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Assessing Teacher Readiness in Secondary Mathematics Education

By Riley Lamont

An Action Research Project submitted to Western Oregon University

In partial fulfillment of the requirements for the degree of:

Masters of Arts, in Teaching

June 2021



**WE, THE UNDERSIGNED MEMBERS OF THE GRADUATE FACULTY OF
WESTERN OREGON UNIVERSITY HAVE EXAMINED THE ENCLOSED**

Action Research Project Title:

Assessing Teacher Readiness in Secondary Mathematics Education

Graduate Student: Riley Lamont

Candidate for the degree of : Master of Arts in Teaching: Initial Licensure

*and hereby certify that in our opinion it is worthy of acceptance as partial fulfillment
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ABSTRACT

Assessing Teacher Readiness in Secondary Mathematics Education

By Riley Lamont

In this tumultuous school year and changing learning environment, it is crucial that teachers are able to look at their own teacher readiness to approach a myriad of topics. These include criticality in the classroom, differentiated instruction, and inquiry-based learning. Using a variety of strategies, the process of self-reflection is paramount to the success of teachers and their ability to adapt instruction and overall preparedness to take the lead in a classroom.

This research includes a study over the course of several months in which the process of continual self-reflection in an online learning environment due to COVID-19. The process of assessing self-readiness goes hand in hand with classroom analysis, behavioral management, student relations, and overall classroom participation.

TABLE OF CONTENTS

Acknowledgements	p. ii
Abstract	p. iii
List of Tables and Figures	p. vi
Chapter 1 – Philosophy of Education	p. 1
Introduction	p. 1
Chapter 2 – Literature Review	p. 11
Purpose and Objectives	p. 11
Procedures for the Literature Review	p. 11
Personal Connection to Research Choices	p. 12
Review of Literature – Theme 1	p. 12
Review of Literature – Theme 2	p. 16
Review of Literature – Theme 3	p. 19
Summary	p. 21
Chapter 3 – Methodology	p. 23
Research Questions	p. 23
INTASC Standards	p. 24
Methodology and Research Design	p. 25
Methods and Procedures	p. 26
Data Collection	p. 26
Procedures	p. 29
Context of the Study	p. 30
Participants	p. 32

Data Analysis Plan	p. 34
Limitations/Delimitations/Biases and Assumptions	p. 37
Chapter 4 – Presentation and Discussion of the Findings	p. 39
Introduction	p. 39
Data Analysis – Theme #1	p. 40
Data Analysis – Theme #2	p. 43
Data Analysis – Theme #3	p. 49
Chapter 5 – Conclusions and Significance	p. 53
Overview	p. 53
Discussion	p. 54
Implications and Recommendations	p. 56
Limitations	p. 57
Conclusion	p. 57
References	p. 59

LIST OF TABLES AND FIGURES

Table 1	p. 29
Table 2	p. 35
Table 3	p. 40
Table 4	p. 43
Table 5	p. 47
Table 6	p. 49
Figure 1	p. 42
Figure 2	p. 45

CHAPTER 1

INTRODUCTION & PHILOSOPHY OF EDUCATION

To be a teacher - what does this constitute? What many roles does a teacher fulfill? These are questions that have a multitude of possible answers, and perhaps there is more than a single correct one. We have all had many teachers throughout our lives, and not just in the context of an educational setting. My first teacher was my mother, who taught me how to use a spoon to eat my dinner, who guided me towards saying my first word, who modeled how to put one foot in front of the other as I took my first steps. As I continued to grow, many other influential people in my life continued to teach me many different things; my older brother, who taught me to push back when push comes to shove; my grandmother, who taught me the importance of asking for help when I need it; and my neighbor, who demonstrated how much dogs love it when you scratch *that* perfect spot behind their ear. Every single teacher I have had has impacted my life and my decisions in some way, shape, or form, regardless of under what circumstances they appeared in my life.

To begin discussion of my philosophy statement on my own role as a teacher, I believe it would be beneficial to reflect on my own journey through the educational system. I was always a student who enjoyed school; I loved to learn and I loved the social aspect that school offered. Two of my very close friends were friends I met before the third grade, and we have grown together in more ways than one. But the one thing that catches my attention as I look back on my formative years is exactly when I, alongside my interests and my schoolwork, was placed into a box.

Throughout middle school and my first year of high school, I threw myself into the subjects that were my true passions at the time: reading and writing. I filled my elective classes with creative writing courses, and volunteered to be a teacher aide for my favorite literature teacher, spending my free time at my bedroom desk as I scribbled idea after idea into college-ruled notebooks. Someday, I was certain, one of these ideas would come to fruition and I would publish a novel. One of my friends and I even adopted pseudonyms for ourselves to use as our “pen names” later in life. It became very apparent to my family and my teachers that I was a reader and a writer, and they quickly opened many doors for my interests. One particular teacher would donate a portion of her free time to reading short stories and poems I had written, listening to me ramble on about ideas I had had for a fantasy novel. But as my interests in these literary topics were spurred on, my interests in other topics, namely mathematics and science, fell to the wayside.

It was when I was nearing the middle of my freshman year that a teacher who I greatly looked up to made a comment about me being “right brained” - and when I asked for clarification on what this implied, they proposed the theory that since I was creative and imaginative, and I had been taking introductory drawing courses as an elective, I was someone who performed better in reading and writing classes, and it was because of this that my interest and work in other classes suffered. At this point, I was a bit confused; this teacher had placed me into a “box” that said I was a good student who performed better in the arts than I did in the sciences. This was not intended maliciously, but somehow, my subconscious brain inside of the body of an impressionable fourteen year old interpreted it that way. I had never thought that I had

underperformed in my science courses, but my brain began to pick apart the insinuation that, somehow, my being good at or enjoying the arts meant I could not succeed in the sciences.

This leaves me wondering exactly how many of my decisions after that point were impacted by those thoughts. I spent the rest of high school effectively consuming as many science classes as possible; I doubled up on courses like biology, chemistry, anatomy and physiology, genetics and forensics, physics... all while no longer having the time to fill notebooks with creative novel ideas I someday hoped to write. Somewhere along the way, my interests shifted, and when I graduated from high school, I intended to continue studying biology in college. This course of study was later changed to mathematics, which I do thoroughly enjoy, but a part of me still wonders if this shift in interest could really be attributed to my personal development or rather a desire to prove others wrong and surprise them by performing outside of the “box” they had placed me in.

My love for language never completely subsided, however, as evidenced by my long list of books held at the library and my notes still full of ideas for fiction books. Academically, I completed a minor in Spanish alongside my degree in mathematics, and I can say with certainty that in every single college level course I took, I was usually the only student whose major was mathematics or “left brain” adjacent. Of course, this “left brain” versus “right brain” theory is just that - a theory - and while there may be a difference in interests, the two sides of our brains often collaborate with one another. That being said, there is nothing wrong with enjoying or performing better in one subject than another, but there is something detrimental about being told you are not good at one subject because of how you perform in another. What sliding scale do we use to decide if someone is “good” at a subject? One of my best friends was told when she was

young that her ADHD must make it difficult for her to focus on more “rigorous” topics like mathematics, and after not performing well on several tests, she made the decision very early on that she was frankly not “good” at mathematics. Yet she uses some sort of math everyday in her work as EMT, such as unit conversion, like kilograms to pounds, and medicine dosages, which informs her decisions in a very fast-paced work environment. So, to say that she is not “good” at math would be a fallacy; she is exceptionally good at mathematics as it pertains to her interests and her career. This speaks to the purpose of mathematics education; the instruction we use must be purposeful.

This begs the question, how many other students were placed into “boxes” throughout their educational career? I think there are many different boxes out there; boxes which are fueled by prejudice, by misconceptions, or just stereotypes. I have also been placed into the box associated with being a woman by some of my male peers, a box which, to them, implies I am lesser in my studies or not capable of the same things they are, a box which implies my place is not in mathematics but rather at a home. But there are others who have been placed in boxes in regards to being a student of color or a student with a disability, which has continued far-reaching implications as well.

As a teacher, I do believe it is important to recognize the background and the cultural identity of each student. They have all led different lives and have had different experiences, some with backgrounds I can never fully comprehend. But to restrict them to solely the box that society’s stereotypes may put them in is detrimental to them, their futures, and their opportunities. Thus, there is a fine line to be drawn between embracing and accepting oneself and one’s identity, and being confined by a box by one’s peers or teachers. For example, I am

proud to be a woman, but the box that others place me into because of this is something that I find myself continually pushing against. My identity should not limit me; this is a fine line which I am still trying to navigate in my own life and experiences.

In all, when I myself step into the role as a teacher, my **philosophy of education** means I will not place my students into a box. There are ways to recognize their cultures and acknowledge their identities and differing backgrounds without allowing society's perception or stereotypes to limit them and their capabilities. This also involves my own acknowledgement of the possible boxes society may have sorted them into already, and how this has affected their background, family, and childhood, molding them into the person they are today. Additionally, their personal interests will affect the choices they make in my classroom, and there are ways to incorporate these interests without losing the heart of the material. At their core, they are learners, but I know I will also be learning from them. In this regard, my **philosophy of education** centers on the fact that, even as a teacher, I will never cease to learn. My students will sometimes be my teachers, and as I continue to grow into the person I will become, I will continue to learn each and every day how to better myself and contribute to a better future. This goes in hand with many of Vygostky's theories, in that the more knowledgeable person is not necessarily always the "adult" of the situation.

