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Action Research in Applying Culturally Responsive Teaching, Engaging Lesson Plans, and Balancing a Learning Management System with Lecture

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

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Graduate Student: Jesse Aitken

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 of the requirements of this master's degree.

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Chapter 1

Introduction

In this chapter, I will be discussing my history as a learner, my stance on various ideologies and philosophies, my role as a teacher in regards to social issues, how I will uphold current laws and practices, my perceived role within the faculty, and my overall teaching philosophy. While I originally had a solid idea of who I would be as an educator, this year has shown that I have much to learn as my perceptions, and the perceptions of the world, are within a massive flux. To say that we are currently living in history has never been more accurate with the current adjustments to life in general due to the COVID-19 pandemic, the race relations within the United States and widespread protests, the most divisive election in my lifetime, distance learning at all levels of schooling, and an overall sense of unrest for most of the year. My personal experiences throughout this time has left me with many questions which have been beneficial as I am experiencing some entirely new ideas as I learn what it means to be an educator.

History of Education

To show my initial thoughts as an educator, let me first share my background as a student. I grew up in a small town in Oregon and feel like I was very lucky to have the teachers I had through Kindergarten and Grade School. In Kindergarten, reading was incentivized with toys, and I soon exploited the system of "read one book, get one toy" to develop my love of reading. I still have the certificate I was awarded for reading 100 books throughout Kindergarten. At a young age, I found that good schoolwork leads to recognition and my parents enforced this idea, often stating that with good grades, I would not be required to work the long hard hours

they worked in their labor jobs. It seemed like every year throughout Grade School, I was able to cruise through the work provided and was often given additional work to push my limits. I can remember being given worksheets of math problems well beyond my expected skills with suggestions of "try it out and see what you can do".

In Middle School and High School, my love to excel in school was reaffirmed with letter grades. My goal was to be a straight-A student, but I found some subjects like Math, English, and Biology more enticing and pushed to break the limits in those areas. Although I never needed it, I often participated in extra credit assignments to assuage my interest and, at times, my boredom. Eventually, I began to feel restrained by the pace of the curriculum and would see what I could accomplish by working ahead in textbooks. My frustration led to some mild disruptive and rebellious behavior in which I would chat or pass notes in class. I was not worried of getting lost within a lecture because I had no issue catching up. I graduated as a Valedictorian with eight Varsity letters in three sports and felt like my success would easily translate to college.

While I look back at most of my high school teachers fondly, I also recognize that few of them were preparing students for college. My hometown is a low-income area and of my class of 150 students, less than 20 were going to a major college the fall after graduation, which was actually more than most graduating classes. A late change in my potential career path led me to choose Portland State University's Honors Pre-Med program with no academic scholarship. I look back on my final year of high school and my first year of college with a sense of frustration at my squandered opportunities. Portland State University does not require on-campus living for Freshmen due to a restricted amount of housing, so I lived well off-campus. Being that I had no scholarship, it was necessary for me to be employed while I went to school, so I picked up a part-time job as well. To say my Freshman year of college was a wreck is an understatement. Fall

term, I received my first B grade ever and found that the world did not end. Winter term, I contracted Mono and was in a major car wreck. Two months later, I was in another major car wreck. I had been so capable on my own academically throughout my time as a learner that I had never truly learned to ask for help. I did not know that I could withdraw from classes or inform teachers of my situation to get extensions. In lecture halls of 300 students, nobody knew I was falling behind for the first time in my life. My grades plummeted and the following fall I split time between Portland State University and Portland Community College.

No longer wanting to be in the medical field, I picked classes at random. I missed having a math class, so I decided to take one at PCC. I had tested through the roof in the placement test and was told I could take any math class, so I chose the class with the highest class-level: Math 211. At the time, I did not know that the class was Fundamentals for Math Education. In that class, I found my love for math in a new form: teaching.

My mother had always said that I should be a teacher and she reminded me of this when I told her of my decision. Growing up, I had often peer-tutored and was often a contributor in class and had no issues showing my solutions on a white board. I found I had patience for someone trying to understand a subject I knew so well and found ways to direct them to solutions rather than cut corners and give them an answer. I decided to relocate and go to Western Oregon University.

At WOU, I found what I had been looking for in my previous college attempts: a sense of belonging. The Math Department became a second home for me with my classmates becoming life-long friends. When I struggled, I found my instructors more approachable, although I was still stubborn at times and found myself not achieving as well in some classes as I expected. At one point, I was struggling with bronchitis on the verge of pneumonia and was unable to

complete a required class needed for graduation. I became frustrated that I would not be graduating with my group of friends and had to wait a year to retake the class. Unfortunately, that class was the second of two classes and, in the year away from school waiting for that class, I found I was unprepared and struggled again. I decided to take both classes in the sequence and was able to persevere while living off campus and working two jobs. I have now returned to Western Oregon University for my graduate degree to become the teacher I know I can be.

