachers' strategies to cope with the transition included collaborating with others, remembering it was the first year with the curriculum, and through various perspectives and personal approaches.

Situation. Schlossberg (2011) told of the importance of understanding the stressors happening concurrently with a transition. Inevitably, teachers were affected by the COVID-19 pandemic that began to affect schools in early 2020. The revised curriculum was introduced to teachers during the 2019-2020 school year and was first implemented in the fall of 2020 when schools were still going back and forth between online and in-person learning. This situation affected teachers transitioning to using the revised curriculum, causing many of them to focus on and implement the online aspects of the curriculum sooner and more intensely than they may have without the pandemic. With 27 years of teaching experience, James told of the intense learning curve for him to become familiar with the online materials quickly. Eve, Levi, Maria,

and Paul also commented regarding the usefulness of the online materials given the pandemic situation. Eve shared having more success transitioning from in-person to online learning with the mathematics curriculum than other subjects due to available online elements. Levi reflected on how parents were even using the online resources to learn how to best support their children at home. Paul talked about the value of the online videos which gave instruction to students and made the transition from in-person to online learning more seamless than other subjects.

The second major situational factor affecting the curriculum transition was implementing the curriculum at international schools. Teachers described the differences between teaching at an international school and teaching at a school in their home countries, the United States and the United Kingdom. Having multiple English language learners in classrooms required teachers to include an additional layer of language learning and cultural context lessons. However, smaller class sizes and having teaching assistants in their classrooms allowed for more focused support than students would have in school systems in their home countries. Maria and Sarah talked about how the political turmoil in the country where their school was located affected students.

Another situational element of this case study was that teachers were involved in the curriculum writing and had input into the changes. Teachers expressed their appreciation for this, although not all teachers initially knew this had been the case. Maria changed her thoughts on the process when she understood teachers had been involved.

Prior experience was helpful for teachers in knowing how transitions typically progress and that the first year will have challenges. The situational factor of having prior experience with similar elements of the revised curriculum caused some teachers to embrace the changes more readily. This was the case with Levi and Luke, whereas Eve, Leah, and Paul expressed hesitance to embrace the new changes due to their familiarity and comfort level with the

previous mathematics curriculum. Transition theory determined that individuals may perceive the same transition differently based on their perspectives (Anderson et al., 2011). This was evident in the variety of teacher participants' responses.

Support. Support is determined by the resources available as a person makes a transition (Schlossberg, 1981). In this case study, teachers had four main sources of support: leadership, training and professional development, collaboration with colleagues, and materials. Amidst these support factors, teachers expressed lacking feedback and opportunities to collaborate and, at times, knowledgeable leaders to ask questions and receive guidance and direction.

Feedback and affirmation are critical elements of support in transition theory (Schlossberg, 1981). Teachers shared receiving affirmation and encouragement from colleagues and leadership, although the feedback element seemed to be lacking as teachers shared being uncertain of whether they were implementing the revised mathematics curriculum according to its intent. Some teachers expressed being pleased and well supported with how the curriculum was introduced, sharing an appreciation for how early the materials were released, how the training sessions provided helpful information, and how they were recorded, allowing easy review. Others expressed a desire for more focused and hands-on introductory training sessions to understand the curriculum better.

Strategies and Self. According to transition theory, individuals assess the transition differently and even when the transition is seen as a positive change, coping mechanisms are still required to make the transition (Anderson et al., 2011; Schlossberg, 1991). Teachers had a variety of strategies they employed to make the transition to using the revised curriculum. Some needed more time than others. For example, Abigail shared appreciating how she could go back and re-watch the training videos when she was more mentally prepared to process the

information. Realizing the first year of curriculum implementation has more challenges than subsequent years was a common strategy of teachers in the transition. Collaboration with colleagues was also a frequently used strategy for teachers as they coped with the transition.

Experiential Learning Theory

The findings of this study were viable with experiential learning theory. Experiential learning theory involves teachers moving through a cycle of concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) (Kolb, 1984). This theory was chosen to form the framework for this case study as teachers were cycling through the transition of experience and reflection to implement a revised curriculum, in this case, a mathematics curriculum. In the phase of concrete experience (CO), teachers in this study began working with the curriculum, training in it, and using the revised curriculum and its materials in their classes. In reflective observation (RO), teachers reflected on how curriculum implementation progressed and collaborated with others to receive and give support. During abstract conceptualization (AC), teachers decided what to keep from previous practice and what to add from outside resources. Active experimentation (AE) occurred as teachers tried new things based on training, collaboration, and reflection outcomes.

Learning is the goal of transitioning through the phases of the experiential learning cycle, and a vital element of the cycle is reflection (Hughes & Scholtz, 2015; Kuk & Holst, 2018). Initially, the journal prompt was to be the main collection method used to capture data on how teachers were reflecting through the process of learning and implementing the revised curriculum. However, all three data collection methods were instrumental in providing information on how teachers reflected for, in, and on action, as Cowan (1998) outlined.

Reflection for action occurred as teachers began learning about the revised curriculum, its purpose, and its features, including the materials associated with it. Teachers shared various opinions regarding the usefulness and effectiveness of the introductory training. Teachers appreciated how information was given in advance of the changes and that the information was available to return to later because it was recorded. Abigail, Anna, and Eve all commented on the value, even suggesting its usefulness for incoming teachers in subsequent years. Reflection in action happened during the school year through dialogue with colleagues and re-watching training seminars. Levi shared how observing others supported his learning, and several teachers shared being supported by the online instructional videos included in the curricular resources. Teachers began to assess the revised curriculum's strengths and weaknesses, deciding what to use from past experiences while learning how to implement new elements from the curriculum revisions. As part of this process of reflection, teachers went back and forth between like and dislike of the revised curriculum. In her individual interview, Maria shared not being a fan of the revised curriculum, whereas, in the focus group, she shared liking it. The timing between the interview and the focus group may have allowed more time for Maria to get comfortable with the revised curriculum. Paul described the love and hate relationship teachers had with the introductory training. Reflection on action similarly occurred through collaborating with colleagues. Jacob discussed how he and his grade level co-teacher would talk about the outcomes of each unit after its completion. They shared what went well and what could have improved and made notes to implement for the following year. The process of reflection may be better supported in the future through more structured opportunities for collaboration.

The process of reflection for learning could have been bolstered by feedback from administrators. Sarah, Luke, and Leah shared not knowing whether they were meeting the intent of the revised curriculum in the way they were implementing it. Collaboration and dialogue with colleagues seemed to happen organically and may have more profound outcomes if additional direction and organization were applied.

Empirical Discussion

This section covers how the findings of this study provide an extension to previous literature. The empirical discussion compares and contrasts the findings of previous research on the topic. This discussion has been organized according to the themes of this study.

Leadership. According to literature, leadership matters in school improvement, and having a solid structure for supporting teachers improves change implementation outcomes (Holmes et al., 2013; Kondakci et al., 2017; Wood-Garnett & Greene-Bryant, 2018). Teacher participants from different schools within FIS expressed the support received from school leadership in different ways, and some teachers felt more supported than others. Those who felt supported discussed valuing the availability of leadership to answer questions and having someone knowledgeable to provide explanations. Similarly, teachers who did not feel supported told of leaders who were not knowledgeable or available to address their questions. Consistent with this finding is the Rigby et al. (2017) study, which concluded that school leaders need training to understand the changes for their observations and feedback to be meaningful to teachers in transition. Boston et al. (2017) also determined that this support for leaders in providing feedback was most effective when it was ongoing.

Additionally, several studies determined that teachers' trust of leadership was important and particularly valuable during curriculum implementation (Berkovich, 2018; Holmes et al.,

2013; Kondakci et al., 2017; Van Maele at al., 2014). Trust was not explicitly addressed by participants in this study but alluded to when referring to how leaders "tried to be helpful" but some teachers did not feel they had the knowledge necessary to assist and provide answers. Aas (2017) referred to tension between teachers and leadership during the process of implementing change. Again, this was not specifically addressed by teachers in this study, but elements of tension could be perceived in some teachers' comments. James shared, "Sometimes I don't know who else to ask," and Leah commented regarding school leadership, "I don't think were familiar with the curriculum either." However, many teachers expressed that leadership was responsive and encouraging.

Teacher participants suggested having a teacher leader at each school or region to support other teachers with the curriculum implementation to answer questions and guide teachers as they made the transition. Similarly, Lowe and Appleton (2015) suggested from their findings to provide a "person of expertise" to mentor primary teachers implementing a new science curriculum. Specific to mathematics, research conducted by Bengo (2016) and Hopkins et al. (2017) concluded that math coaches were beneficial during mathematics curriculum transition. Math coaches can provide a bridge between professional development and classroom application (Knight, 2007). In Leithwood's (2016) literature review and Hanuscin et al.'s (2016) findings, department-head leadership was a more effective influencer in school reform than school-level leadership.

First-year implementation. There was robust discussion by teachers around the fact that this was the first year using the curriculum. All teachers shared about the ongoing nature of the transition to using the revised curriculum. Eve shared how the first year was a time for "testing out the curriculum." Abigail shared her relief at the realization that her colleagues were also "all

still learning." Outcomes from Golding's (2017) research also included the need for follow-up and support as teachers continue to make a curriculum transition. Additionally, a gradual and structured implementation program was an element of success in Miedijensky and Abramovich's (2019) study on implementing change. Curriculum transition is a process and is meaningful when several years can be spent building a culture supportive of the change (Fullan, 2016).

In terms of teachers not fully implementing the curriculum, Salminen and Annevierta (2016) found that some teachers used only one, whereas some used several of the new curriculum requirements in their lesson planning. Teacher participants in this study shared similar experiences. Paul shared that he was "trying to see the bigger objectives and work on those a little more next year." Lydia comforted others, saying, "This is the first year, and this year is not going to look like it's meant to look."

Professional development and training. Teachers shared being pleased with the amount of time they were given to become familiar with the information and the changes to the curriculum. However, several teacher participants expressed a desire for training to be centered around specific age groups and region-specific training, as schools in different parts of the world had issues that pertained only to their region. Several teacher participants, including Leah and Maria, discussed wanting the training to include a practical or hands-on element. Similarly, Hill et al. (2018) studied the ineffectiveness of a mathematics professional development program and found sources to include inadequate training, not considering teachers' needs, and disconnect between the goals of the district and the training.