I can hope that my classroom environment will be conducive to learning in the same sense that it is conducive to curiosity. A classroom which fuels conversation, rather than inhibits it, is one which allows the opportunity for collaboration and growth. My **philosophy of education** is to promote questioning, not restrict it. There will be continued opportunity for open dialogue and discussion about the math they are learning and the *why* about how it works. I know

that, as a student, I was very guilty of memorizing the formulas and the equations without actually understanding why or how they work. I can say that rather than learn *how* to construct the unit circle and label the points, I directly memorized it for my precalculus tests. Of course, when I reached college, there was not enough space in my mind at the time alongside what I was learning to retain this memorized circle with all of its points, so I had to teach myself how to construct it and why the points lie where they do, two years after actually taking that precalculus course where I “learned” the material. I found myself asking questions about this to online databases and resources, like Khan Academy, while wondering whether my knowledge could have been increased if I had had the courage to raise my hand in that precalculus classroom as a shy eleventh grader. But I understand the pressures that come with being a high school student, or a student general, and how it can be difficult to exert yourself socially in a class where that may not be your norm. In this sense, my **philosophy of education** also is reliant upon my ability to remember what it was like when I was a student myself.

It should also be noted that, in mathematics particularly, students may have had poor experiences or difficulties in the subject earlier on in life. The same friend I mentioned earlier, who now is burgeoning on a successful career in the medical field, had been told in her young, formative years that she was just not “good” at mathematics, partly due to her ADHD and difficulty focusing. This then affected her perceptions of mathematics later in her life; she retook Algebra II in high school, complaining to me that there was no way she would ever pass it since she was frankly “bad” at math. In this sense, she had completed a self-fulfilling prophecy, in which this fate manifests itself partly because she “believes” in it. These self-fulfilling prophecies, a term coined by Steele (1995), I believe, can occur rather frequently in subjects like

mathematics. One may fall under stereotype threat, in which they feel/are at risk of conforming to stereotypes about their social group. For example, if I, a woman, was reminded before taking an exam that females “traditionally” scored lower on mathematics tests than males; I would now shift my focus away from me solely taking the test as *me*, and now taking the test as a female and the possible implications of my performing poorly on this test.

A study by Jorgenson (2003) examined grouping by ability in mathematics classrooms, and the possibility of self-fulfilling prophecies in these groups. Students are frequently grouped into higher or lower “streams” in their mathematics classrooms, based on their performance and perceived ability. Jorgenson describes, “... it appears (at least from the students’ perspectives) that ability grouping locks them into particular clusters... More critical, is the ways in which such curriculum impacts on how they come to see themselves as learners of mathematics. Collectively, the objective practices of Mathematics Education (differentiated curriculum, assessment, teaching) come to position students differently through what they experience in terms of objective practices, which in turn become internalised as learners of Mathematics” (2003). Following student feedback, Jorgenson could see that students sorted into “lower” streams viewed their experiences and teachers in a negative light, not continuing on in mathematics past the required level, and interpreted their sorting as meaning they were “bad” at mathematics. What’s more, the students at the “higher” level interpreted their success positively, some acknowledging that they are possibly just more *intelligent* than their peers. One must acknowledge the ways in which students are perceptive, and can discern the differences between themselves and the other groupings or streams. This may contribute to things like math anxiety.

Thus, in my classroom, such groupings will not be implemented; my **philosophy of education** also centers around the importance of inclusivity.

However, this leads to the question of *how* to structure a classroom while simultaneously undoing any possible decisions these students may have made about their mathematical abilities. The text “The Book of Learning and Forgetting” by Frank Smith discusses this topic as well, and in reference to self-perceptions a student may have, explains, “They must be persuaded that none of these things [are] true, and that they are as competent (and as worthwhile as anyone else)... None of this is accomplished without skill and sensitivity in intimate personal relations” (1998). In this sense, my goal is to create a classroom environment which is inclusive and allows room for personal growth. This also relates to being an ethical teacher, in the sense that I am focused on what is best for the students while maintaining a professional role in the classroom. Now, this involves making mistakes, and being tolerant of such mistakes; thus, my **philosophy of education** also is to serve as a reminder that it is perfectly acceptable to make mistakes, when conquering material both new and old. Also, it is difficult to measure learning without having room for growth in the classroom; I have always been an advocate for things like allowing test retakes, because I stake my approach to the matter in the sense that it does not matter if a student takes two days or two weeks to learn the material, what matters is that they *are* learning it, and should not be penalized for a topic not “clicking” immediately.

Now, I do not expect every student who enters my classroom has an invested interest in mathematics. But I do believe that there are ways to incorporate the things they are interested in into mathematics. Some teachers believe in teaching students toward their “learning styles,” an idea that has continually been debated about. This is in regards to students labelling themselves

as “visual learners” or “auditory learners,” saying they retain information better in a specific way. It is strenuous to conduct an explicit study on this material, as there are many variables to consider and choosing a sample would be difficult. I don’t necessarily believe in teaching toward learning styles, but I do see no reason why information should not be made available to students in a variety of different ways. This leads me to the idea of differentiating material such that students have an array of sources to receive new information, and how students' interests can be incorporated into what they are learning. It also pertains to incorporating and encouraging inquiry in a classroom, switching the emphasis from direct, teacher-focused instruction and rather towards instruction which addresses student questions and thought processes.

In regards to the various prominent philosophies of education, my views on these topics are ever-changing, and will continue to do so as I grow into my role as an educator. Currently, I would say I lean towards existentialism and progressivism, in that I would like to give students the opportunity to explore, serving as a facilitator for their learning, while allowing students to work at their own pace and have some say in what they complete. I acknowledge that, depending on the grade level, this will be more difficult in some classes than others. A course like statistics may offer more flexibility than Algebra 1, which generally has a more rigid curriculum.

Branching off from this, in my role as an educator, I value communication with the students as well as the parents. I do wish that parents allow their students some autonomy when it comes to their schoolwork and the decisions they make, but I also want to bridge that communication gap so we can work as a team to ensure that their continued learning is our main goal. I want to emphasize inquiry and differentiation, as well as approach my teaching through a critical lens. My **philosophy of education** can be relatively summarized in my mission statement

as a teacher; we are all lifelong students, and my students will recognize this and continue to grow from this. They will be curious, make mistakes, and ask questions. We will treat others with respect, value each other's thoughts and opinions, and be empathetic towards our peers. Lastly, we will learn *with* one another and *from* one another, and continue to do so for the rest of our lives.

CHAPTER 2

LITERATURE REVIEW**Purposes and Objectives for the Literature Review**

My purpose in this review of the research was to discover how teachers and researchers have looked at relevant practices and methodologies which connect with their students. I searched for research on topics I believe fall under this umbrella, because I feel the most beneficial practices are ones which connect to students and contribute to their learning in this regard and I want to build up my own readiness as an instructor to bridge these connections with the students in my classroom. I also searched for studies which fell under more specific direction as dictated by the three themes we researched. The first theme, Theme 1, includes Diversity, Differentiation, Inclusive Education, and Culturally Responsive Pedagogy. Theme 2 outlines Strategies, Scaffolding, Effective Instruction, High Leverage Practices, and Evidence Based Practices. Theme 3 covers Subject-Specific, Disciplinary Issues Related to my Goals for Teaching Improvement. Here, this would detail the effectiveness of practices in a mathematics-specific context, although some of the literature in other courses is applicable to a mathematics classroom.

Procedures for the Literature Review

I selected literature for this review based on several specific criteria. Research on the sub-themes of Theme 1, Theme 2, and Theme 2 were included if it contained references to terms like diversity, culturally responsive pedagogy, differentiation, inclusive teaching, effective instruction, evidence based practices, and scaffolding. Additionally, I narrowed down my findings by specifying “mathematics education” and “high school,” since my original search was

very broad and yielded hundreds of pages of results. Additionally, I used the specific descriptor “study” as we were focusing on peer-reviewed research and studies for this project. I conducted a search for books and articles in the database of the Hamersly Library at Western Oregon University, alongside the EBSCO database for articles that met the keyword criteria listed above.

Personal Connection to Research Choices

I approached these articles with an open mind, but I also can note that my choice in these selected articles is related to my own personal interest in enhancing my ability to connect with my students as an educator. Fostering an environment of inclusivity and curiosity in my future classroom is very important to me, and making connections to their funds of knowledge is something I take very seriously. Many of these themes and selected articles draw on this desire, some of which are mathematics-classroom specific and some of which are not, but are still applicable to me and my teaching practices.

REVIEW OF LITERATURE

Theme 1: Diversity, Differentiation, Inclusive Education, and Culturally Responsive Pedagogy.

To begin, I first want to focus on inclusive education and culturally responsive pedagogy. I believe these are tied together, wherein culturally responsive pedagogy can result in an inclusive education if incorporated correctly, as well as acknowledging and embracing diversity in the classroom through means such as differentiation.

The first article I found was Jamie Huff Sisson, Victoria Whittington, and Anne-Marie Shin's "*Teaching Culture Through Culture*": *A Case Study of Culturally Responsive Pedagogies in an Australian Early Childhood/Primary Context* (2020), in which the authors discuss the value of culturally responsive pedagogies through a case study done in Australia. The 5 key principles this article discusses are 1) high intellectual challenge, 2) strong connection to students' worlds, 3) recognition of cultural difference as an asset, 4) critical thinking, and 5) performing learning/multimodal literacies. They incorporated an indoor/outdoor schedule, which contributed to many things, such as the image of a child who was competent and capable. Students were engaged in problem-solving discussions, and they not only learned about culture but learned through culture. Sisson, Whittington, and Shin state, "A teacher's ability to be critically reflective of their own identities and practice is also significant to the enactment of CRP [Culturally Responsive Pedagogy]" (2020). I appreciated this article and this quote because it demonstrates the importance of a teacher's ability to self-scrutinize as well as contribute to a child's own growth and autonomy.