I feel like while my history as a learner seems less than ideal, there are some valuable lessons that can be found throughout. First and foremost is that while a student may seem capable and has shown independence in the past, sometimes their pride or stubbornness gets in the way of asking for assistance when they need it most. Also, the old idiom of standing up more times than you fall down holds true. Finally, it is important to keep an open mind and learn from mistakes.

Philosophy of Teaching

Due to my background being in Math rather than Education, I am still learning about the different influences, issues, and ideologies that shape our educational system. One specific strategy that I found has not worked is lecture-based learning. The best way to retain information is interactively (Boston, Dillon, Smith, & Miller, 2017). If a compelling lesson plan with diverse approaches to the material is presented, then goals in learning are much more easily achieved. I have also found that scaffolding of information is highly important and prevents students from being blindsided by a massive amount of new information.

I would also say that a good balance of formative and summative assessments is absolutely necessary and having a grading system that pulls from both can be beneficial to all

students if done correctly (Boston, Dillon, Smith, & Miller, 2017). I have seen students struggle through formative assessments until the material finally clicks and they pass the summative assessments with flying colors. Conversely, I have seen students that struggle with test taking have their grade salvaged by completing all of the additional work available.

The prominent philosophies of education are still very new to me. Maslow's Hierarchy of Needs makes sense to some degree in that basic needs are required before self-actualization, or effective learning, can occur. On the other hand, I feel some students may use a learning environment as a distraction from the lack of their basic needs and be able to use education as a focal point. It is important for a teacher to be aware of the students that are high-risk or high-need and be able to make the necessary accommodations for those students. By being an understanding and receptive teacher, these insights become more available.

I feel like many teachers are more focused on classroom management than creating a learning environment. I would say that a combination of the Cognitive and Constructivist Views of Learning are most appealing if used in a scaffolding sense. For example, material can be first introduced through pre-assessment, then approached from one angle, then another, until a connection can be made to the material for each student. After some practice using the students' preferred approach, they then have some autonomy for problem solving and can get a better sense of the big picture behind the material. That is one thing that is exciting about math is the multitude of approaches and strategies to solve problems. By not forcing students to adopt one, and only one, method for solving a problem, they then have incentive to look for patterns and shortcuts to improve their math skills or at least expedite the math process. This will, in turn, also assist classroom management as students will be more able to engage in the classroom,

preventing disruptions by students that have become lost in the lesson or frustrated with their confusion of the material.

I really enjoy the aspects of problem-based learning and student-centered learning as ways to grant student autonomy while developing problem solving skills that can be used inside and outside of the classroom. Having an interactive approach to the classroom and creating engaging lesson plans to fuel student interest are absolutely essential in combating the "math is boring" tropes and generating genuine excitement within the math classroom. It has been found that having an environment that draws the attention of the students is better suited for students to retain that information and be able to apply it later on.

With the current social climate, teaching with social justice is as important as any facet of teaching. I have people in my life of all different backgrounds and have had the privilege to travel overseas to various locations and see different cultures. Even traveling within the United States, different regions hold different values, and it is important to be aware and inclusive of people and their differences. With that being said, some people perceive their opinions to be the only proper opinions and I feel it is important to keep an open mind and find common ground to build rather than look for differences to divide individuals. Everyone has a unique experience and nobody can ever truly perceive how another individual feels for that reason. It is important for people to not judge someone from their appearance, background, culture, or any other aspect of their life they may have no control over. I want my classroom to be an inclusive environment where students have an opportunity to learn more than just the math curriculum required. For example, we could look at social issues as they relate to math and how there is a disparity between the diversity in classrooms and expulsion rates for students of color or how the overall

diversity in school compares to the representation seen with students of different races in special education for behavioral issues.

Another important topic made more apparent with the boom of technology is being an ethical teacher that abides by the laws that govern our school system. When classes were in person, it seemed like there was a headline every week of a teacher in trouble for one reason or another, whether it was inappropriate conduct with a student or activities less-than-becoming of a role model outside of the classroom or improper use of discipline.

Students having devices that can record and upload instantly has allowed a more intimate view of how some educators are forgetting their purpose: to create an effective learning environment. Social media has also allowed students and parents a better insight to the lives of teachers outside of school and, while I feel like teachers should be allowed to have a normal life outside of school, it is important to realize that one of the best ways to show students how to be a good person is to lead by example and be a good role model. By being or creating a distraction that detracts from an effective learning environment, it is a disservice to the role we are given.

It is also important to recognize that new information is constantly becoming available and methods and practices are constantly being adjusted to better fit the frame of knowledge we currently have. With that being said, legislation often has a slower response to these changes, so it should be recognized that when school reform is pushed and new policies are put in place, they may not be ideal to the current teaching environment and as teachers, it is our responsibility to apply the new policies.