Teachers expressed ambiguity regarding whether they were meeting the curriculum revision's intentions and uncertainty as to the materials available to them. Sarah shared, "There's no one telling you like, yeah, that's exactly what we meant for you to be doing." Luke and Leah

expressed similar sentiments. Maria mentioned, "I would have preferred a firmer, more consistent plan to start with." These are valuable insights, as understanding the curriculum supports teachers in meeting its intent (Remillard & Kim, 2017). Clear guidelines were one of the successful components in Galloway and Numajiri's (2019) study on the value of "bottom-up" curriculum implementation, and a lack of expertise was also a challenge for teachers implementing a new curriculum in the Jarvis (2016) study. Stouraitis et al. (2017) relayed the vital role teachers play in meeting the goals and intent of a curriculum, and in Hiebert and Stigler's (2017) comparison of Japanese and U.S. teaching, they shared the importance of having a system in place for teachers to follow. Many of the teachers in this study echoed these sentiments that a clear plan and system of implementation would have made them even more successful, particularly in knowing whether they were meeting the curriculum writers' intent.

Materials. Although teachers mentioned a lack of diverse and internationally sensitive materials, they did not speak of a misalignment between the materials and the objectives of the curriculum. On the topic, James shared how "Somebody must have checked this all out pretty extensively at some point." Lydia explained regarding writing the TSWs (the objectives The Student Will accomplish), "Basically what happened was the materials are based on the Common Core, and then we wanted our TSWs to kind of follow as much as we can the Common Core curriculum, so most of our TSWs are based on like what's in the book." She further noted of the curriculum writers, "We're not allowed to put any TSWs that the textbook or workbook or whatever [that] couldn't help the teacher teach." This differs from the Polikoff (2015) and Swars and Chestnutt (2016) studies that found a lack of available materials aligned with Common Core. This adds to the body of knowledge on this topic, suggesting an increase in resources centered around Common Core from 2016 to the time of this study in 2021.

Teachers used a variety of materials to meet the objectives of the revised curriculum. Many spoke of using their own materials and resources from past experience. Sarah told of seeking to find a balance between using her previous materials that she found to be fun and hands-on and using the new materials and "exact things from the book." This verifies the findings of Baumfalk et al. (2019) that teachers use a variety of materials beyond those supplied with the curriculum to reach its aim.

Collaboration. Collaboration was a significant theme of the study covering 8% of the collected data content. Teachers discussed it as providing support, and it was used as a coping strategy for teachers in the transition process. Nine of 12 teacher participants shared their immense appreciation for dialoguing with colleagues, and some teachers expressed a desire for more opportunities for collaboration. Consistent with this, Lotter et al. (2018) found that collaboration opportunities were significant in increasing teachers' use of a new instructional strategy and reinforcing professional development. Research overwhelmingly supports that, in addition to increasing motivation to use a new curriculum, teachers understand and implement curriculum better with increased collaboration and advice-seeking from colleagues (Al Salami et al., 2017; Dilkes et al., 2014; Hopkins et al., 2017; Kaiser, 2013; Kensington-Miller et al., 2014; Porter et al., 2015; Wilhelm et al., 2016). Some teachers, such as Lydia, suggested that additional opportunities for collaboration be provided. This corroborates Sandholtz et al.'s (2019) findings that lack of collaboration opportunities was a challenge for teachers during curriculum implementation.

Similarly, professional learning communities (PLCs), a system for collaboration, have also been supportive to teachers during curriculum transitions (Golding, 2017). The teacher

participants in this case study were not involved in PLCs. However, Anna mentioned missing her involvement in PLCs, an experience she had found supportive at previous schools.

Teacher perspectives. Knowledge of the reasoning behind changes has been influential on the transition process's effectiveness (Hemmi et al., 2019; Kondakci et al., 2017). Teacher participants in this case study shared their appreciation for teacher involvement and input afforded them by administrators in the process of curriculum revision at FIS. Levi praised the fact that "We have access to the writers, and it is in-house." Maria shared how involving teachers in the curriculum revision process includes those "able to see, 'does it work in a real-life classroom?'" This correlates with the findings of a Finnish study by Salminen and Annevierta (2016), where being involved in curriculum planning positively influenced teachers' lesson planning. Wilcox and Lawson (2018) also found that curriculum implementation sustainability was enhanced by incorporating teacher voice in the revisions. The literature supports that curriculum implementation is effective when teachers are actively involved in the process of curriculum revision (Biesta et al., 2015; Galloway & Numajiri, 2019; Wilcox & Lawson, 2018).

All teachers in this study shared liking mathematics at some level. Ten out of 12 shared preferring math as a favorite subject to teach. This is inconsistent with the reportedly common experience of elementary teachers in other studies who experience math anxiety and dislike mathematics (Adeyemi, 2015; Gresham, 2018; Novak & Tassell, 2017).

In this study, teachers' perspectives, and engagement due to prior experience affected teachers mainly in two ways. Firstly, having used one curriculum for many years and feeling comfortable and confident with it caused Paul, Eve, and Leah to feel hesitant to transition using a revised curriculum. This affirms Harris and Graham's (2019) findings that teachers are generally reluctant to change curricula. Jacob shared how teachers often teach based on how they were

taught. Hughes et al. (2019) and Jarvis (2016) also determined that many teachers feel secure in prior practice and teaching the way they were taught. These initially hesitant teachers felt better about the transition as they began to determine the similarities to the previous curriculum they were familiar with using. Indeed, a personally meaningful curriculum has been easier for teachers to implement (Ittner et al., 2019). Secondly, and further aligned with Ittner et al.'s (2019) findings, prior experience studying the concepts involved in the revised curriculum positively affected Levi, Jacob, and Luke's willingness to change and begin implementation. These findings are consistent with Salminen and Annevierta's (2016) determination that prior experience affects teacher engagement with a new curriculum and other research showing that teachers transitioning curricula make decisions based on their context and beliefs (Horn & Kane, 2015; Munter & Correnti, 2017; Richards, 2017; Saadati et al., 2019; Sun, 2019).

Situational factors of COVID 19 and international school setting. Sun (2019) related that some structures and policies could cause setbacks in curriculum transition. The policies and new structures at schools due to the COVID-19 pandemic may have caused a setback for some teachers. However, it was a motivator for some teachers to implement the online components of the curriculum more quickly. Having these online resources available helped smooth the transition during the pandemic. Teacher participants shared how the stress of changes due to COVID-19 outweighed any stress of implementing the revised mathematics curriculum. UNESCO (2020) identified confusion and stress as a negative consequence of school closures due to the COVID-19 pandemic. Kim and Asbury (2020) found that teachers in the United Kingdom also expressed feeling stressed and overwhelmed due to the pandemic and desired increased relationship-building and comradery as they navigated through the challenges

associated with teaching during the COVID-19 pandemic. This furthers the argument that teachers desire opportunities for collaboration during times of stress and transition.

Gardner-McTaggart (2018) formulated that change is often destabilizing at international schools, where consistency is valuable to a transient student population. In terms of transience, Maria and Sarah mentioned the instability among their student populations sharing of students' families who had to leave the country for political reasons. Teachers also shared extensively on the pressure on English language learners to learn English and math concurrently.

Implications

This section provides the implications of this research. First, the theoretical implications explain how the findings enrich transition theory and experiential learning theory. Secondly, the empirical implications are given, summarizing the finding's contributions to the literature. Finally, the practical implications explain how the findings are helpful to practitioners, administrators, and teachers, who implement curricula revisions.

Theoretical Implications

Transition theory indicates that transitions involve a process affected by several factors, namely situation, self, strategies, and support (Schlossberg, 1981). Teachers in this study were affected by situational factors. Understanding these situations would support assisting teachers as they make a curriculum transition. Teacher participants had different perspectives on the curriculum revisions and how to cope with the transition relating to the self and strategy elements of transition theory. Knowing how teachers are supported during transition can further help leaders seeking fidelity of curriculum implementation. This research further supports the effectiveness of using Schlossberg's (1981) transition theory as a framework for studies in education.

Teachers in this study moved through a cycle of learning. Kolb's (1984) experiential learning theory and the experiential learning cycle effectively provided a framework for understanding how teachers learn to implement a revised curriculum. Teachers moved from experiencing the curriculum to conceptualizing how to implement the curriculum to reflecting on how to improve the experience for their students to actively experimenting with the curriculum. Reflection, individually and with colleagues, was valuable to teachers as they transitioned.

Empirical Implications

The empirical implications of this study suggest an alignment with previous literature on the topic of teachers in transition. These areas of alignment include leadership, time, teacher involvement, and collaboration. Leadership matters in providing a smooth curriculum transition (Holmes et al., 2013; Kondakci et al., 2017; Wood-Garnett & Greene-Bryant, 2018). Teacher leaders further support fellow teachers in the transition (Bengo, 2016; Hopkins et al., 2017; Lowe & Appleton, 2015). The transition to using a revised curriculum is a gradual process taking time and requiring feedback to reach full implementation intentions (Fullan, 2016; Golding, 2017; Miedijensky & Abramovich, 2019). Active involvement of teachers and increasing their knowledge improves the integrity of implementation (Biesta et al., 2015; Galloway & Numajiri, 2019; Hemmi et al., 2019; Kondakci et al., 2017; Salminen & Annevierta, 2016; Wilcox & Lawson, 2018). Collaboration supports teachers in implementing curriculum transition and positively contributes to teacher understanding of the revisions (Al Salami et al., 2017; Dilkes et al., 2014; Hopkins et al., 2017; Kaiser, 2013; Kensington-Miller et al., 2014; Lotter et al., 2018; Porter et al., 2015; Sandholtz et al., 2019; Wilhelm et al., 2016). All of these implications are closely aligned with and confirm the literature on teachers transitioning to using a revised curriculum.

One finding of this study was divergent from the literature. Teachers in this study shared the Common Core-based curriculum's objectives were mainly aligned with the curricular materials' material resources. This is a new finding, as previous studies from 2015 and 2016 saw a lack of appropriate materials to meet the objectives of Common Core (Polikoff 2015; Swars & Chestnutt, 2016). Indications being that materials have become available in the past five years that align with Common Core objectives.

Practical Implications

The table below shows the relationship between the research sub-questions, their related themes, and the study's practical implications.

Table 5.1

Research questions, themes, and practical implications

Research Sub-Questions	Related Themes	Practical Implications
Sub-question 1: Situation	COVID-19	The stress of moving to online learning caused faster implementation of online materials. The math transition was not the most stressful happening of the school year.
	International Schools	Teachers spend time teaching language, context, and vocabulary for math. Smaller classes and teaching assistants provide support.
Sub-question 2: Support	Leadership	Availability and knowledge appreciated. Feedback and follow-up may support better understanding.
	Materials	Manipulatives wanted. Alignment with objectives appreciated. Teachers supplemented curricular materials with own materials.
	Training and Professional Development	Appreciation for early timing and being able to re-watch. Desire for focus on grade-level bands (lower and upper elementary) and regions. Suggestion for training teacher leaders to support teachers.
	Collaboration	Additional opportunities for collaboration desired by many. Some teachers initiated collaboration efforts on their own.