The second article I came across for culturally responsive pedagogy was Emily P. Bonner and Thomasenia L. Adams' *Culturally responsive teaching in the context of mathematics: a grounded theory case study* (2011). This case study provides implications in a mathematics classroom, going over four cornerstones of culturally responsive mathematics teaching: communication, knowledge, trust/relationships, and constant reflection/revision. There are implications that students of color are often denied access to further math knowledge, resulting in gaps in testing scores between white students and black students. Community knowledge, student background knowledge, connections with the community, explicit and intentional

connection to student culture and language, incorporating movement and rhythm into lessons, high expectations, and facilitating student self-esteem were all integral parts of Ms. Finley (the study participant)'s classroom and teaching approach. She also engaged in constant, in-the-moment revision alongside long-term revision and reflection. Bonner and Adams note, "The student was explicitly at the center of these practices and was therefore encompassed by Ms. Finley's foundational beliefs and everyday practice" (2011). In all, this involves a personal commitment to the teaching and learning process. Although this article is a bit older, its practices are still relevant and provide me with the insight to the cornerstones of culturally responsive pedagogy.

The third piece I found on culturally responsive pedagogy was Dianne Truscott and Vera Stenhouse's article *A Mixed-Methods Study of Teacher Dispositions and Culturally Relevant Teaching* (2018). This mixed-method study examined teaching dispositions of 19 teachers in a program for culturally relevant teaching. Findings found that dispositions related to academic success and cultural competence were prevalent but those related to critical consciousness were minimal. Truscott and Stenhouse note that high expectations were important, but there was a difference between one school aligning these with "strong character" and another with "activist dispositions" (2018). As stated, "Statements coded as *respect for diversity, authenticity, learner protection, and meaningful purpose and vision* were frequent, suggesting that PSTs [preservice teachers] associated their practices and learning with the pedagogy used to propel the work" (2018). Dispositions was not a term I had not heard frequently before, but this has made me reflect on my own disposition as a teacher. I would say that mine aligns with academic success and the idea of high expectations, but I am not sure if I would approach this as an activist

disposition or strong character disposition. My mentor teacher is someone who reinforces high expectations, although it is more difficult to do so in the online setting we are currently working with.

After culturally responsive pedagogy, I next wanted to read more about inclusive education. This next article, *Early Evaluation Findings From the Instructional Conversation Study: Culturally Responsive Teaching Outcomes for Diverse Learners in Elementary School* (2017, by Pedro Portes, Manuel González Canché, Diego Boada, and Melissa Whatley, focuses on improving instruction for all students, with a focus on English Language Learners. This study involves Instructional Conversation pedagogy, or teaching through conversation which focuses on students' lived experiences and cultural contexts, driven by activation of linguistic tools; this is a constructivist pedagogical system. Their statistical analysis showed evidence that ELL students (and other students) instructed through IC scored higher on standardized tests than the control group. Future challenges include "...exploring the extent to which this approach can be further developed to assist learners with limited academic language development at other proficiency levels or, more specifically, to assist all students at different levels of English language proficiency" (2017). I was interested to find a study about English Language Learners, particularly because I am not sure how to approach this in a mathematics classroom because mathematics can be a new language in itself. Instructional Conversation was not something I had thought about before but I could see it being a useful strategy which is culturally responsive and engaging for *all* students, regardless of their background. This is also considered a constructivist pedagogy, which is a philosophy I have aligned partly with, and can be used to model a growth environment.

Lastly, while looking for more information on inclusive education I found the article *Study Examines Benefits of Teaching Math in Culturally Responsive Ways*, written by Mike Kring (2019.) Kring discusses research completed by Naheed Abdulrahim and Michael Orosco at the University of Kansas, in which they looked at 35 peer-reviewed studies about culturally mathematics teaching. Here, data analysis resulted in seven themes: cultural identity, instructional engagement, educator reflection, high expectations, student critical thinking, social justice and collaboration. This centers on students “funds of knowledge” and the unique background experiences each student brings into the classroom (2019). There is an emphasis on collaboration between the community and students, and Kring writes, “The studies also showed that culturally responsive mathematics approaches encouraged students to use their higher-level thinking skills, such as analysis, reasoning and evaluation” (2019). These methods also bettered the teachers themselves as they worked through this reflection process. I enjoyed reading this article in that it draws attention to an emphasis on collaboration within the classroom. I think promoting collaboration in the classroom can also foster inclusivity, and allows room for conversation and growth through these interactions. This can improve mathematics instruction (and general instruction) overall.

Theme 2: Strategies, Scaffolding, Effective Instruction, High Leverage Practices, and Evidence Based Practices

The first article I found for Theme 2 was *Scaffolding Mathematics Remediation for Academically At-Risk Students Following Developmental Education Reform in Florida* (2017) by Rebecca Brower, Chenoa Woods, Tamara Jones, Toby Park, Shouping Hu, David Tandberg, Amanda Nix, Sophia Rahming, and Sandra Martindale. This study focuses on a Florida school

and the remediation of students who are at-risk of dropping out or failing, and developing the academic skills needed to succeed at the college level. Specifically, this article also discusses scaffolding course sequencing and providing clear pathways which correspond to student's motivations and goals, alongside scaffolding instruction, including conceptual vs. procedural knowledge. They specifically scaffolded instructional modalities; "Modularized instruction offered students the ability to work at their own pace (typically online) and accelerate their learning while corequisite instruction allowed students to gradually prepare for college-level math by combining the developmental and gateway math course" (2017). This relates to the overall pacing of the course and gives students more control over their learning. Additionally, classes can be scaffolded in regards to their mathematical support. In regards to scaffolding, these are all methods I would like to integrate in my classroom which relate to the overall classroom strategy. Working through modulus is a strategy I have been trying to incorporate already, but it is difficult to allow students to work at their own pace in an online setting.

The second article I found for Theme 2 was Chiu-Lang Chen and Cheng-Chih Wu's article *Students' behavioral intention to use and achievements in ICT-Integrated mathematics remedial instruction: Case study of a calculus course* (2020). This article and study looks at the impacts of information and communication technology (ICT) in a grade 12 calculus classroom. For results, Chen and Wu state, "...when ICT-integrated mathematics remedial instruction was not implemented, students' scores in the posttest were not significantly higher; however, after implementing ICT-integrated mathematics remedial instruction, the grades in the posttest were significantly higher" (2020). To implement mathematics remedial instruction, technology could be a very useful strategy. Perceived usefulness and attitude is a large factor here. In the end,

students developed confidence in themselves when working towards attainable goals which then motivated them to learn. I can see that this instruction also allowed students to work at a pace which reflected their own learning, relating to scaffolding and strategy.

The third article for Theme 2 is *Remediation for Students With Mathematics Difficulties: An Intervention Study in Middle Schools* by Elisabeth Opitz, Okka Freesemann, Susanne Prediger, Urs Grob, Ina Matull, and Stephan Hußmann (2016). This article relates to strategy and effective teaching practice. In this study, students were taught basic concepts (place value and basic operations) and practiced fact retrieval and counting (in groups). Analysis showed that the interventions can be used to reduce given deficits. Highly structured and organized programs were effective, alongside the incorporation of these 5 strategies: teaching of heuristics to solve word problems, explicit instruction, use of graphical representations and manipulatives, thoughtful selection and sequencing of instructional examples, and encouraging students to verbalize their own strategies or the strategies modeled by the teacher. These intervention programs are very important - I think of mathematics as a system of “building blocks”, and if a student does not have a strong foundation, they may have mathematics difficulties later on. This strongly relates to my teaching goals of building this strong foundation.

Fourth, I found the article *Culturally and Linguistically Responsive Teaching in Practice: A Case Study of a Fourth-Grade Mainstream Classroom Teacher* (2017) by Qianqian Zhang-Wu. I really enjoyed this article and case study, as it looks at scaffolding and being a culturally responsive teacher, which can also tie into Theme 1. This case study focused on a fourth grade classroom with diverse learners, looking at three levels of framework: instructional, institutional, and societal. The teacher plays a central role, and pays attention to their instruction from both

cultural and language perspectives. One teacher in the study incorporated language scaffolding, drawing upon Spanish to facilitate student understanding and using prior language knowledge, with sensitivity to inequity and diversity. An "... [Ms. B] valued the prior knowledge of every student in teaching and learning new vocabulary. Instead of providing the dictionary definitions of the new words, she encouraged students to build upon what they had already learned to predict the meanings" (2017). Here, support from the school and research community was crucial. I could use these strategies, which are also culturally responsive, by scaffolding mathematics material in my classroom.

Theme 3: Subject-Specific, Disciplinary Issues Related to my Goals for Teaching Improvement

For my first article for this theme, I found Jamie Amemiya, Adam Fine, and Ming-Te Wang's article *Trust and Discipline: Adolescents' Institutional and Teacher Trust Predict Classroom Behavioral Engagement Following Teacher Discipline* (2020). This article and study looks at how students are usually more cooperative in their classroom when they have a relationship of trust with their instructor. Students were asked about their engagement, their relationships with math and their teachers, and their overall trust; results showed that the association of teacher discipline and student's next day engagement depended on teacher trust. Amemiya, Fine, and Wang state, "... this study demonstrates some of the first ecologically valid evidence that adolescents interpret teacher discipline within the broader social context of trust, and high levels of trust at the institutional and teacher level may be important for discipline to have its intended impact of improving classroom behavior" (2020). Only students with teacher and institutional trust improved their behavior after discipline, but could have negative effects on

those who didn't trust either the institution or their teacher. Overall implications show that, as a math teacher, I need to build a relationship of trust with my students early on in their career in my classroom if I want any discipline to have a positive effect.

Second, I located the article *Teacher Math Anxiety Relates to Adolescent Students' Math Achievement* (2018) by Gerardo Ramirez, Sophia Yang Hooper, Nicole B. Kersting, Ronald Ferguson, and David Yeager. This National Mindset Study found that higher math teacher anxiety is associated with lower student achievement. Here, adults' own fears can undermine students' autonomy, and thus their knowledge growth. Math teacher anxiety creates an aversive learning experience and models negative attitudes around math. This study found that teachers employed less process-oriented tasks, as associated with the growth mindset, and don't send the message that all students are good at math. Amemiya, Fine, and Wang state, "Our take-home message is that the way teachers feel in the classroom and the indirect messages they convey through their practice may be an important factor shaping student math learning" (2020). This relates to specific disciplinary issues in my classroom because it expresses the need for me to incorporate process-oriented tasks in my classroom to reinforce the growth mindset and also reduce my own math anxiety around the topic so that I do not create adverse learning experiences for my students. This pertains to the growth mindset as well, which pertains to my personal philosophy of teaching.

For my third article, *Inside the Math Trap: Chronic Math Tracking From High School to Community College* (2020) by Federick Ngo and David Velasquez was an interesting read. This article looks at a study on "math traps", where stifled mobility is prevalent and coursework repetition. Being trapped in math was also linked to race/ethnicity, and this is inspired by poverty

traps. High stakes testing can also be described as a barrier to upwards mobility, and future research could call for looking at the impacts of students retaking a math course in high school or college. Better alignment between college and high school standards could improve this policy. I can note, from my own observations, that students often elect to not progress past the required courses in mathematics, and it can be a reason they avoid certain degrees or majors. Creating an environment in my classroom where these “math traps” don’t prevail is a priority.

Lastly, Kristi Bergeson and Beth Beschorner’s piece *Modeling and Scaffolding the Technology Integration Planning Cycle for Pre-Service Teachers: A Case Study* (2020) was a very relevant read. This study discusses the ways in which teachers integrated technology into their mathematics classrooms, how this worked to improve literacy, and how they could align their pedagogy with these digital tools. It also discusses the repercussions of this integration, such as how the teachers felt overwhelmed and underprepared. Teachers could use TIPC (Technology Integration Planning Cycle) as a method of modeling and scaffolding. This article is fairly recent, and very pertinent to the online-schooling system we are in right now. I can understand how it is to feel overwhelmed and underprepared, but I can also see how teachers found the TIPC to be beneficial and the importance of technology inclusion. Specifically to my mathematics content area, there are many strategies online which I could use TIPC as a method for integration.

Summary

The literature reviewed here demonstrates the value I place in creating an inclusive environment, as well as my desire to implement a variety of strategies in order to improve my readiness as a teacher to discuss and carry out these methods. Fostering a classroom culture of respect,

curiosity, and empathy is a large part of my future vision as a teacher, and in a mathematical context I want to work to reduce anxiety, allow opportunities for scaffolding, offering the students the freedom of asking questions, and promoting collaboration. Overall, as I prepare to step further into my role as an educator, it is necessary to reflect on my own readiness to approach these topics and enact any changes. To improve mathematics education, the literature helps inform my decisions to differentiate instruction and incorporate student-centered learning, and through inquiry. It is important to note that each and every strategy may not work for a single student, but rather, my intention is to remind them each and every day they are a valued and cared for member of our mathematical community.

CHAPTER 3

RESEARCH METHODS AND DESIGN

To begin discussion of this study and the action research conducted over the course of this school year, I will first discuss the principles and practices associated with action research, then outline my choices for data collection methods used, and will finally outline the context of my study while discussing which methods were implemented and the limitations of this study. I will also discuss how I am working to improve my own practice to align with those of the INTASC professional standards, and how these relate to my chosen research questions.

Research Questions

In order to make progress towards my teaching goals, I decided to center my research questions around teacher readiness. This involves examining how my lesson plans have demonstrated growth in my own readiness and self-efficacy, how I have prepared for criticality in the classroom, and how I have incorporated inquiry-based instruction as opposed to direct instruction into my classroom. Aligning with the INTASC standards for teacher professional development, I made note of how my own teaching practice has grown alongside these standards. Through continuous self-reflection and journal entries, the purpose of this study is to enhance my teacher readiness and therefore enhance student learning. The research question(s) for this study, falling underneath Theme 1, Theme 2, and Theme 3 respectively, were as follows:

- 1) *How have I grown in my readiness to incorporate differentiated instruction and address the needs of students with diverse learning strengths?* Collected data was analyzed through the lens in which I have effectively scaffolded and differentiated instruction to meet the needs of my students.

- 2) *How have I grown in my readiness and self-efficacy in planning for criticality in my classroom?* In my own preparation to approach my lesson plans through the lens of a culturally responsive teacher, data was analyzed with the aim of identifying areas where I had accounted for diversity, inclusive education, and criticality in my classroom. This is with the directed idea of accounting for diversity in my classroom and growing in my own self-efficacy and readiness as a culturally responsive educator.
- 3) *How have I increased my teacher-readiness to deliver inquiry-based instruction as opposed to direct instruction?* I hoped to learn whether or not I was continuously allowing the opportunity for inquiry-based instruction as opposed to direct instruction in my classroom. Data acquired pertaining to this question was used to analyze how I have promoted inquiry in a mathematics classroom as opposed to direct instruction, and encouraged an inquiry-based approach to my lessons.

INTASC Standards

Developed by the Council of Chief State School Officers (CCSSO), the INTASC standards serve as a set of guidelines which outline areas of professional development for teachers in all stages of their professional careers in order to provide students with the skills to be prepared for the world post-graduation. Since these are applicable professional practice standards, this means that each standard for performance will appear different depending on which developmental stage an educator is currently at in their career. These benchmarks are ones I strive to reach, and will continue to do so for the rest of my educational career.

The INTASC standards can be sorted in four groups, and each standard is relevant in some way to the research I will be conducting. The first group can be titled “The Learning and

Learning,” which encompasses Standard #1: Learner Development, Standard #2: Learning Differences, and Standard #3: Learning Environments. The second grouping, “Content,” pertains to Standard #4: Content Knowledge and Standard #5: Application of Content. The third group, “Instructional Practice,” covers Standard #6: Assessment, Standard #7: Planning for Instruction, and Standard #8: Instructional Strategies. Lastly, the fourth grouping consists of Standard #9: Professional Learning and Ethical Practice and Standard #10: Leadership and Collaboration, under the umbrella of “Professional Responsibility.” My first question, which pertains to incorporating differentiated instruction and meeting the needs of students, envelops elements of standards 1, 2, 6, 7, 8, and 9. My second question as it relates to criticality pertains to standards 1, 2, and 7, and my third question in regards to my own practice and promoting inquiry in my classroom pertains to 3, 4, 5, 7, and 8. Thus, all of these standards play an important and unique role in the goals I have set for my own teaching.

Methodology and Research Design

In preparing to address my research questions, it was apparent that qualitative methodology would be well suited to the scenarios at hand. Qualitative methodology, as opposed to quantitative, allows the researcher to look for trends in judgements and thoughts. Additionally, there is an opportunity to delve deeper into the problem and see what future questions arise while studying, in this case, my teaching practice.

To conduct this research, the method of action research is notable. Action research is described as “meaningful, friendly, and possible” (Preisman, 2007). This allows for the opportunity to analyze data sources which are less quantitative and more evidential, in that they serve as reflections. This is pertinent to action research, qualitative methodology, and my goal

as an educator and researcher. Gould states, “Action research is a professional development strategy that puts the teacher at the center of the professional development process” (2008).

This is particularly pertinent to the work I am doing, as I am the center of my own research and my goals for personal educator growth and improvement.

Methods and Procedures

This study was designed to conduct action research, as my research questions relate to my own growth and study of my teaching practice. This allows me to hold myself accountable as to how my practice relates to the INTASC standards for professional development as I work to improve my teaching through data collection and analysis.

Going hand in hand with self-reflection and self-efficacy, it is important as an educator to allow room for continual growth and improvement. Studying my own practice as it relates to my classroom environment, content development, and relationship with my students is an important undertaking which leaves room for accountability and maturation. Through action research, alongside the standard methods of observation and reflection, I can navigate forward into my role as an educator who is continuing to evolve.

Data Collection

The application of my action research requires means of collecting data which is representative of this research and demonstrates me working to obtain these goals as an educator. When conducting action research, the first step is to identify a topic or issue of study, the second is to collect data as it pertains to the issue, the third is to analyze/interpret this data, and lastly to enact action planning. This final step is the application of the results of this action research project. To accomplish this, it was necessary to select data sources which I felt were

representative of the data I wanted to collect and the growth I hoped to observe. It was also important to keep my research simple and focused (Johnson, 2012). This involves selecting a variety of data sources which adhere to the anonymity of my students, as I am the central participant of this study, and allows for multiple bases of comparison over the course of my student teaching. The next paragraphs outline my chosen sources of data collection.

Journal Entries

Journal entries allow for a chance to see visible adaptation and growth, thus they tie in well with my action research. Through a process of self reflection, I could identify areas of growth and other areas I would like to expand in. This allowed me to see where I have been challenged and also observe my personal growth throughout my teaching journey, This also allowed me time to monitor the effectiveness of my teaching; weekly journal entries allow time for me to ponder my live lessons, the student work they have submitted after, and also student engagement outside of our live learning and during our asynchronous, applied times.

Additionally, these allowed me to observe my own personal growth and flexibility in regards to the ever-changing landscape of our classes this year, whether that be fully online, hybrid, or transitioning back to in-person. This accounted for adaptation of my readiness and preparedness for the class, the adjustments made to differentiation and my approach to criticality, and how I plan on using inquiry-based instruction in these changing environments.

Lesson Plans

In this program, I had many opportunities to write formal lesson plans. These include ones for the EdTPA submission, my formal observations, and just daily lesson planning. Additionally, in comparing my lesson plans with my journal entries, I could see where I have

adhered to my lesson plan and where I strayed. For inquiries, for example, this allowed me to reflect on where my course changed mid-lesson based on student questioning and feedback. These also gave me insight into how I have planned for criticality and adopted any scaffolds or differentiation necessary.