Sub-question 3: Strategies and Self (Coping)	First Year Differences	Helpful to know it was a year for trial and error.
	Teacher Perspectives	Some liked, some disliked the curriculum changes. Prior experience was beneficial or limiting based on the teacher and the type of experiences.

As administrators and curricula leaders seek to support teachers in making transitions to using revised or new curricula, an awareness of the situational factors affecting teachers concurrently, knowledge of the support teachers need, and an understanding of how teachers cope through various strategies according to their individual experience and perspectives will help incubate a more effective transition. To avoid the inconsistencies and lack of fidelity of curriculum implementation found in studies by Chalkiadaki (2019) and Nevenglosky et al. (2019), follow-up training, feedback, and a well-communicated plan for tiered implementation should be developed. Goals for the first, second, and third years of curriculum implementation should be defined in simple, understandable terms and communicated to teachers. If curriculum writers go to the time, trouble, and research to put together a new or revised curriculum for teachers to implement in the classroom, there also needs to be energy allocated to determine the key components teachers should not miss from the changes. There should be good training, follow-up, and feedback for the first years of implementation, so teachers know if they are meeting the curriculum goals and the work of curriculum writers was not in vain.

Curriculum leadership should consider: What are the most critical elements to focus on for the first year? What about the second and third years? How can they know if teachers are implementing the curriculum effectively and what additional training is needed? What will the plan be for new teachers joining the school system in subsequent years?

In this study, in areas where administrators lacked the knowledge to support teachers in this transition, teacher leaders arose to support others. Time spent appointing and training

teacher leaders in an upcoming curriculum may also support this curriculum implementation process. Curriculum leaders should decide what content is most valuable, and then teach school leadership and teacher leaders the goals to communicate to other teachers. It would allow teachers an easy go-to contact person among their peers to ask questions and receive support. These goals can be spread out over several years of curriculum transition but need to be communicated effectively to leadership and teachers.

Leaders should be trained to provide feedback to teachers on whether the intent of the curriculum change is evident in their classrooms. It should be easy for teachers to know if they meet years one, two, and three of curriculum transition goals. This would provide additional support for teachers coping with the transition. It should also result in better outcomes for students if the intent of the curriculum change is being followed up on and mentorship provided to teachers on meeting its goals. When support and understanding were lacking, teachers turned to their own resources for support. Teachers could be supported by offering opportunities for sharing their ideas and best practices as a curriculum transition is in progress.

Technology can play a role in improving curriculum transition. In this study, due to the COVID-19 pandemic, teachers quickly became familiar with and implemented the online portions of the curriculum. Teachers in this study appreciated re-watching training content, having videos available for supporting lesson planning and student learning, and supplemented training materials with general online content found through Google, on YouTube, Teachers Pay Teachers, and Pinterest. Teachers becoming familiar with the online components of a curriculum can be beneficial in an international school classroom as students sometimes need to leave school due to family, home country holidays, or political reasons.

For teachers, understanding that curriculum transition is a process and takes time can be a coping mechanism. At times it becomes necessary to, as Leah said, "do it because you're supposed to" and work through the trial-and-error nature of trying and learning something new. Pre-service teachers can be taught the process of change, what to look for, and what resources to go to from the results of this study as they seek to implement a new or revised curriculum.

Delimitations and Limitations

This section provides a discussion of the limitations and delimitations of the study. The limitations are factors outside the researcher's control. The delimitations are deliberately chosen areas of focus that precluded other factors from influencing the research.

Limitations

Circumstances beyond the researcher's control included the effects of the COVID-19 pandemic and its policies on education during the period of this research. The 2020-2021 school year, when this research occurred, was not a typical school year due to the restrictions of the pandemic. All interviews and focus groups were conducted online through Zoom to protect the health and safety of participants and follow recommended COVID-19 protocols.

Seven participants were female, and five were male. This ratio is inconsistent with the predominantly female teacher population of elementary teachers. Participation in this study was voluntary, and the researcher did not control the ratio of male to female teachers.

International schools were intentionally chosen as the focus of this study, and FIS schools are found throughout the globe. However, the participants in this study were working at international schools in the Commonwealth of Independent States (CIS) or post-Soviet countries in Eurasia, which may separate the results from those found at other international schools.

Delimitations

Data places the population of international school educators at half a million, serving approximately 6 million students (ISC, 2020). International schoolteachers were chosen to participate in this study as limited studies have focused on this population of educators and due to the convenience and availability of international teachers to the researcher during the data collection process. Due to the researcher's convenience, only one organization of international schools, FIS, was the focus of this study.

Mathematics was chosen as the subject of focus for this study as mathematics education has undergone significant changes in recent years. Participation was voluntary and was done by convenience sampling. Having mathematics as the subject of focus may have affected who volunteered, as most of the teachers who participated in this study expressed liking mathematics. A random sample rather than a convenience sample may have yielded a different percentage of teachers who liked and disliked mathematics, and therefore, potentially, different results.

Teacher participants were required to be in at least their second consecutive year of teaching at FIS. This precludes the information on how first-year teachers in the organization transition to using a revised curriculum. This was a chosen delimitation as the experience of a first-year teacher in the organization may be different from a second-year teacher, as they would be transitioning to an entirely new school system, not just transitioning to using a revised mathematics curriculum.

This study focused on elementary teachers as participants. Administrators and curriculum leadership were not included, nor were parents or students. Elementary teachers teach multiple subjects and cannot focus solely on mathematics. Additionally, they are often not entirely comfortable with mathematics, even experiencing math anxiety. Elementary

mathematics is valuable as it provides the foundation for students' future mathematics experiences.

Recommendations for Future Research

The following recommendations for future research are based on the limitations and delimitations of this study. Similar studies could be done on how international teachers transition to using curriculum focusing on subjects other than mathematics, such as literacy or science. In the future, researchers could interview middle school and high school mathematics teachers to understand how they transition to using revised and new curricula.

A comparative case study could be conducted at multiple organizations of international schools to determine how other international educators transition to using revised mathematics curricula and how teachers at different organizations make the transition. Broadening the scope of international schools involved in a similar study may bring different results, as all the schools in this study were in former Soviet states, where English is not widely spoken. Teachers discussed how the curriculum was American-centric. Another organization of international schools may have curricula that are more internationally focused. A different study could determine the effectiveness of such curricula when teaching English language learners and multi-cultural students and making a curricular transition. Comparing results with teachers at schools in the United States or the United Kingdom would additionally provide the perspective of differences among these populations of educators. Such a study may find that educators from the U.S. and U.K. who teach in Central Asia and Eastern Europe are more familiar with and therefore open to change than teachers who have lived in one place. Alternatively, a transition may be easier for a teacher who lives in one place, as overseas educators may be seeking stability and control of something they know, causing them to be less open to change at school.

Further studies could research the effectiveness of curriculum transition in determining whether the goals of the curriculum writers were met after the three years of the implementation process. Additionally, a quantitative study could determine if students' scores on standardized assessments changed three years after a mathematics curriculum transition. One additional gap in the literature found during this research and an area for future study is that there is minimal research on how online teacher collaboration can support teachers transitioning to using a revised or new curriculum. A comparative study could be undertaken between teachers with math anxiety and teachers confident in math to determine any differences in how they transition to using a revised or new mathematics curriculum.

Thomas and Cooper (2016) discussed the lack of resources for parents in curriculum reform. Levi made a unique observation regarding parents' use of the online component of the curriculum to learn about the curriculum revisions for themselves. It may warrant further study of how parents can support the transition to using a revised curriculum. Students' perspectives of a transition would also be an interesting factor to consider in future studies. Further research is also recommended on how teachers cope with the stressors of a pandemic for additional guidance for school administrators and teachers on what to expect and how to best transition when facing unexpected calamity.

Summary

This single instrumental case study answered how teachers at an organization of international schools transitioned to using a revised mathematics curriculum. Teachers were affected by the situational factors of COVID-19 and being at international schools. The data collected through interviews, focus groups, and journal entries were categorized into eight themes to answer the research questions. Teachers were supported by leadership, collaboration,

training, and materials. Teachers coped through the transition through various strategies based on their perspectives and prior experience and remembered that the first year using a revised curriculum always brings challenges.

REFERENCES

Aas, M. (2017). Understanding leadership and change in schools: Expansive learning and tensions. *International Journal of Leadership in Education*, *20*(3), 278-296.

Adeyemi, A. (2015). Investigating and overcoming mathematics anxiety in in-service elementary school teachers (Electronic and thesis dissertations, Paper 5463). Retrieved from http://scholar.uwindsor.ca/etd

Al Salami, M. K., Makela, C. J., & de Miranda, M. A. (2017). Assessing changes in teachers' attitudes toward interdisciplinary STEM teaching. *International Journal of Technology and Design Education*, *27*(1), 63-88.

Allinder, R. M. (1994). The relationship between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education, 17*(2), 86–95.

Alvunger, D. (2018). Teachers' curriculum agency in teaching a standards-based curriculum. *The Curriculum Journal*, *29*(4), 479-498.

Amador, J. (2016). Mathematics pedagogical design capacity from planning through teaching. *Mathematics Teacher Education & Development*, *18*(1), 70–86.

Ampadu, E., & Danso, A. (2018). Constructivism in mathematics classrooms: Listening to Ghanaian teachers' and students' views. *Africa Education Review*, *15*(3), 49–71.

Anagnostopoulos, D., Levine, T., Roselle, R. & Lombardi, A. (2018) Learning to redesign teacher education: A conceptual framework to support program change. *Teaching Education*, *29*(1), 61-80.

Anderson, M. L., Goodman, J., & Schlossberg, N. K. (2011). *Counseling adults in transition:*

Linking Schlossberg's theory with practice in a diverse world (4th ed.). New York: Springer Pub.

Andrews, P. (2007). The curricular importance of mathematics: A comparison of English and Hungarian teachers' espoused beliefs. *Journal of Curriculum Studies, 39*(3), 317–338.

Angelopoulou, M., & Kavvadia, K. (2018). Experiential learning in oral health education. *Journal of Education and Health Promotion*, *7*(1), 70-70.

Ansari, D. (2016). No more math wars. *The Education Digest*, *81*(7), 4.