Observation Notes

An additional data source I used are observation notes from both my cooperating teacher and university supervisor. Part of their observational requirement was to complete notes I could access and learn from afterwards. These allowed me to witness my growth through their observations, as well as paying attention to challenges they noticed I faced and potential areas of growth. Both my cooperating teacher and university supervisor paid close attention to detail and their advice was invaluable; they wanted to assist me in thriving in the educational environment and provide feedback as to which strategies I incorporated were effective and how I am improving in my implementation of my research goals and standards I have set for myself. They could make note from an outsider's perspective as to where my readiness appears to be at each lesson in regards to planning, criticality, differentiation, as well as my ability to adapt to change. They had the ability to notice details I may have overlooked as I was going through a live lesson with students, and could make note of times when I incorporated inquiry into my classroom and allow my lessons to be student-focused rather than direct instruction, teacher-focused pacing.

CRTSE

The final data source I used is in response to my research question on diversity; the Culturally Responsive Teaching Self-Efficacy Scale, developed and implemented in the midwest, provides roughly forty questions for teachers to engage with. These questions allow teachers to

rate their confidence in regards to specific culturally responsive teaching practices, and accounts for self-efficacy. Implementing this as a data source allowed me to take this survey continuously and see how I have grown in my readiness and confidence to plan for criticality and develop a culturally responsive classroom.

Procedures

Table 1 (below) will summarize my procedures for data collection.

Table 1.

Data Collection Procedures

Research Questions	Data Sources	Purpose	Procedures
How have I grown in my readiness to incorporate differentiated instruction and address the needs of students with diverse learning strengths? (Differentiation)	Journal Entries Documents/Lesson Plans Interviews (CT/Supervisor)	Examine the different ways I have differentiated instruction throughout the term and feedback from peers.	EdTPA After-class check-in with CT Meetings with supervisor after observation Weekly journal entries
How have I grown in my readiness and self-efficacy in planning for criticality in my classroom? (Diversity)	Culturally Responsive Self Efficacy Scale (CRTSE) Journal Entries Interviews	Take note of how I have planned for criticality in the classroom and my own self-efficacy in this regard.	Take the CRTSE every 3 weeks EdTPA After-class check-in with CT Meetings with supervisor after observation Weekly journal entries
How have I increased my	Journal Entries	Gather information on	EdTPA After-class check-in with CT

teacher-readiness to deliver inquiry-based instruction as opposed to direct instruction? (Subject Specific)	Documents/Lesson Plans Interviews (CT/Supervisor)	how I have incorporated inquiry-based instruction throughout the term and gain feedback from my peers.	Meetings with supervisor after observation Weekly journal entries
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Context of the Study

I currently teach at a public high school in a mid-sized urban district in the mid-willamette valley, which serves grades 9-12. The student enrollment is currently 865 students, and there are 43 teachers, 19 educational assistants, and 4 counselors/psychologists; the student to teacher ratio is approximately 20.116 to 1. For demographics, 3% of the student body is labeled as “American Indian/Alaska Native”, 2% is “Asian”, 1% is “Black/African American”, 9% is “Hispanic/Latino”, 4% is “Multiracial”, 1% is “Native Hawaiian/Pacific Islander”, and 80% is “White”. The school is made up of a variety of cultures, religions, socioeconomic statuses, and linguistic backgrounds.

Due to COVID-19, as of March 2021 we are currently working in a Comprehensive Distance Learning (CDL) model. This means students are enrolled in four classes at a time, and meet synchronously through Zoom twice a week per class. Periods 1 and 2 meet Monday and Thursday for an hour at a time, and Periods 3 and 4 meet Tuesday and Friday. The first class of the day is from 9:30 to 10:30am, and the second class is from 10:45 to 11:45am. The afternoons are dedicated to their Applied Learning time, in which students are expected to complete asynchronous work and attend teacher’s office hours as needed. Wednesdays are dedicated to further asynchronous learning and live Zoom sessions with their Advisory class; this is the same

day in which faculty, school-wide meetings and training are scheduled. On April 20th, 2021, we moved to a Hybrid model; synchronous core classes remained on Zoom, but the afternoons will involve staggered Applied Learning on campus for the Advisory Groups. This means students attend in-person school twice a week in the afternoons, remaining in their assigned cohorts. Currently all of our grading, assignments, planning, and much of our student interaction occurs through the Canvas interface. Our students also complete asynchronous online work through MATHia, which is a service provided through Carnegie Learning alongside their textbooks. We align assignments on this online math learning software with in-class instruction and textbook assignments.

I primarily work under the mentorship of my cooperating teacher. There are five teachers in total in the mathematics department at the high school, and the math department meets every other week to discuss new strategies; in the online environment, we are constantly encountering new methods and technologies to use in the classroom. In the fall, I had the opportunity to work as a substitute teacher for a five week period for one of the mathematics teachers, which gave me insight into the community environment and feel of the department. Every teacher, both in mathematics and out, as well as administrators such as the vice principal and the principal were incredibly helpful and strived to assist me in any way possible. I am very fortunate to have been placed at a welcoming and supportive department and school.

Two of the other mathematics teachers also have taken student teachers under their wing, although they are both in the initial stages of their programs through other universities and are not full time. This has allowed me to sit in on their planning process as well. Due to the CDL model for school this year, all teachers are teaching three online classes and have one prep

period. Last semester, my cooperating teacher and I had two Algebra 1 sections and one AP Calculus class; this semester, we have two College Algebra sections and one Algebra 1 section. The Algebra 1 class I have been primarily teaching independently since the beginning of the second semester (mid-February 2021) consists primarily of freshman and several sophomore students. I teach hour-long live Zoom sessions on Tuesdays and Fridays. Approximately 20% of these Algebra 1 students are on individual education plans (IEPs) or 504 plans. There are no Ever English Learners in my classroom. In the College Algebra Classes, approximately 25% of the students are in the Talented and Gifted (TAG) program. Due to the connections between College Algebra and the partnered community college, I am not qualified as a student teacher to independently teach the live instruction lessons, so I prepare videos and work for students to watch and interact with on their Applied Learning days as well as assist in the live Zoom class and host regular online office hours. In our class, we have different considerations for these students in different programs or on distinct learning plans.

Participants

Due to the approach of action research and that this study is primarily a self-study, the main participant is myself in the role of the teacher. I have been placed at this high school since September of 2020, and have done all student teaching in the current CDL format. The school assisted me in obtaining a Restricted Substitute license in October to fill in for another mathematics teacher through the end of November, and I am available to fill in if needed later in the school year for any teachers who need a substitute. For the planned lesson requirements, I am currently the full time teacher for the Algebra 1 class and assist in planning for the College Algebra course and posting asynchronous work for them to complete and review. In a standard

year, there would be more classes to work with, but due to COVID-19 each teacher only has three classes of their own. When designing this study, I did so with the advice and support of my mentor teacher.

Our Algebra 1 class has 28 students, freshman and sophomore, with a mix of students on IEPs, 504 plans, as well as students with other needs. Our College Algebra classes have 20 and 25 students respectively, also with a mix of students on IEPs, 504 plans, in the TAG program, amongst other needs.

This past year has been a different and difficult year for everyone involved (students, parents, teachers, administrators, and so on). My experiences in student teaching have led me to the research questions and the goals I have obtained for myself. In this online environment, it is difficult to avoid reliance on direct instruction, which is where I decided to focus on inquiry-based instruction as this is a goal of mine and shifts the focus of the classroom more so unto the student. Additionally, through the Zoom interface, there at times is a disconnect between the students and my cooperating teacher and myself; this has led me to invoking a second goal which involves planning for criticality in the classroom. Lastly, the online learning environment is not suitable for all of the students, and differentiation continues to be a necessity to address the needs of my students with diverse learning strengths; this is a goal I continually strive to accomplish in order to support my students learning and content knowledge growth, as well as their overall growth in mathematics and school itself. These all pertain to the readiness that I experience myself; while it is impossible to plan out every aspect of the classroom because things rarely go to plan, sometimes accounting for flexibility in my classroom is *part* of being ready to teach a lesson. In assessing my readiness in differentiating, approaching criticality, and

promoting an inquiry-based classroom, I allow opportunity for continual growth and self-reflection in these areas.

Data Analysis Plan

When the new semester began in February and we received a new group of students and a fresh start to classes, I began enacting my data collection plans. This involved adhering to a weekly schedule to allow opportunity for this self-monitoring and analysis. In the afternoon after each class, generally during my office hours, I would make quick notes about what had happened that day and how the lesson went. Then on Friday I would reflect back over my notes for this week and compile this into one journal entry after I had had time to continually think back on the week and whatever had occurred. During this weekly journal reflection, I would make note of observations, challenges which arose, growth I experienced or noticed, any learning experiences for myself as the teacher, and any questions I had for myself or for others. I also made note of technologies to use or to look for; on the online interface, to make lessons engaging this often involves incorporating some form of educational technology to avoid solely sharing a screen with the students for the entirety of the lesson. Building this into my journal entry also helped me reflect on how my technology choices have grown, what has become a staple in my e-learning environment, and how these technologies assist me in my research as well. I also collected my lesson plans to analyze my potential growth over time; this involves reflecting back on lesson plans from when I first started student teaching, as well as those formally written for my cooperating teacher or university supervisor observations.

Additionally, my cooperating teacher and I spend around ten minutes after every class talking about how the lesson went that day. I also have access to their observation notes and

feedback from their formal observations. For growing my self-efficacy in the classroom, I used the Culturally Responsive Self Efficacy Scale (CRTSE) to assess my readiness and self-efficacy in approaching classroom criticality; I took the CRTSE in February when I began student teaching, and then continued to take it every other week on Fridays to see how my self-efficacy has potentially grown in this area.