Avidov-Ungar, O. (2016). A model of professional development: teachers' perceptions of their professional development. *Teachers and Teaching*, *22*(6), 653-669.

Baird, J., Johnson, S., Hopfenbeck, T. N., Isaacs, T., Sprague, T., Stobart, G., & Yu, G. (2016). On the supranational spell of PISA in policy. *Educational Research*, *58*(2), 121-138.

Barwell, R. (2016). Formal and informal mathematical discourses: Bakhtin and Vygotsky, dialogue and dialectic. *Educational Studies in Mathematics*, *92*(3), 331-345.

Baumfalk, B., Bhattacharya, D., Vo, T., Forbes, C., Zangori, L., & Schwarz, C. (2019). Impact of model-based science curriculum and instruction on elementary students' explanations for the hydrosphere. *Journal of Research in Science Teaching*, *56*(5), 570-597.

Bengo, P. (2016). Secondary mathematics coaching: The components of effective mathematics coaching and implications. *Teaching and Teacher Education*, *60*(11) 88-96.

Bernhardt, P. E. (2015). 21st century learning: Professional development in practice. *The Qualitative Report*, *20*(1), 1-19.

Berkovich, I. (2018). Typology of trust relationships: Profiles of teachers' trust in principal and their implications. *Teachers and Teaching: Theory and Practice*, *24*(7), 749–767.

Biesta, G., Priestley, M., & Robinson, S. (2015). The role of beliefs in teacher agency. Teachers

and teaching: *Teachers' Professional Agency in Contradictory Times*, *21*(6), 624-640.

Biesta, G., Priestley, M., & Robinson, S. (2017). Talking about education: Exploring the significance of teachers' talks for teacher agency. *Journal of Curriculum Studies*, *49*(1), 38-54.

Boaler, J. (2013). Ability and mathematics: The mindset revolution that is reshaping education. *FORUM*, *55*(1), 143-152.

Boaler, J. (2016*). Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages, and innovative teaching*. San Francisco, CA: Jossey-Bass.

Boaler, J., & Selling, S. K. (2017). Psychological imprisonment or intellectual freedom? A longitudinal study of contrasting school mathematics approaches and their impact on adults' lives. *Journal for Research in Mathematics Education*, *48*(1), 78-105.

Boaler, J., & Sengupta-Irving, T. (2016). The many colors of algebra: The impact of equity focused teaching upon student learning and engagement. *Journal of Mathematical Behavior*, *41*(3), 179–190.

Bonne, L., & Johnston, M. (2016). Students' beliefs about themselves as mathematics learners. *Thinking Skills and Creativity*, *20* (6), 17-28.

Boston, M. D., Henrick, E. C., Gibbons, L. K., Berebitsky, D., & Colby, G. T. (2017). Investigating how to support principals as instructional leaders in mathematics. *Journal of Research on Leadership Education*, *12*(3), 183-214.

Brown, L. R. (2019). *Experiences of Troops to Teachers (TTT) in Maryland* [Doctoral dissertation]. Liberty University.

Brozo, W. G., & Crain, S. (2018). Writing in math: A disciplinary literacy approach. *The Clearing House: A Journal of Educational Strategies, Issues, and Ideas*, *91*(1), 7-13.

Bunnell, T. (2014). *The changing landscape of international schooling: Implications for theory and practice.* Milton Park, Abingdon, Oxfordshire, UK: Routledge.

Bunnell, T. (2016). Teachers in international schools: A global educational 'precariat'? *Globalisation. Societies and Education*, *14*(4), 543-559.

Bunnell, T., Fertig, M., & James, C. (2016). What is international about international schools? An institutional legitimacy perspective. *Oxford Review of Education*, *42*(4), 408-423.

Campbell, A., Craig, T., & Collier-Reed, B. (2019). A framework for using learning theories to inform 'growth mindset' activities. *International Journal of Mathematical Education in Science and Technology*, *51*(1), 26-43.

Campbell, C. L., & Kresyman, S. (2015). Aligning business and education: 21st century skill preparation. *E-Journal of Business Education and Scholarship Teaching*, *9*(2), 13.

Campbell, P. F., Nishio, M., Smith, T. M., Clark, L. M., Conant, D. L., Rust, A. H., DePiper, J. N., Frank, T. J., Griffin, M. J., & Choi, Y. (2014). The relationship between teachers' mathematical content and pedagogical knowledge, teachers' perceptions, and student achievement. *Journal for Research in Mathematics Education*, *45*(4), 419–459.

Carmen, B. (2019). *A phenomenological study of the experiences of secondary teachers trained in content-only areas throughout their first year instructing English language learners* [Doctoral dissertation]. Liberty University.

Cerda, G., Pérez, C., Giaconi, V., Perdomo- Díaz, J., Reyes, C., & Felmer, P. (2017). The effect of a professional development program workshop about problem solving on mathematics teachers' ideas about the nature of mathematics, achievements in mathematics, and learning in mathematics. *Psychology, Society, & Education*, *9*(1), 11.

Chalkiadaki, A. (2019). The predisposition of school culture towards change in public primary

education in Greece. *Education 3-13*, *47*(4), 410-425.

Chan, K. K. H. & Yung, B. H. W. (2018). Developing pedagogical content knowledge for teaching a new topic: More than teaching experience and subject matter knowledge. *Research in Science Education*, *48*(2), 233-265.

Chauraya, M., & Brodie, K. (2017). Learning in professional learning communities: Shifts in mathematics teachers' practices. *African Journal of Research in Mathematics, Science and Technology Education*, *21*(3), 223-233.

Clapham, A. & Vickers, R. (2018). Neither a borrower nor a lender be: Exploring 'teaching for mastery' policy borrowing. *Oxford Review of Education*, *44*(6), 787-805.

Claro, S., Paunesku, D. & Dweck, C. S. (2016). Growth mindset tempers the effects of poverty on academic achievement. Proceedings of the National Academy of Sciences, *113*(31) 8664-8668.

Common Core State Standards Initiative. (2019). Standards for mathematical practice. Retrieved from http://www.corestandards.org/Math/Practice/

Corbin, J., & Strauss, A. (2015). *Basics of qualitative research*. Thousand Oaks, CA: Sage.

Cowan, J. (1998). *On becoming an innovative university teacher*. Buckingham, UK: Open University Press.

Creswell, J. W. (2013*). Qualitative inquiry & research design: Choosing among the five approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W. & Poth, C. N. (2018*). Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). Thousand Oaks, CA: Sage.

Cuban, L. (2013). *Inside the black box of classroom practice: Change without reform in American education.* Harvard Education Press: Cambridge, MA.

Daly, I., Bourgaize, J., & Vernitski, A. (2019). Mathematical mindsets increase student motivation: Evidence from the EEG. *Trends in Neuroscience and Education, 15*(6), 18-28.

Degol, J. L., Te Wang, M., Zhang, Y. & Allerton, J. (2018). Do growth mindsets in math benefit females? Identifying pathways between gender, mindset, and motivation. *Journal of Youth and Adolescence, 47*(5), 976-990.

Denzin, N. K. and Lincoln, Y. S. (2011). *SAGE handbook of qualitative research*. Thousand Oaks, CA: Sage.

Dewey, J. (1938). *Experience and education*. New York, NY: Macmillan.

Dilkes, J., Cunningham, C., & Gray, J. (2014). The new Australian curriculum, teachers and change fatigue. *Australian Journal of Teacher Education (Online), 39*(11), 45-64.

Duckworth, A. (2017). *Grit: Why passion and resilience are the secrets to success.* London, UK: Vermilion.

Dweck, C. S. (2016). *Mindset: The new psychology of success.* New York, NY: Random House.

Dweck, C. S., & Master, A. (2008). Self-theories motivate self-regulated learning. In D. H. Schunk, & B. J. Zimmerman (Eds.), *Motivation and self-regulated learning: Theory, research, and applications.* Lawrence Erlbaum Associates. doi:10.4324/9780203831076

Dyke, M. (2017). Paradoxes of long-life learning: An exploration of Peter Jarvis's contribution to experiential learning theory. *International Journal of Lifelong Education, 36*(1/2), 23-34.

Egan, K. (1978). What is curriculum? *Curriculum Inquiry*, *8*(1), 66-72.

Eun, B. (2019). Adopting a stance: Bandura and Vygotsky on professional development. *Research in Education, 105*(1), 74–88.

Farber, K., & Bishop, P. (2018). Service learning in the middle grades: Learning by doing and

caring. *RMLE Online, 41*(2), 1-15.

Flowers, R. D., Luzynski, C., & Zamani-Gallaher, E. M. (2014). Male transfer student athletes and Schlossberg's transition theory. *Journal for the Study of Sports and Athletes in Education, 8*(2), 99-120.

Fullan, M. (2007). *The new meaning of educational change.* New York, NY: Teachers Collage Press.

Fullan, M. (2016). The elusive nature of whole system improvement in education. *Journal of Educational Change, 17*(4), 539-544.

Fullan, M. (2016). *The new meaning of educational change* (5th ed.). New York, NY: Teachers College Press.

Galloway, N., & Numajiri, T. (2019). Global Englishes language teaching: Bottom-up curriculum implementation. *TESOL Quarterly*, doi:10.1002/tesq.547

Gardner-McTaggart, A. (2018). International schools: Leadership reviewed. *Journal of Research in International Education, 17*(2), 148-163.

Gerstenschlager, N. E., & Barlow, A. T. (2019). Transitioning from practicing teacher to teacher leader: A case study. *Teacher Development, 23*(1), 18-35.

Golding, J. (2017). Mathematics teachers' capacity for change. *Oxford Review of Education, 43*(4), 502-517.

Goodman, J., Schlossberg, N. K., & Anderson, M. L. (2006*). Counseling adults in transition: Linking practices with theory.* Springer Publishing Company. ProQuest Ebook.

Goodyear, V. A., Parker, M., & Casey, A. (2019). Social media and teacher professional learning communities. *Physical Education and Sport Pedagogy, 24*(5), 421-433.

Gordon, S. P., & Newby Parham, J. (2019). Transitioning from the military to teaching: Two

veterans' journeys through the entry year. *The Educational Forum*, *83*(2), 140-159.

Graham, K. (2019). *The transition from classroom teacher to instructional coach a transcendental phenomenological study* [Doctoral dissertation]. Liberty University.

Grammer, J. K., Coffman, J. L., Sidney, P., & Ornstein, P. A. (2016). Linking teacher instruction and student achievement in mathematics: The role of teacher language. *Journal of Cognition and Development*, *17*(3), 468-485.

Gresham, G. (2018). Preservice to inservice: Does mathematics anxiety change with teaching experience? *Journal of Teacher Education*, *69*(1), 90-107.

Griffin, K. A. & Gilbert, C. K. (2015). Better transitions for troops: An application of Schlossberg's transition framework to analyses of barriers and institutional support structures for student veterans. *The Journal of Higher Education*, *86*(1), 71-97.

Gross, Z., & Rutland, S. D. (2017). Experiential learning and values education at a school youth camp: Maintaining Jewish culture and heritage. *International Review of Education*, *63*(1), 29-49.

Gross, Z., & Rutland, S. D. (2017). Experiential learning in informal educational settings. *International Review of Education*, *63*(1), 1-8.

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education*, *4*(1), 63–69.

Gutek, G. L. (1995). *A history of the western educational experience* (2nd ed.). Long Grove, IL: Waveland Press.

Hadar, L. L., & Benish-Weisman, M. (2019). Teachers' agency: Do their values make a difference? *British Educational Research Journal*, *45*(1), 137-160.

Haim, O., & Amdur, L. (2016). Teacher perspectives on their alternative fast-track induction.

Teaching Education, *27*(4), 343-370.

Hairon, S., Goh, J. W. P., Chua, C. S. K., & Wang, L. (2017). A research agenda for professional learning communities: Moving forward. *Professional Development in Education*, *43*(1), 72-86.

Hanuscin, D., Sinha, S. & Hall, M. (2016). Supporting teachers in (re)constructing identities as leaders: The role of professional development. In L. Avraamidou (Ed.) *Studying Science Teacher Identity: Theoretical, Methodological, and Empirical Explorations*, pp. 197–218. Rotterdam: Sense Publishers.

Harris, R., & Graham, S. (2019). Engaging with curriculum reform: Insights from English history teachers' willingness to support curriculum change. *Journal of Curriculum Studies*, *51*(1), 43-61.

Hatch, J. A. (2002*). Doing qualitative research in education settings*. Albany, NY: State University of New York Press.

Heinrich, W. F., & Green, P. M. (2020). Remixing approaches to experiential learning, design, and assessment. *Journal of Experiential Education*, *43*(2), 205–223.

Hemmi, K. Krzywacki, H. & Liljekvist, Y. (2019). Challenging traditional classroom practices: Swedish teachers' interplay with Finnish curriculum materials. *Journal of Curriculum Studies*, *51*(3), 342-361.

Hiebert, J., & Stigler, J. W. (2017). Teaching versus teachers as a lever for change: Comparing a Japanese and a U.S. perspective on improving instruction. *Educational Researcher*, *46*(4), 169–176.

Hill, B. (2017). Research into experiential learning in nurse education. *British Journal of Nursing*, *26*(16), 932-938.

Hill, H. C., Corey, D., & Jacobs, R. T. (2018). Dividing by zero: Exploring null results in a mathematics professional development program. *Teachers College Record, 120*(6), 1–42.

Hill, I. (2016). What is an international school? *International Schools Journal*, *35*(2), 9-21.

Hobson, D. P, & Silova, A. (2014). *Globalizing minds: Rhetoric and realities in international schools.* Charlotte, NC: Information Age.

Hoffman, S. J., & Silverberg, S. L. (2015). Training the next generation of global health advocates through experiential education: A mixed-methods case study evaluation. *Canadian Journal of Public Health*, *106*(6), e442-e449.

Holmes, K., Clement, J., & Albright, J. (2013). The complex task of leading educational change in schools. *School Leadership & Management*, *33*(3), 270-283.

Hopkins, M., Ozimek, D., & Sweet, T. M. (2017). Mathematics coaching and instructional reform: Individual and collective change. *Journal of Mathematical Behavior*, *46*(6), 215-230.

Horn, I. S., & Kane, B. D. (2015). Opportunities for professional learning in mathematics teacher workgroup conversations: Relationships to instructional expertise. *Journal of the Learning Sciences*, *24*(3), 373-418.

Hrycak, J. (2015). Home and away: An inquiry into home-based and overseas teachers' perceptions regarding international schools. *Journal of Research in International Education*, *14*(1), 29-43.

Huang, T., Chen, C., & Chou, Y. (2016). Animating eco-education: To see, feel, and discover in an augmented reality-based experiential learning environment. *Computers and Education*, *96*(2), 72-82.

Hughes, P., Swars Auslander, S., Stinson, D. W., & Fortner, C. K. (2019). Elementary teachers'

mathematical beliefs and mathematics anxiety: How do they shape instructional practices? *School Science and Mathematics*, *119*(4), 213-222.

Hughes, S., & Scholtz, F. (2015). Increasing the impact of a business simulation: The role of reflection. *The International Journal of Management Education*, *13*(3), 350-361.

Hwang, J., & Choi, K. M. (2020). Relationships between emotional dispositions and mathematics achievement moderated by instructional practices: Analysis of TIMSS 2015. *International Journal of Mathematical Education in Science and Technology*, *51*(1), 44-62.

ISC. (2020). ISC research. International School Consultancy. Retrieved from https://www.iscresearch.com.

Ishimaru, A. (2013). From heroes to organizers principals and education organizing in urban school reform. *Educational Administration Quarterly*, *49*(1), 3-51.

Ittner, D., Hagenauer, G., & Hascher, T. (2019). Swiss principals' emotions, basic needs satisfaction and readiness for change during curriculum reform. *Journal of Educational Change*, *20*(2), 165-192.

Jaciw, A. P., Hegseth, W. M., Lin, L., Toby, M., Newman, D., Ma, B., & Zacamy, J. (2016). Assessing impacts of math in focus, a "Singapore math" program. *Journal of Research on Educational Effectiveness*, *9*(4), 473-502.

Jarvis, D. (2016). Messy but meaningful: Exploring the transition to reform-based pedagogy with teachers of mathematics and coordinators in Ontario, Canada. *Teacher Development*, *20*(1), 18-39.

Johnson, K., & Olanoff, D. (2020). Using transformative learning theory to help prospective

teachers learn mathematics that they already "know". *The Mathematics Enthusiast, 17*(2/3), 725-769.

Jonker, H., März, V., & Voogt, J. (2018). Teacher educators' professional identity under construction: The transition from teaching face-to-face to a blended curriculum. *Teaching and Teacher Education, 71*(4), 120-133.

Kaiser, E. (2013). Contextualized support for urban teachers implementing writer's workshop. *Critical Questions in Education*, *4*(3), 213–224.

Karmelita, C. E. (2018). Exploring the experiences of adult learners in a transition program. *Journal of Adult and Continuing Education, 24*(2), 141-164.

Kartoglu, U., Vesper, J., Teräs, H., & Reeves, T. (2017). Experiential and authentic learning approaches in vaccine management. *Vaccine, 35*(17), 2243-2251.

Kensington-Miller, B., Sneddon, J., & Stewart, S. (2014). Crossing new uncharted territory: Shifts in academic identity as a result of modifying teaching practice in undergraduate mathematics. *International Journal of Mathematical Education in Science and Technology*, *45*(6), 827-838.

Ker, H. (2017). The effects of motivational constructs and engagements on mathematics achievements: A comparative study using TIMSS 2011 data of Chinese, Taipei, Singapore, and the USA. *Asia Pacific Journal of Education*, *37*(2), 135-149.

Kim, H. (2019). Teacher learning opportunities provided by implementing formative assessment lessons: Becoming responsive to student mathematical thinking. *International Journal of Science and Mathematics Education, 17*(2), 341-363.

Kim, H., Han, C, Bae, M. & Kwon, O. (2017). The relationship between mathematics teachers'

noticing and responsive teaching: In the context of teaching for all students' mathematical thinking. *Journal of Korean Society of Mathematics Education Series A: The Mathematical Education*, *56*(3), 341–363.

Kim, L. E., & Asbury, K. (2020). 'Like a rug had been pulled from under you': The impact of COVID-19 on teachers in England during the first six weeks of the UK lockdown. *British Journal of Educational Psychology*, *90*(4), 1062-1083.

Knight, G. R. (2006). *Philosophy & education: An introduction in Christian perspective (4th ed.).* Berrien Springs, MI: Andrews University Press.

Knight, J. (2007). *Instructional coaching: A partnership to improving instruction.* Thousand Oaks, CA: Corwin Press.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice Hall.

Kolb, D. A. (2015). *Experiential Learning: Experience as the source of learning and development* (2nd ed.). Upper Saddle River, NJ: Pearson Education, Inc.

Kolb, A. Y. & Kolb, D. A. (2017). *The experiential educator: Principles and practices of experiential learning.* Kaunakakai, HI: Experiential Based Learning Systems.

Kolb, A. Y., & Kolb, D. A. (2018). Eight important things to know about the experiential learning cycle. *Australian Educational Leader*, *40*(3), 8-14.

Kyei-Blankson, L. (2014). Training math and science teacher–researchers in a collaborative research environment: Implications for math and science education. *International Journal of Science and Mathematics Education*, *12*(5), 1047-1065.

Kondakci, Y., Beycioglu, K., Sincar, M., & Ugurlu, C. T. (2017). Readiness of teachers for change in schools. *International Journal of Leadership in Education*, *20*(2), 176-197.

Kuk, H.-S., & Holst, J. D. (2018). A dissection of experiential learning theory: Alternative approaches to reflection. *Adult Learning*, *29*(4), 150–157.

Leavy, A., Hourigan, M., & Carroll, C. (2017). Exploring the impact of reform mathematics on entry-level pre-service primary teachers' attitudes towards mathematics. *International Journal of Science and Mathematics Education*, *15*(3), 509-526.

Leithwood, K. (2016). Department-head leadership for school improvement. *Leadership and Policy in Schools*, *15*(2), 117-140.

Lemke, C. (2002). *enGauge 21st century skills: Digital literacies for a digital age*. Naperville, IL: North Central Regional Educational Laboratory.

Lewin, K. (1951). *Field theory in social sciences*. New York, NY: Harper & Row.

Li, H., Ochsner, A., & Hall, W. (2019). Application of experiential learning to improve student engagement and experience in a mechanical engineering course. *European Journal of Engineering Education*, *44*(3), 283-293.

Li, H., & Stylianides, A. J. (2018). An examination of the roles of the teacher and students during a problem-based learning intervention: Lessons learned from a study in a Taiwanese primary mathematics classroom. *Interactive Learning Environments*, *26*(1), 106-117.

Liljedahl, P. (2015). Numeracy task design: A case of changing mathematics teaching practice. *ZDM*, *47*(4), 625-637.