Table 2*Data Analysis Steps*

Phase I Familiarize myself with data	Data will be organized in a variety of ways - in a binder, there is a notebook which contains weekly journal entries. There are notes which transcribe important topics covered in my observations and feedback received from my CT and university supervisor. There are notes with each of my CRTSE results as I continue to take it throughout my research process. All lesson plans are stored in a Google drive folder, to be reviewed later on.
Phase 2 Generate initial codes	Organize data into meaningful groups with research questions in mind using color coding Manually code with notes in transcribed text Begin digital code book, collating data within groups Code for all potential themes FIRST IMPRESSION CODING Note tensions & inconsistencies of codes
Phase 3 Search for themes	Organize codes into potential themes using digital table Note thoughts on relationships between the emerging themes in digital diary Note any potential sub-themes in digital diary Add a miscellaneous section in digital code diary for any seemingly unrelated code

<p>Phase 4 Review themes</p>	<p>Revise table of potential themes, considering internal homogeneity and external heterogeneity</p> <p>Read collated data extracts for each theme, checking for coherent pattern</p> <p>For extracts with no coherent pattern, re-examine theme and related coded data for sub-theme or renaming of theme</p> <p>For themes where coherent pattern exists, examine for individual theme validity in relation to entire data.</p> <p>Examine transcripts for any missed data extracts needing coded for theme</p> <p>Re-read entire transcripts for any new themes that may have been missed</p> <p>Stop when no more substantial and relevant themes emerge</p> <p>Examine how themes fit together in relation to research questions and note thoughts and considerations in digital journal</p> <p>Create thematic map</p>
<p>Phase 5 Define & name themes</p>	<p>Adjust digital table of them to organize collated data extracts within each theme for consistency</p> <p>Identify relative narrative for each theme in the digital diary</p> <p>Write a detailed analysis for each theme, to include individual relevance and how that relates to overall analysis and answers the questions of this research Examine written analysis for any excessive overlapping of themes</p> <p>Examine each theme for any sub-themes needing to be identified and explained</p> <p>For each theme, describe scope and content in no more than two sentences, adding potential names to each theme</p>
<p>Phase 6 Write the thematic report</p>	<p>Write an analysis within and across themes</p> <p>Choose examples for each point of evidence in answering research questions</p> <p>Create narrative that incorporates evidential answers to each research question</p>

Limitations/Delimitations/Bias and Assumptions

Before discussing more specifics of my research, I will address the limits of action research methodology. Most notably, is it not an objective or experimental form of research and thus findings are not able to be generalized. Furthermore; action research operates best when those conducting the research have the opportunity to complete the project, reflect, and then try again, contributing to its cyclical nature. However, due to the restraints of my current MAT program, I have only had the opportunity to implement one cycle. Ideally, I will have more time in my career to continue to reflect on my teaching practices, but this will not be addressed at the time of this project.

Delimitations:

- **Winter and Spring Term 2021:** These terms were chosen because they offered overlap between the semester change at the high school and students are more experienced in distance learning, as am I.
- **Algebra 1:** This class was selected because it is the class in which I am the primary teacher, plan lessons for, and grade for.

I must also address biases and assumptions. As this is a self-study, where I am the subject, my bias includes my own perspective and social identity. This can have an effect in the way I perceive and make note of things, as well as the inferences I draw. Additionally, this also encompasses my relationships with my students. It must also be noted that I am student teaching, wherein I am still under the supervision of my cooperating teacher and thus have limitations in this regard as well.

In my research, I used multiple methods of data collection. These different methods served as method triangulation based on the explanation from Carter et al. (2014). The methods of data collection were through journal entries, documents such as lesson plans and supporting materials, and interviews.. This allowed me to analyze the data through differing means to ensure that I was correctly interpreting the data, as well resulting in “a broader understanding of the phenomenon” (Carter et al., 2014, p. 546). In addition, to further strengthen my credibility, I also used member checks to provide a form of consensual validation. These member checks were conducted with the assistance of my cooperating teacher, as well as my university supervisor.

CHAPTER 4

PRESENTATION AND DISCUSSION OF THE FINDINGS**Introduction**

In this chapter, I will discuss the specific data collected and my analysis of said data in relation to how they relate to my three research questions, each falling into their respective, distinct categories for Theme #1, #2, and #3 as follows:

- 1) *How have I grown in my readiness to incorporate differentiated instruction and address the needs of students with diverse learning strengths?*
- 2) *How have I grown in my readiness and self-efficacy in planning for criticality in my classroom?*
- 3) *How have I increased my teacher-readiness to deliver inquiry-based instruction as opposed to direct instruction?*

The data to be discussed in the following sections was collected between February and May of 2021, where I was a student teacher and the primary instructor for an Algebra 1 course. The data collected for each research question was done so with a variety of data sources. These primarily consisted of lesson plans, journal entries, interview notes, as well as self-scoring scales. As all of these pertained to my own teacher readiness, there was room for self-inference and ample opportunity for self-reflection. Compiling this data in a way that I was able to efficiently analyze my work as well as gauge how my teacher readiness had improved over the course of this time frame involved categorizing and coding this data to search for specific themes and underlying codes within the research itself.

Considering the limitations of this school year, I am pleased with the research collected and my personal goal outcomes. I have noticed a marked improvement in my readiness to address differentiated instruction, approach criticality, and deliver inquiry-based instruction. Reflecting on the journal entries over the course of the time period in which I conducted research, a large difference in all three areas was noted in my self-confidence and teacher readiness in all three areas of research. Additionally, my lesson plans also demonstrate an improvement in differentiation, which can also be attributed to getting to know my students more throughout the course of the semester and understanding how best to differentiate and adapt material to meet their individual needs.

Data Analysis: Theme #1

Table 3

Data Analysis: Theme #1

Code	Description	Examples
Success Emotive Inadequacy Frustration Variety Vocabulary	<p>Lesson Plans: Lesson plans were completed both informally and formally in the form of the EdTPA template over the course of the data collection period. These were annotated and coded for themes as they relate to differentiated instruction.</p> <p>Journal Entries: These journal entries were compiled weekly, composed of smaller notes from daily lessons and activities and a weekly reflection for how I felt the week went overall.</p>	<p>Lesson Plans: Lesson plans demonstrated an improvement in differentiated instruction. This included a continued emphasis in vocabulary and frequent references to substantiate past academic vocabulary as it pertained to our current material, summarizing material, and providing students with multiple means to convey knowledge and information (written, oral, visual).</p> <p>Journal Entries: Journal entries provided opportunity for reflection after teaching the lesson plans mentioned previously, as well as opportunity to reflect and make note on individual student interactions and what instruction seemed to “work” for them - and likewise, what</p>

		instruction did <i>not</i> work for them.
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Journal Entries

On our Canvas interface, I frequently reference our “Algebra Toolkit,” which has a list of pertinent and important vocabulary by unit. Students are reminded during their lessons to keep this nearby so they have a continued reference. I also provided a video link to me navigating this Algebra Toolkit and talking through definitions, so those who need to listen once more to a verbal explanation have access to that as well. Each vocabulary word is accompanied by an image to assist students in visualizing key concepts. Each week, I made note on if students were accessing the toolkit and if they found it beneficial for their learning; some students told me that they liked the pictures, or that having a concise list of words and definitions helped to summarize their learning.

Additionally, journal entries consisted of codes such as “frustration” and “inadequacy,” the majority of which came from my own self-reflection. Student engagement had been a large struggle in our distance learning environment due to COVID-19, and it was difficult to gauge any success in differentiation without student interaction. However, as time passed and students became more comfortable around me, this changed. Students who may not be comfortable speaking up on Zoom were willing to explain their work to me audibly in one-on-one meetings, or through written responses submitted online. In seeing the change in student interaction and comprehension alongside the differentiation tactics I was applying, my own readiness to enact differentiated instruction improved vastly. The courses I took as part of my degree also provided me with a large number of strategies to enact as well, something I will continue to learn about and take part in as my educational career continues.

Lesson Plans

In coding my lesson plans, frequent emerging themes included “variety” and “vocabulary.” Something I consider a major improvement in my readiness to differentiate material for student needs is a continued emphasis on vocabulary; often students need reiteration and re-emphasis on important concepts, so over the course of the data collection period I saw a large improvement in vocabulary incorporation and recapitulation. This also involves incorporating explicit learning targets into my lesson plan materials, with key vocabulary prominently highlighted, and the “Algebra Toolkit.”

Figure 1

Lesson Plan Vocabulary Excerpt

10 mins	Independent Application:	Independent Application:
	Have students think for one minute - what do you think it means for graphs to have no solution? After one minute, have them waterfall their answers in the chat. Look for students who mention something about “no intersection” or how the lines don’t cross. If not, reiterate how the solution comes from when the lines intersect. If the lines don’t intersect, then they have no solution. Graph two parallel lines, like $y=5x+3$ and $y=5x-2$. Show how they grow at the same rate and thus never cross, so this system has no solutions. (You can mention how these are “parallel” - this is a term they will hear in geometry more.)	Students should think independently for a moment and then on the count of 3-2-1 put their ideas for what they think it would mean for a system to have no solutions.

Scanning for “variety” was also important - lesson plans worked to transgress the stagnant nature of assessments, both informal and formal, by allowing students multiple means to demonstrate their learning. There were strong connections between addressing this research question and Question #3, which pertains to inquiry-based instruction. I wanted to promote inquiry and my readiness to incorporate inquiry-based instruction, but not by ignoring the

students who need guidance and clear structure. This became a fine line to navigate, but in navigating it somewhat successfully through student, parent, and teacher feedback I note that my readiness has greatly improved.