Lotter, C. R., Thompson, S., Dickenson, T. S., Smiley, W. F., Blue, G., & Rea, M. (2018). The impact of a practice-teaching professional development model on teachers' inquiry instruction and inquiry efficacy beliefs. *International Journal of Science and Mathematics Education*, *16*(2), 255–273.

Lowe, B., & Appleton, K. (2015). Surviving the implementation of a new science curriculum. *Research in Science Education*, *45*(6), 841–866.

Luciano, G. L., Visintainer, P. F., Kleppel, R., & Rothberg, M. B. (2016). Ambulatory morning report: A case-based method of teaching EBM through experiential learning. *Southern Medical Journal*, *109*(2), 108-111.

Mahfouz, J., Sausner, E., & Kornhaber, M. (2019). US international schools overseas and the Common Core. *International Journal of Leadership in Education*, *22*(4), 406-420.

Manuel, J., Carter, D., & Dutton, J. (2018). "As much as I love being in the classroom …": Understanding secondary English teachers' workload. *English in Australia*, *53*(3), 5–22.

Marshall, C., & Rossman, G. B. (2016). *Designing qualitative research* (6th ed.). Thousand Oaks, CA: SAGE.

Martinie, S. L., Kim, J., & Abernathy, D. (2016). "Better to be a pessimist": A narrative inquiry into mathematics teachers' experience of the transition to the Common Core. *The Journal of Educational Research*, *109*(6), 658-665.

McCarthy, M. (2016). Experiential learning theory: From theory to practice. *Journal of Business & Economics Research*, *14*(3), 91-100.

Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco, CA: Jossey-Bass.

Meyer, H. D., & Benavot, A. (2013). *PISA, power and policy: The emergence of global educational governance.* Oxford: Symposium Books.

Miedijensky, S. & Abramovich, A. (2019). Implementation of "Education for Sustainability" in three elementary schools – What can we learn about a change process? *Eurasia Journal of Mathematics, Science and Technology Education*, *15*(10), em1754.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014*). Qualitative data analysis: A methods sourcebook* (3rd ed.). Thousand Oaks, California: SAGE Publications, Inc.

Miller, P. H. (2011). *Theories of developmental psychology*. (5th ed.). New York, NY: Worth Publishers.

Molapo, M. R. & Pillay, V. (2018). Politicising curriculum implementation: The case of primary schools. *South African Journal of Education*, *38*(1), 1-9.

Morrison, A. R. (2018). Beyond the status quo – setting the agenda for effective change: The role of leader within an international school environment. *Educational Management Administration & Leadership, 46*(3), 511-529.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage.

Munter, C., & Correnti, R. (2017). Examining relations between mathematics teachers' instructional vision and knowledge and change in practice. *American Journal of Education*, *123*(2), 000-000. doi:10.1086/689928

Namkung, J. M., Peng, P., & Lin, X. (2019). The relation between mathematics anxiety and mathematics performance among school-aged students: A meta-analysis. *Review of Educational Research*, *89*(3), 459-496.

Napan, K., Green, J. K., Thomas, J. A., Stent, W. J., Jülich, S. J., Lee, D., & Patterson, L. (2018). Collaborative transformations: Cooperative inquiry as a catalyst for change. *Journal of Transformative Education*, *16*(3), 246-267.

National Commission on Excellence in Education. (1983). A nation at risk: The imperative for educational reform. *The Elementary School Journal*, *84*(2), 112-130.

National Governors Association Center for Best Practices & Council of Chief State School

Officers (2010). Common Core State Standards for Mathematics. Washington D.C. Retrieved from http://www. corestandards.org/the-standards

NCTM. (1991). *Professional standards for teaching mathematics*. Reston, VA: National Council of Teachers of Mathematics.

Nevenglosky, E. A., Cale, C., & Aguilar, S. P. (2019). Barriers to effective curriculum implementation. *Research in Higher Education Journal*, *36*(1), 31-62.

Ng, Y. F., Chan, K. K., Lei, H., Mok, P., & Leung, S. Y. (2019). Pedagogy and innovation in science education: A case study of an experiential learning science undergraduate course. *The European Journal of Social & Behavioural Sciences*, *25*(2), 2910-2926.

Ngwenya, V. C. (2019). Curriculum implementation challenges encountered by primary school teachers in Bulawayo Metropolitan Province, Zimbabwe. *Africa Education Review*, *17*(2), 158-176.

Ni Fhloinn, E., Nolan, B. C., Hoehne Candido, G., & Guerrero, S. M. (2018). Pre-service versus in-service mathematics teachers' opinions of mathematics reform in post-primary schools in Ireland. *Irish Educational Studies*, *37*(4), 431-452.

Nordin, A., & Sundberg, D., (2018). Exploring curriculum change using discursive institutionalism - a conceptual framework. *Journal of Curriculum Studies*, *50*(6), 820-835.

Nortvedt, G. A., & Buchholtz, N. (2018). Assessment in mathematics education: Responding to issues regarding methodology, policy, and equity. *ZDM*, *50*(4), 555-570.

Novak, E., & Tassell, J. L. (2017). Studying preservice teacher math anxiety and mathematics performance in geometry, word, and non-word problem solving. *Learning and Individual Differences*, *54*(2), 20-29.

OECD. (2005). *Definition and selection of key competencies*. Paris, France: OECD.

OECD. (2012). Country note: United States. Program for International Student Assessment (PISA) Results. Retrieved from https://www.oecd.org/unitedstates/PISA-2012-results-US.pdf

OECD. (2018). Education at a glance. Centre for Educational Research and Innovation. Retrieved from https://www.oecd-ilibrary.org/education/education-at-a-glance-2018_eag-2018-en

Ottmar, E. R., Rimm-Kaufman, S. E., Larsen, R. A., & Berry, R. Q. (2015). Mathematical knowledge for teaching, standards-based mathematics teaching practices, and student achievement in the context of the responsive classroom approach. *American Educational Research Journal*, *52*(4), 787-821.

Parkay, F. W., Anctil, E. J. & Hass, G. (2014). *Curriculum leadership: Readings for developing quality educational programs* (10th ed.). Boston, MA: Allyn & Bacon.

Parkes, C. M. (1971). Psycho-social transitions: A field for study. *Social Science and Medicine*, *5*(2), 105-115.

Patton, M. (2015). *Qualitative research & evaluation methods* (4th ed.). Thousand Oaks: CA: Sage Publications.

Paunesku, D., Walton, G. M., Romero, C., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015). Mind-set interventions are a scalable treatment for academic underachievement. *Psychological Science*, *26*(6), 784–793.

Perusso, A., Blankesteijn, M., & Leal, R. (2019). The contribution of reflective learning to experiential learning in business education. *Assessment and Evaluation in Higher Education*, *45*(7), 1-15.

Piaget, J. (1952). *The origin of intelligence in children*. New York, NY: International University Press.

Piaget, J. (1959). *Language and thought of the child.* (M. Grabain, Trans.). New York, NY: Humanities Press.

Piasta, S. B., Logan, J. A. R., Pelatti, C. Y., Capps, J. L., & Petrill, S. A. (2015). Professional development for early childhood educators: Efforts to improve math and science learning opportunities in early childhood classrooms. *Journal of Educational Psychology*, *107*(2), 407-422.

Polikoff, M. S. (2015). How well aligned are textbooks to the common core standards in mathematics? *American Educational Research Journal*, *52*(6), 1185-1211.

Polikoff, M. S., Petrilli, M. J., & Loveless, T. (2020). A decade on, has Common Core failed? Assessing the impact of national standards. *Education Next*, *20*(2), 72–81.

Polly, D. (2017). Elementary school teachers' uses of mathematics curricular resources. *Journal of Curriculum Studies*, *49*(2), 132-148.

Porter, R. E., Fusarelli, L. D., & Fusarelli, B. C. (2015). Implementing the common core: How educators interpret curriculum reform. *Educational Policy*, *29*(1), 111-139.

Posner, B. Z. & Kouzes, J. M. (2017). The leadership challenge (6th ed.). Hoboken, NJ: John Wiley & Sons.

Prenger, R., Poortman, C. L., & Handelzalts, A. (2017). Factors influencing teachers' professional development in networked professional learning communities. *Teaching and Teacher Education*, *68*(11), 77-90 .

Putnam, R. D. (2015*). Our kids: The American dream crisis.* New York, NY: Simon & Schuster.

Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics

curricula. *Review of Educational Research*, *75*(2), 211–246.

Remillard, J., & Kim, O. (2017). Knowledge of curriculum embedded mathematics: Exploring a critical domain of teaching. *Educational Studies in Mathematics*, *96*(1), 65-81.

Reshmad'sa, L. & Vijayakumari, S. N. (2017). Effect of Kolb's experiential learning strategy on enhancing pedagogical skills of pre-service teachers of secondary school level. *I-Manager's Journal on School Educational Technology*, *13*(2), 1.

Richards, J. C. (2017). *Curriculum development in language teaching* (3rd ed.). Cambridge, UK: Cambridge University Press.

Richland, L. E., & Begolli, K. N. (2016). Analogy and higher order thinking: Learning mathematics as an example. *Policy Insights from the Behavioral and Brain Sciences*, *3*(2), 160-168.

Rigby, J. G., Larbi-Cherif, A., Rosenquist, B. A., Sharpe, C. J., Cobb, P., & Smith, T. (2017). Administrator observation and feedback: Does it lead toward improvement in inquiry-oriented math instruction? *Educational Administration Quarterly*, *53*(3), 475-516.

Rubin, H. J. & Rubin, I. S. (2011). *Qualitative interviewing: The art of hearing data* (3rd ed.). Thousand Oaks, CA: Sage.

Saadati, F., Cerda, G., Giaconi, V., Reyes, C. & Felmer, P. (2019). Modeling Chilean mathematics teachers' instructional beliefs on problem solving practices. *International Journal of Science and Mathematics Education*, *17*(5), 1009-1029.

Salminen, J., & Annevirta, T. (2016). Curriculum and teachers' pedagogical thinking when planning for teaching. *European Journal of Curriculum Studies*, *3*(1), 387– 406.

Sandholtz, J. H., Ringstaff, C., & Matlen, B. (2019). Coping with constraints: Longitudinal case

studies of early elementary science instruction after professional development. *Journal of Educational Change, 20*(2), 221-248.

Scardamalia, M., & Bereiter C. (2016) Creating, crisscrossing, and rising above idea landscapes. In R. Huang and J. Price Kinshuk (Eds.), *ICT in Education in Global Context. Lecture Notes in Educational Technology* (pp. 3-16). Springer, Berlin, Heidelberg.