Observations

The observations conducted by my cooperating teacher and university supervisor also provided insight into the effectiveness of my differentiated instruction, as well as more ideas to enact. Both my CT and university supervisor reminded me greatly that in this strange, chaotic year, we are all still learning. In differentiating instruction, they reminded me of things I can do to benefit class instruction as a whole, such as concise vocabulary usage and slowing my rate of speech. These were observations I took to heart; fortunately, I have class recordings of live Zoom sessions, and I was able to watch those back and find areas for improvement in my rate of speech and vocabulary usage. They helped me strengthen my learning targets, incorporate more variety in my assessments, and create assessments and assignments which can be decomposed into smaller assignments for students with 504 or IEP plans which consist of this accommodation. Overall, their feedback was invaluable and instrumental in improving my readiness to differentiate instruction.

Data Analysis: Theme #2

Table 4

Data Analysis: Theme #2

Code	Description	Examples
Frustration	Observations: Both my cooperating teacher and	Observations: These observations provided unique insight into

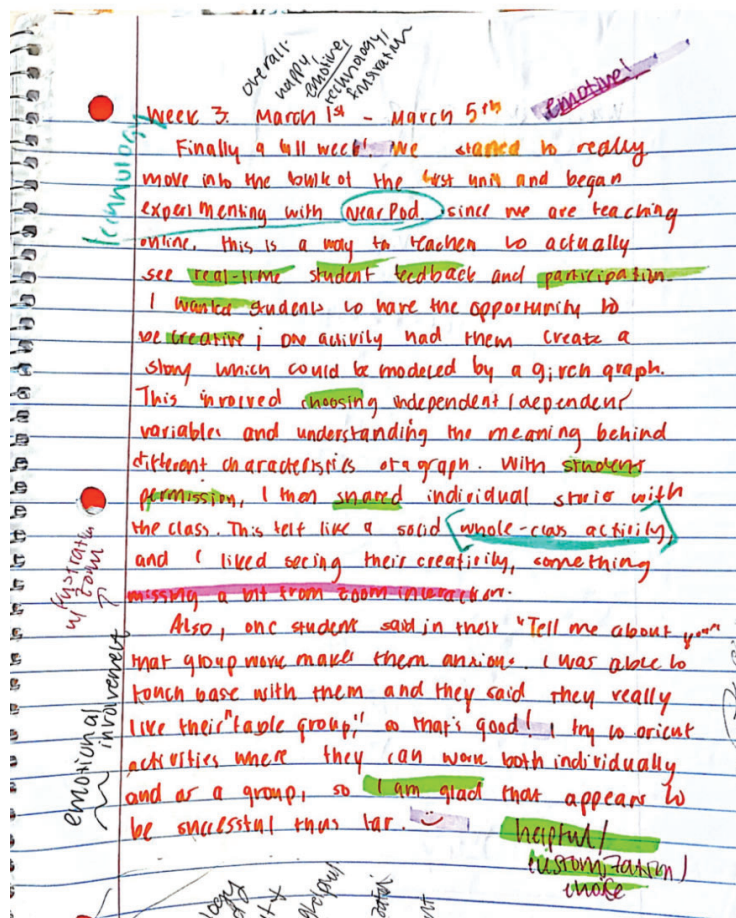
<p>Emotive Inadequacy Personality Emotional Connection Tone</p>	<p>university supervisor provided numerous informal and formal observations over the course of this research. Their feedback was noted by me in a file, and I made specific notes to when they referred to anything in the realm of culturally responsive teaching and planning for student relationships.</p> <p>Journal Entries: These journal entries were compiled weekly, composed of smaller notes from daily lessons and activities and a weekly reflection for how I felt the week went overall.</p>	<p>my role as a teacher through the lens of another person's perspective. They picked up on instances of student engagement and culturally responsive teaching that I overlook or take in stride. For example, even the kind tone I take with students - something I think of as standard and naturally part of my teaching routine, but that my observers note is very important.</p> <p>Journal Entries: These provided strong insight into my mindset approaching criticality and my role as a culturally responsive teacher. There were many instances of frustration and inadequacy on my part expressed in these weekly reflections; but stronger ties were often built in moments where students expressed their personalities in ways I had not seen before. I began to include more direct references to student interests, with specific cues for when to bring up examples pertinent to their interests or cultural background.</p>
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Journal Entries

Over the course of this research period, my self-assessment of my own teacher readiness greatly grew. These journal entries provided valuable insight into how my confidence increased as I felt more comfortable stepping into the role of an educator. Additionally, my journal entries were often able to bridge the connection between material covered in my own university classes and the courses I was teaching.

Figure 2

Journal Entry Example



Frequent codes in my journal entries involved feelings of inadequacy and frustration on my own part, stemming from what I felt was my inability to successfully reach students. Teaching online has been difficult to say the least; I have many students who struggle economically and computer access and reliable internet has been an uphill battle in our e-learning circumstances. Additionally, many come from rural backgrounds with even poorer internet connection, where even Wifi hotspots courtesy of the high school do not function properly. Over the course of the year I was offered insight into their unique cultural backgrounds

and what their families place value in. Several students come from families who place great stock in hard work, but because of this these students saw online school as an opportunity for them to get jobs or help out on their family's farm instead of attending the Live Zoom classes where material was covered. This was information I began to take into consideration over the course of my research period, and it started to steer the conversations I had with students individually as well as the examples and problems I chose to discuss in class and the mathematics that it illustrates.

My journal entries note my struggle to explicitly approach criticality in the classroom. There is not as much opportunity for discourse over Zoom as I believe there would be learning in-person; it felt like much of the mathematics I was teaching was foundational and did not allow for opportunity for self-exploration. That being said, while whole-class discussion did not occur the way I desired, one-on-one conversations were had and the codes in my journal entries afterwards were often "personality" and "emotive." I felt as if I had made connections to students in these individual conversations that allowed us to engage in critical thinking skills I miss when I am doing whole-class discussion on Zoom.

Observations

An observation was made by a fellow teacher in the department about my ability to guide a conversation with my students; as is common in high schoolers, their thoughts and beliefs are in part largely contributed to by their parents' thoughts and beliefs. When they engage in conversation with their peers, often these opinions come out in casual conversation, and they sometimes need to be reminded to sit back and consider another perspective. This teacher noticed how, when students engaged in a conversation in front of me which could have turned

into a debate, I stepped in and had them listen to the other to see if we could find a medium; this engaged their criticality in a way outside of the realm of mathematics specifically, and although this observation was not part of a formal observation completed by my CT or supervisor, it is one I made note of and took to heart. As a teacher, there is a large aspect of the content I teach which may not specifically relate to mathematics itself, but rather to overarching human nature as whole; engaging students in communicative and positive discourse encourages their critical thinking in more than one walk of life.

CRTSE Scale

This 50-question survey was instrumental in my self-analysis of my own readiness to approach criticality in my classroom. The CRTSE scale, or Culturally Responsive Teaching Self Efficacy Scale, consisted of fifty self-efficacy questions in which I rate how confident I was to engage in said specific practice on a scale of 0 to 100. Here, 0 means no confidence at all, and 100 means fully confident. Examples of these practices include “... adapt instruction to meet the needs of my students” and “... support the academic learning and social development of students negotiating a new culture.” My final score was the average of my 50 answers. Taking it roughly every other week, I took this test six times over the course of my data collection. Each score was as follows:

Table 5

Data Analysis: CRTSE Scale

Week	Score
1	27
2	35

3	40
4	68
5	73
6	80

The largest jump in self-scoring occurred between weeks 3 and 4, where parent-teacher conferences fell in-between. These conferences and meeting the parents for the first time was instrumental in my self-readiness to approach the role as a culturally responsive teacher. It opened the window into what the students' lives were like at home, their parents' expectations for them and their academics, and offered insight into their unique cultural backgrounds. It also bridged the gap between me and their parents; moving forward and having dealt with my first one-on-one parent interaction with my cooperating teacher as support, I felt more comfortable reaching out to parents individually afterwards and approaching more personal conversations with my students individually. This is an area where the teacher-education aspect is ever-changing and improving as we learn more about becoming culturally responsive teachers in these changing environments, so I know that while I will never think of myself as truly “ready” to address criticality, I can discern the improvement in my teacher readiness to plan for criticality and approach this topic in my classroom.

Data Analysis: Theme #3**Table 6***Data Analysis: Theme #3*

Code	Description	Examples
<p>Time Management</p> <p>Missed opportunity</p> <p>Emotion</p>	<p>Lesson Plans: Lesson plans were completed both informally and formally in the form of the EdTPA template over the course of the data collection period. These were annotated and coded for themes as they relate to inquiry-based instruction.</p> <p>Journal Entries: These journal entries were compiled weekly, composed of smaller notes from daily lessons and activities and a weekly reflection for how I felt the week went overall.</p>	<p>Lesson Plans: These lesson plans demonstrated an improvement in my ability to plan for and promote inquiry-based instruction. This involves more annotation in how I dictate student work time, the specific problems I choose for them to work on, and the assessments I provide at the end.</p> <p>Journal Entries: Journal entries provided insight into my own mindset as I grew in my role as the primary teacher, as well as insight into individual interactions I had with students. This includes notes of specific moments where inquiry occurred, as well as moments which are “missed opportunities” - such as an instance where a student asked a follow-up question, which I answered before moving onto the next topic, but upon reflection realize I could have taken their question (which pertained to connections between mathematics and “real-world” applications such as biology) and pulled up specific examples or incorporated problems which align with these interests for them to work through in the next class.</p>

Journal Entries

Common codes in my weekly self-reflection journal entries include “time management” and “missed opportunity” - these journal entries also encompass some of the observation notes from my CT and university supervisor, and my reflection on those. They aided me in making note of moments in which I could have taken student input and geared instruction more effectively towards the questions they were asking, as well as maintaining a balance between navigating “off-topic” and making sure to get through the material I needed to get through that day. With online classes due to COVID-19, there was not much flexibility in our class schedule. We already only saw students twice a week on Zoom, which meant these one-hour instruction windows needed to be used effectively to convey required instruction. I also made note of an important code, “emotion”, which focused on the punctuation and the emotion of my writing as I reflected over the weeks. Journal entries for weeks I felt were successful in the sense that I was able to navigate the waters between inquiry and core content were peppered with exclamation points and even rudimentary smiley faces sketched in the lines; those I may have deemed as more disheartening weeks were not. These entries were much blunter and succinct, void of drawings to convey my emotions. As I progressed through the weeks, I noted that “smiley faces” became much more frequent, even on days I felt were “unsuccessful” in my attempts to promote inquiry-based instruction. I began to note other forms of interactions such as higher student engagement, individual conversations occurring both on and off Zoom calls, or even submission comments left on assignments turned in through Canvas. In this sense, my teacher-readiness to incorporate inquiry-based instruction greatly improved as I became more comfortable gearing conversations and lessons towards incorporating student choice and interests.