Schlossberg, N. K. (1965). Adults in transition [Paper presentation]. Training of Counselors of Adults, Chatham, MA.

Schlossberg, N. K. (1981). A model for analyzing human adaptation to transition. *The Counseling Psychologist, 9*(2), 2–18.

Schlossberg, N. K. (1991). *Overwhelmed: Coping with life's ups and downs.* Lexington, MA: Lexington Books.

Schlossberg, N. K. (2011). The challenge of change: The transition model and its applications. *Journal of Employment Counseling, 48*(4), 159-162.

Schoenfeld, A., & Kilpatrick, J. (2013). A US perspective on the implementation of inquiry-based learning in mathematics. *ZDM-International Journal on Mathematics Education, 45*(6), 901–909.

Schunk, D. H. & Zimmerman, B. J. (2008). *Motivation and self-regulated learning: Theory, research, and applications.* New York, NY: Lawrence Erlbaum Associates, Taylor & Francis Group.

Schwandt, T. A., Lincoln, Y. S., & Guba, E. G. (2007). Judging interpretations: But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Directions for Evaluation,* 2007(114), 11-25.

Sforza, D., Tienken, C. H., & Kim, E. (2016). A comparison of higher-order thinking between

the common core state standards and the 2009 New Jersey content standards in high school. *AASA Journal of Scholarship & Practice, 12*(4), 5.

Shanker, S. (2016). *Self-reg: How to help your child (and you) break the stress cycle and successfully engage with life.* New York, NY: Penguin Books.

Sherin, M. & Drake, C. (2009). Curriculum strategy framework: Investigating patterns in teachers' use of a reform-based elementary mathematics curriculum. *Journal of Curriculum Studies, 41*(4), 467–500.

Simon, M. A. (2009). Amidst multiple theories of learning in mathematics education. *Journal for Research in Mathematics Education*, *40*(5), 477-490.

Sisk, V. F., Burgoyne, A. P., Sun, J., Butler, J. L., & Macnamara, B. N. (2018). To what extent and under which circumstances are growth mind-sets important to academic achievement? Two meta-analyses. *Psychological Science*, *29*(4), 549–571.

Slavin, R. E. (2012). *Educational psychology: Theory and practice.* (10th ed.) Boston, MA: Pearson Education.

Sparks, S.D. (2013). "Growth mindset" gaining traction as school improvement strategy. *Education Week, 33*(3), 21.

Spillane, J. P., Hopkins, M., & Sweet, T. M. (2018). School district educational infrastructure and change at scale: Teacher peer interactions and their beliefs about mathematics instruction. *American Educational Research Journal*, *55*(3), 532–571.

Spillane, J. P., Shirrell, M., Hopkins, M. (2016). Designing and deploying a professional learning community (PLC) organizational routine: Bureaucratic and collegial arrangements in tandem. *Les Dossiers des Sciences de l'Éducation, 35*, 97–122.

Stake, R. E. (1995). *The art of case study research.* Thousand Oaks, CA: Sage Publications.

Stake, R. E. (2010). *Qualitative research: Studying how things work.* New York, NY: Guilford Press.

Steiner-Khamsi, G., & Waldow, F. (2018). PISA for scandalisation, PISA for projection: The use of international large-scale assessments in education policy making - an introduction. *Globalisation, Societies and Education*, *16*(5), 557-565.

Stevenson, H. (2017). The "datafication" of teaching: Can teachers speak back to the numbers? *Peabody Journal of Education*, *92*(4), 537–557.

Stouraitis, K., Potari, D., Skott, J., (2017). Contradictions, dialectical oppositions and shifts in teaching mathematics. *Educational Studies in Mathematics*, *95*(2), 203-217.

Sun, K. L. (2019). The mindset disconnect in mathematics teaching: A qualitative analysis of classroom instruction. *Journal of Mathematical Behavior*, *56*(12), 100706.

Tampio, N. (2017). Who won the math wars? *Perspectives on Politics*, *15*(4), 1087-1091.

Tao, J., & Gao, X. (2017). Teacher agency and identity commitment in curricular reform. *Teaching & Teacher Education*, *63*(4), 346–355.

Thomas, J., & Cooper, S. (2016). The road to reform: A grounded theory study of parents' and teachers' influence on elementary school science and mathematics. *School Science and Mathematics*, *116*(1), 29-42.

Thompson, J. J., Hagenah, S., McDonald, S., & Barchenger, C. (2019). Toward a practice-based theory for how professional learning communities engage in the improvement of tools and practices for scientific modeling. *Science Education*, *103*(6), 1423–1455.

Treacy, M. (2017). Spoon-feeding to tongue-biting and beyond: Factors that contributed to changes in Irish primary school teachers' mathematics practice. *Irish Educational Studies*, *36*(3), 375-397.

Trochim, W. (1989). Outcome pattern matching and program theory. *Evaluation and Program Planning, 12*(4), 355-366.

UNESCO (2020). Adverse consequences of school closures. UNESCO. Retrieved from https://en.unesco.org/covid19/educationresponse/consequences

Van Maele, D., Van Houtte, M., & Forsyth, P. B. (2014). *Trust and school life: The role of trust for learning, teaching, leading, and bridging.* Dordrecht, Netherlands: Springer.

Van Themaat, J. V. L. (2019). Thinking together changes the educational experiences, provision and outcomes for SEND pupils – professional learning communities enhancing practice, pedagogy and innovation. *Support for Learning, 34*(3), 290-311.

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies, 44*(3), 299-321.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wagganer, E. L. (2015). Creating math talk communities. *Teaching Children Mathematics, 22*(4), 248-254.

Waheed, Z., Hussin, S., & Bin Megat Daud, M. A. K. (2018). The best practices for school transformation: A multiple-case study. *Journal of Educational Administration*, *56*(1), 88–103.

Walshaw, M. (2017). Understanding mathematical development through Vygotsky. *Research in Mathematics Education, 19*(3), 293-309.

Weinstein, C. S., Romano, M., & Mignano, Jr. A. (2010). *Elementary classroom management: Lessons from research and practice.* New York, NY: McGraw-Hill.

Wilcox, K. C., & Lawson, H. A. (2018). Teachers' agency, efficacy, engagement, and emotional resilience during policy innovation implementation. *Journal of Educational Change, 19*(2), 181-204.

Wiles, J. W. & Bondi, J. C. (2011). *Curriculum development: A guide to practice.* (8th ed.). Boston, MA: Pearson.

Wilhelm, A. G., Chen, I. C., Smith, T. M., & Frank, K. A. (2016). Selecting expertise in context: Middle school mathematics teachers' selection of new sources of instructional advice. *American Educational Research Journal*, *53*(3), 456–491.

Wood-Garnett, S., & Greene-Bryant, B. (2018). Ten principles for changing a high school's trajectory. *State Education Standard*, *18*(2), 33–36.

World Bank. (2019). *World Bank learning outcomes query*. Education Statistics (EdStats). https://datatopics.worldbank.org/education/wQueries/qlearning

Yeager, D. S., Hanselman, P., Walton, G. M., Murray, J. S., Crosnoe, R., Muller, C., Tipton, E., Schneider, B., Hulleman, C. S., Hinojosa, C. P., Paunesku, D., Romero, C., Flint, K., Roberts, A., Trott, J., Iachan, R., Buontempo, J., Yang, S. M., Carvalho, C. M., Hahn, P. R. (2019). A national experiment reveals where a growth mindset improves achievement. *Nature (London), 573*(7774), 364-369.

Yin, R. K. (2018). *Case study research and applications: Design and methods*. Los Angeles, CA: Sage Publications.

Zeid, H. A., Assadi, N. & Murad, T. (2017). The effect of junior high school teachers' motivation and willingness to change on the diversity of their teaching methods. *Theory and Practice in Language Studies*, *7*(12), 1160-1170.

Zimmerman, B. J. & Schunk, D. H. (2001). *Self-regulated learning and academic achievement:*

Theoretical perspectives. Mahwah, NJ: Lawrence Erlbaum Associates.

Zull, J. E. (2002). *The art of changing the brain: Enriching teaching by exploring the biology of learning*. Sterling, VA: Stylus.

APPENDIX A

IRB Approval Letter

February 15, 2021

Christine Saba

Jerry Woodbridge

Re: IRB Exemption - IRB-FY20-21-376 INTERNATIONAL SCHOOL ELEMENTARY EDUCATORS' TRANSITION TO A REVISED MATHEMATICS CURRICULUM: A CASE STUDY

Dear Christine Saba, Jerry Woodbridge:

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46: 101(b):

Category 2.(iii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is

met:

The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

Your stamped consent form can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. This form should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document should be made available without alteration.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at [email removed].

Sincerely,

G. Michele Baker, MA, CIP

Administrative Chair of Institutional Research

Research Ethics Office

APPENDIX B

Site Approval Letter

Dear Administrator,

I am writing to obtain permission for teachers in your school(s) to participate in a research study on how teachers transition to using a revised mathematics curriculum. The elementary school educators at your school(s) were selected to participate because they have recently changed to using a revised mathematics curriculum. All elements of this study will be conducted using social distancing due to the current uncertain nature of the COVID-19 pandemic. Please read this form and ask any questions you may have before agreeing.

Christine Saba, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to understand how educators transition to a revised mathematics curriculum at international schools.

Procedures: If you agree to allow participation in this study, I would ask teacher participants to agree to do the following:

1. Audio-recorded interview (Time estimate: 1 hour).
2. Audio-recorded focus group interview (Time estimate: 1 hour).
3. Write two journal entries based on an experience of trying something new from the mathematics curriculum. (Time estimate: 25 minutes writing time).

Risks: The risks involved in this study are minimal, which means they are equal to the risks one would encounter in everyday life. As an educator, the researcher is a mandatory reporter, therefore any information given in the process of this research that triggers the mandatory reporting requirements for child abuse, child neglect, elder abuse, or intent to harm self of others will be reported.

Benefits: Participants should not expect to receive a direct benefit from taking part in this study.

Compensation: Participants will not be compensated for participating in this study.

Confidentiality: The records of this study will be kept private. In any sort of report, I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

- Participants will be assigned a pseudonym. I will conduct the interviews in a location where others will not easily overhear the conversation.
- Data will be stored on a password locked computer. After three years, all electronic records will be deleted.
- Interviews will be recorded and transcribed. Recordings will be stored on a password locked computer for three years and then erased. Only the researcher will have access to these recordings.
- I cannot assure participants that other members of the focus group will not share what was discussed with persons outside of the group.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University. Participants are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions: The researcher conducting this study is Christine Saba. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at csaba@liberty.edu. You may also contact the researcher's faculty chair, Dr. Jerry Woodbridge at [email removed].