Additionally, as I reflected through the weeks with these journal entries I could see how at times inquiry-based learning provided a sense of frustration in some students, namely those on IEP plans. These students on special education plans often succeed in a structured setting with clear outlines and plans, as well as succinct and explicit instructions and requirements, per the instructional assistants who work with them one-on-one outside of my instruction. Allowing them the sense of “freedom” and self-exploration the inquiry-based instruction I was gearing towards did not benefit these students the way I wanted to. This led to a strong connection between this research question and research question #1, which pertains to differentiated instruction. The inquiry-based instruction needed to also be differentiated to allow more flexibility and opportunity for some, and more rigidity and clarity for those who thrive in that environment. This led to a fine line to be drawn between effectively incorporating inquiry-based instruction in my classroom while maintaining structure for those who need it.

Lesson Plans

By the end of my data collection period, my lessons began having built-in “flex” time. This allowed me the opportunity to have an extra problem or concept lined up if needed to fill the time, but in the event that student questioning led us to another tangent, I also had the time to address this question or curiosity. This prevented me from losing track of time or going over on time as I had done so in my earlier lessons, while still making sure I got through all key material needed for the lesson that day. In reviewing my lesson plans over the course of this time period, I can note that there is a marked improvement in inquiry-based instruction in my class, especially within the confines of Zoom.

Observations

My cooperating teacher and university supervisor provided valuable feedback in my attempts to center my classroom in inquiry. My university supervisor also advised me after one observation to enhance my students' learning with more incorporation of student choice as well. This could be as simple as allowing students to pick two of three questions to complete in a test; I can see how inquiry-based learning and student choice can often go hand in hand. Again, their feedback and observation notes provided me with insight in balancing inquiry with structure for my students who thrive in a more rigorous environment, and how to incorporate both to address all student needs.

CHAPTER FIVE

CONCLUSIONS AND SIGNIFICANCE**Overview**

The purpose of this action research project was to analyze my own teaching as it pertains to the INTASC standards I will adhere to and within the context of my classroom. Self-reflection, which goes hand in hand with self-criticism, is a vital instrument in teacher success. The ability to analyze my work and recognize strengths, weaknesses, and overall areas of improvement benefits me, my fellow teachers, and my students. Building relationships and establishing trust with my students and fellow teachers involves analyzing the areas in which I have and will fall short, and the ways in which I can continue to better myself in the ever-changing educational environment. All three of my research questions pertained to teacher readiness, and the ways in which I can prepare myself to approach a myriad of topics in an educational setting. To recapitulate, these research questions were:

1. How have I grown in my readiness to incorporate differentiated instruction and address the needs of students with diverse learning strengths?
2. How have I grown in my readiness and self-efficacy in planning for criticality in my classroom?
3. How have I increased my teacher-readiness to deliver inquiry-based instruction as opposed to direct instruction?

Teacher readiness is something difficult to quantify but is analyzable through the lens of a teacher seeking to improve their instruction. It has a strong relationship with confidence and self-efficacy as an instructor, and allows space for continual growth. These questions work

independently as well as have sufficient overlap between the two that I was able to analyze all three while coming to a central conclusion about the ways in which my readiness has improved to approach the three concepts individually as well as my readiness to step into the role of a teacher overall.

Chapter 1 of this research project allowed me to discuss my own philosophy of education, which sets a strong foundation for my research goals and the questions I was asking about self-reflection as a teacher. Chapter 2 contained my literature review which assisted me in guiding my improvement and developing my teaching goals by reading the work and theories others had completed. Chapter 3 consisted of my research methods and research questions, and in chapter 4 I presented a discussion and analysis of my findings. This final chapter, Chapter 5, will pertain to the conclusions I can draw from my research and the significance of these conclusions.

Discussion

This action research project allowed me to purposefully analyze and answer my questions as they relate to all three of my research questions. I was able to see improvement in all three themes/goals, and am also able to see the large potential for improvement in future work to support my students and build relationships.

For my first research question as it related to differentiated instruction, I became more and more confident in my ability to incorporate differentiation and more knowledgeable of the variety of strategies that are out there. Differentiation became a standard part of my lesson plan, and I was able to introduce scaffolds for other students as I became acquainted with them and the

ways in which they succeed. I made decisions in my lesson plans and activities that I felt would assist both individual students and the class as a whole.

My second research question pertained to criticality in the classroom, and my role as a culturally responsive teacher. This was the area in which I did see notable improvement, but that I still feel I have so much more to learn and improve in. The research helped me greatly, as well as strategies and techniques provided to me by my own courses, but in many ways my focus was pulled more towards differentiation and inquiry-based learning more than towards criticality. That being said, I began working harder to incorporate student interests and backgrounds into the classroom as the time passed, which also played a hand in inquiry-based instruction.

Lastly, my third research question was centered around inquiry-based instruction. This was an area where I noticed large improvements in my own readiness, especially in the battle to stray from direct instruction. In the online learning environment, direct instruction was easy to make the go-to form of classroom engagement and instruction; throughout my data collection period, I found myself making noticeable efforts to stray from this and promote inquiry and curiosity in the classroom.

In reviewing my previous four chapters, and in particular my philosophy of education, I can see the ways in which this has changed and stayed the same. I still firmly believe that a teacher is a lifelong learner, and that we will grow together, both individually and as a whole. While I continue to place an emphasis on inquiry, I also recognize now the importance of a balance between pure-inquiry and curiosity driven learning and also a structured classroom. Many students benefit from still maintaining a sense of structure in the material and in their learning, but it is still very important to allow them to explore topics on their own, under the

umbrella of our class curriculum. It is also important to note the age of my students and that they are primarily freshmen and still growing and trying to maintain a solid footing in the high school world, so a sense of rigor is still important as they continue establishing their own identities.

The literature review was very beneficial for me as I began exploring ways in which I could conduct research in my own classroom, and being able to read about the things other teachers had implemented was incredibly helpful. Reflecting back, I wish I had looked at more mathematics-specific content, although at times it was difficult to find journals for this. Still, general education classroom material was still very informative as I was able to apply these ideas to the structure of my own classroom. One difficulty stemmed from our environment this year; teaching online due to COVID-19 and unprecedented times is a much different classroom setting than those described in the journals and articles I read. I hope the work that I have done and my peers have done this year will benefit teachers and teachers in training to come.

Overall, the process of action research was interesting and different. Coming from a mathematics background, I am primarily used to quantitative data. Having the opportunity to analyze the opposite side of that coin, qualitative data, was eye-opening. The entire process was very self-reflective and allowed me to see who I am as a teacher, as a student, and as a person.

Implications and Recommendations

In all, my readiness improved substantially over the course of the semester. This was in large part due to establishing student relationships and my own confidence as a classroom teacher; these two things contributed greatly to my readiness to approach all three research areas. The overarching theme of all three themes, however, and something I consider to be a pillar of teacher readiness was adaptability. Being able to adapt and be flexible in my lesson plans,

conversations, live Zoom sessions, and even weekly schedule was crucial in enhancing student learning. Although I do not believe that there will ever be a time in which I am truly, through and through, *ready* for everything the students and life can toss my way, there is a certain degree to which I can establish my own ability to adapt to changing circumstances. In this tumultuous year, where COVID-19 and climate factors disrupted learning and daily life in general, adaptability was essential.

Limitations

Conducting action research within the confines of this school year was difficult. Although the time period was several months for data collection, I only met with students personally twice a week. My journal entries provided insight into the interactions happening with students outside of this synchronous learning time, but there were still gaps in what I was able to pull from student interactions and class participation. Stress levels ran high for both faculty and students; already fighting within the confines of online learning, we had to deal with multiple unforeseen circumstances such as an ice storm which knocked out power for many students and teachers. Still, my lesson plans, journal entries, observations, and overall self-reflection show the progression of my own readiness in approaching differentiation, criticality, and inquiry-based instruction in my classroom. There is always room for more improvement and upwards ability, but I am proud of the work completed.

Conclusion

During the course of this action research project, I have learned so much about my students, education, and also myself. Stepping into the role of a primary teacher has been stressful, to say the least, but it has also been invaluablely rewarding in the lessons it has taught me

and the ways in which my confidence has grown. All three of my research questions were related to readiness to tackle certain topics as I am fighting to feel any sort of “readiness” to teach and fulfill the role my students expect and deserve of me. I do not believe there is ever a point in a teachers career where they are officially “done” learning or growing; as stated in my philosophy of education, a teacher is a lifelong student themselves. Readiness or preparedness has no maximum, no ceiling to stop our growth - as we become rooted in the educational system and in the lives of our students, it is important we continue striving to better ourselves. The process of continued self-reflection opened my eyes to my strengths and weaknesses, as well as grew my appreciation for the work I have done and the interactions I am fortunate to have with my students on a daily basis. I am incredibly grateful for this experience and am eager to continue my personal growth in the coming years.

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