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, [address removed] or email at [email removed].

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent: I have read and understood the above information. I have asked questions and have received answers. I consent to allow educators in the school(s) I oversee to participate in the study.

_____

Signature of Administrator Date

_____

Signature of Investigator Date

APPENDIX C

Participant Invitation Email

Dear Fellow Teachers:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a doctoral degree. The purpose of my study is to research how teachers at an organization of international schools transition to using a revised mathematics curriculum and to understand how to replicate or improve the process for success in the implementation phase in the future. I am writing to invite eligible participants to join my study.

Participants must be 18 years of age or older, current elementary school teachers in at least their second year teaching elementary math, and currently transitioning to using a revised mathematics curriculum. Participants will be asked to complete an audio- and video-recorded Zoom interview, an audio- and video-recorded Zoom focus group, two journal entries by email, and a review of their interview and focus group transcripts by email. The interview will take about 45 minutes to complete and the focus group will take about an hour to complete. The journal entries should take a total of 25 minutes to complete and reviewing the transcripts should take a total of 15 minutes. Names and other identifying information will be requested as part of this study, but the information will remain confidential.

A consent document is attached to this email. The consent document contains additional information about my research. Please type your name and date on the consent form and return it to me by email prior to completing any procedures.

If you would like to participate, for your convenience, you can reply with the email text below:

Dear Christine,

I would be pleased to be a participant in your study. I can confirm that I am at least 18 years of age or older, a current elementary school teacher in at least my second year teaching elementary math, and I am currently transitioning to using a revised mathematics curriculum. Please find the signed consent form attached. I am located in [City, Country] and a few preferred days and times for an interview are [days and times].

Sincerely,

[Your name]

Thank you for considering being a part of my study.

Best Regards,

Christine Saba

APPENDIX D

Consent Form

Title of the Project: International School Elementary Educators' Transition to A Revised Mathematics Curriculum: A Case Study

Principal Investigator: Christine Saba, Doctoral Candidate, Liberty University

Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be must be 18 years of age or older, a current elementary school teacher in at least your second year teaching elementary math, and currently transitioning to using a revised mathematics curriculum. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

What is the study about and why is it being done?

The purpose of this study is to research how teachers at an organization of international schools transition to using a revised mathematics curriculum. The aim is to understand how to replicate or improve the process for success in the implementation phase in the future.

What will happen if you take part in this study?

If you agree to be in this study, I would ask you to do the following things:

1. Participate in a video- and audio-recorded interview on Zoom (Time estimate: 45 minutes).
2. Participate in a video- and audio-recorded focus group (with 5-7 people) on Zoom (Time estimate: 1 hour).

3. Write two journal entries based on an experience of trying something new from the mathematics curriculum (Time estimate: 24 minutes total writing time or 12 minutes per journal prompt). Journal prompts will be sent by email to participants within 1 week of the individual interview. Participants will have 2 weeks upon receipt to return the journal prompts by email to the researcher.
4. Transcript review (Time estimate: 15 minutes total). Each participant will be asked to review the transcript of their interview and their focus group interview. Transcripts will be sent to each participant within 2 weeks after the interview and returned by email within 1 week of receipt.

How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include increased knowledge on the topic and an improved process for rolling out new curriculum to teachers resulting in improved learning outcomes.

What risks might you experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

As an educator, the researcher is a mandatory reporter, therefore any information given in the process of this research that triggers the mandatory reporting requirements for child abuse, child neglect, elder abuse, or intent to harm self of others will be reported.

How will personal information be protected?

The records of this study will be kept private. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be kept confidential through the use of pseudonyms. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password locked computer. After three years, all electronic records will be deleted.
- Interviews will be recorded and transcribed. Recordings will be stored on a password locked computer for three years and then erased. Only the researcher will have access to these recordings.
- Confidentiality cannot be guaranteed in focus group settings. While discouraged, other members of the focus group may share what was discussed with persons outside of the group.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researcher at the email address included in the next paragraph. Should you choose to withdraw, data collected from you, apart from focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your contributions to the focus group will not be included in the study if you choose to withdraw.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Christine Saba. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [email removed]. You may also contact the researcher's faculty sponsor, Dr. Jerry Woodbridge, at [email removed].

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, [address removed] or email at [email removed].

Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the researcher using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

☐ The researcher has my permission to audio- and video-record me as part of my participation in this study.

_____

Printed Subject Name

_____

Signature & Date

APPENDIX E

Interview Questions

1. How were you involved in the introduction of the revised mathematics curriculum?
2. How did your prior experience affect your transition to using the new curriculum?
3. How was leadership helpful in the transition?
4. What professional development resources were helpful in making the transition and why?
5. How were materials associated with the new curriculum helpful?
6. How were opportunities for collaboration with colleagues helpful?
7. What did you do on your own to make this transition?
8. How did your feelings towards mathematics affect your implementation of the new curriculum?
9. What helped you cope with the stress of this transition?
10. How have you seen the new curriculum to have a meaningful impact in your classroom?

APPENDIX F

Focus Group Questions

1. How were teachers involved in the process of decision-making regarding to the new curriculum?
2. What other stressors were happening at the school besides the new curriculum change in mathematics?
3. If so, how did other stressors happening at school complicate the roll out of the new curriculum?
4. What unique challenges are there transitioning to a new curriculum at an international school?
5. What unique advantages are there to transitioning to a new curriculum at an international school?
6. How did you come to understand the objectives of the new curriculum?
7. How did colleagues work together through the transition?
8. What was most helpful during this transition?
9. What would have been helpful during this transition time?

APPENDIX G

Journal Prompt

Try using an instructional method that was unfamiliar to you before being introduced to the new math curriculum. For example, try a math talk. Prior to implementing the lesson, discuss your preparation of the lesson including the resources used to plan. After doing the new lesson, reflect on how it went and what you might do differently next time. The cloze sentences below can be used to guide your reflection. Please note whether you applied this in an online home learning environment and the platform you used, such as Zoom, Seesaw, etc., or if you conducted this in a face-to-face classroom environment.

Pre-lesson reflection: I am planning to try (enter new instructional strategy or goal from the curriculum). I learned about this strategy from (enter where you learned about this strategy). In preparation for this lesson, I (how did you prepare for the lesson). Resources that were helpful in planning were (what resources did you use). I obtained these resources from (enter who assisted you in finding these resources). I feel (enter confidence level) about doing this lesson because (enter why you have this level of confidence).

Post-lesson reflection: Today I tried (enter new instructional strategy from the curriculum). This lesson was done (in person, on Zoom, as a video post on Seesaw). It went (enter reflection on how it went, what went well, and what could have gone better). I was surprised by (enter any unexpected happenings during the lesson). Before I try it again, I will (enter resources and support to be sought). Next time I plan to (enter a strategy to try next time based on what was learned from the experience).

APPENDIX H

Sample Journal Entry - Levi

Pre-lesson reflection: I am planning to try 3-act math. I learned about this strategy from our curriculum and curriculum resources. In preparation for this lesson, I watched a video about 3-act math, and worked my way through the problems. Resources that were helpful in planning were the Savvas video about 3-act math. I obtained these resources from school-provided account access. I feel very confident about doing this lesson because I was able to see another professional work through the process and I worked through the problems before trying to teach it.

Post-lesson reflection: Today I tried the 3-act math. This lesson was done in person It went well; however, I think it was not rigorous enough for my students. I was surprised by this fact as my students usually need a bit of extra time to understand new math concepts. Next time I plan to consider more carefully if the exercise is too easy before teaching it.

APPENDIX I

Pearson
221 River St,
Hoboken, NJ 07030, USA
T +1 201 236 700
E info@pearson.com
W pearson.com

PERMISSIONS GRANT LETTER/INVOICE

Correspondence Date	20-Oct-2021	**Pearson Reference**	205070
Deal Type	Permissions Granting: Educational		

Request date	08-Sep-2021	**Requester Reference Number**	N/A
Requester Representative Name	Christine Saba		
Requester Representative Address	[redacted]		

Requested Content:

Title	Experiential Learning: Experience as the Source of Learning and Development
Author	Kolb
ISBN	9780133892406
Edition Number	2
Copyright Year	2015
Pearson Entity	Pearson Education, Inc.

Asset Description	**Figure 2.5**
Requested Use	Doctoral Research

Pearson hereby grants you permission to use the specified content of the above work, subject to the terms and conditions contained in the attached schedule; and the specified conditions below:

Rights Granted:

Formats	Print,Digital	**Territory**	United States of America
Languages	English	**Editions/Revisions**	
Duration	5 Month	**Number of students/ copies**	1

Used By:

Publisher/institution	Chrstine Saba	**Tax Number**	
Publisher Address	[redacted]		
Details of the Requesters Product/Title	EDUC 989 Dissertation		
Author/Instructor	Dr. Jerry Woodbridge		

Fees:

Fee	0 USD
GST, VAT or HST	
Total Fee	**0 USD**

Attribution:

Kolb, D, Experiential Learning: Experience as the Source of Learning and Development, 2nd ed, 2015

Reprinted by permission of **Pearson Education, Inc.**
(for crediting figures and diagrams, the acknowledgement must appear below each figure and/or diagram).

Please Note:

By accepting the terms and conditions of this license, the signatory agrees to make payment on or before the date of your publication.

Please make payment by check or wire transfer.

To cancel a grant of permission, contact the Pearson Representative indicated below, prior to remit of payment.

Failure to make payment by **N/A** may result in an automatic cancellation of this license.

Subsequent use of Pearson Asset(s) without timely payment shall be considered use without permission and may result in assertion of a claim of copyright infringement by Pearson.

Permitted Use of Pearson Asset(s):

The Pearson Asset(s) are being provided to you for your use in connection with your aforementioned use ("Used By" section above).

The rights granted must not deviate from or exceed those right specified in the "Rights Granted" section above. Any expansion beyond these specified terms require a new permission request.

You may only use the Pearson Asset(s) as provided and are prohibited from modifying or otherwise changing the Pearson Asset(s) to create derivatives or other products.

Any assignment, amendment or transfer of this license is not permitted without the prior written consent of Pearson.

Pearson Representative	Gaynor Elizabeth Thomas	**Capacity**	
Signature		**Date**	

Requestor Name		**Capacity**	
Signature		**Date**	

V3.2 APRIL 29, 2020

Signatures and email addresses removed.