Much like any decision being made, I feel like the people making the decisions should be informed decision-makers. This means that there needs to be an open line of communication available with a proper common goal: create the best learning environment possible for the

students to succeed. The issue becomes what each party's view of success looks like. For legislators, that may be test scores. For parents, that may be the percentage of students going to college. For school board members, that may be the percentage of students graduating. The difficult part is for individuals to put their egos aside and remember that the students are who their decisions are affecting most.

As previously stated, I want to create an inclusive learning environment where students can learn effectively. I want students to feel that I am approachable if they do not understand instructions or the material and be able to feel like they are accomplishing something important by being in my math class. In my opinion, the best math classes include aspects from real life and from other classes to better ground the information and give the students a reason for why they are learning a topic. With technology being so prominent in everyday life, I hope to incorporate technology into my classroom to better serve the students and show what resources are available outside the classroom if they are struggling to comprehend the material. I also plan to use instructional materials to decorate my classroom in order to immerse the students in a mathematical environment and also provide a subtle prompt for basic mathematical concepts for the students that may be in need of such tools.

As a teacher, I will be a role model to students and be a valuable resource to them in their education. I will provide and maintain a positive and inclusive environment that will help them build on the knowledge they have and create further opportunities for them to extend their knowledge. In creating this environment, it is my goal to better understand my students and establish a place where their needs can be met. I want all of my students to succeed in the goals that the curriculum has established for them and that they have established for themselves and will do my best to ensure those goals are met but will push to have those goals exceeded as well.

Forecast

In the subsequent chapters, I will be building upon my ever-expanding knowledge through a literature review with a focus on three groups of themes that tie into my interests as a future educator and are applicable to my placement as a student teacher. I will then discuss my specific research questions and the development of my methods for action research. An analysis of the data obtained regarding my research questions will follow including artifacts to support the findings. The research will be concluded with a discussion of the results, implications of the research, and a final statement.

Chapter 2

Literature Review

Purposes and Objectives for the Literature Review

Before applying my concept of creating balance between formative and summative assessments between two different learning management systems, I must first look at what research has previously been made in such regard as well as look into broader issues that may influence my concept. In order to better organize the information found, the research was divided into three themes. Within Theme 1, research pertaining to diversity, differentiation, inclusive education, and culturally responsive pedagogy can be found. Theme 2 focused on strategies, scaffolding, effective instruction, high leverage practices, and evidence-based practices. Finally, Theme 3 narrowed down to subject-specific research and disciplinary issues related to my goals for balancing formative and summative assessments. While Theme 2 and Theme 3 will focus more on my ideas, Theme 1 is very relevant to my current placement as many of the students I work with are ethnically diverse or are working with IEPs that must be accounted for within the math program.

Procedures for the Literature Review

Most of my research has been performed via the EBSCO database through the Hamersly Library at Western Oregon University. Another main source for research was through Google Scholar. Some of the search terms I focused on were “math”, “classroom management”, “high school”, “diversity”, “culturally relevant”, “culturally responsive”, “scaffold”, “differentiation”, and “evidence-based practices”. Many other terms were used through the different search engines. I also refined my search to include only articles written since 2010. Some older articles

that are often referenced by other articles will be mentioned regarding Theme 1 as the issue with diversity has been a long-standing problem within education. Some older concepts, such as Maslow's Hierarchy, will also be discussed as some of them are still relevant to teaching in its current form.

Personal Connection to Research Choices

As mentioned previously, many of the students at my placement are ethnically diverse and high-risk students in an alternative high school. For this reason, my focus for the pieces of research I chose is made with their potential needs in mind and how they can best be benefitted. As a future educator, I have come to understand that my needs come far after the needs of my students and in order to properly achieve this self-sacrifice, I need to keep an open mind. I feel like the articles I selected best encompass the properties needed to help me become a better educator that can actively assist my students.

Review of Literature

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

Terminology and instructions in math can be difficult for many students, but this issue becomes compounded in a diverse environment with students that are learning English. Ji-Yeong I (2019) wrote an article regarding a study which discusses how the lesson plan and assessments were modified to assist students that were learning English. By creating tasks that reduced the cognitive demands of the mathematical language and focusing on strategies for solving problems, there was less conflict created through the miscommunication of ideas. Limitations included sample-size and the need for one-on-one instruction due to the small sample-size. I felt

like this article was relevant as while many of the students in my placement are efficient in English, some of them at one point were emerging bilinguals and they may have struggled previously in math classes for this reason, so it is important to take note that they may have some mathematical deficits that are pending resolution.

While the location of my placement is not nearly the size of Chicago, the student population is fairly diverse with a substantial population of Latin, Black, and Native American students exceeding the population of White students. For this reason, I decided to review an article written by Gutstein (2016). The class goal was very student-centered and allowed autonomy for them to "learn and use college-preparatory, conceptually based mathematics to study and understand social reality to prepare themselves to change it" (p.454). This sort of approach to teaching math gives students a sense of empowerment and can genuinely fuel their curiosity for the topic. It is my desire to be able to connect to my students in such a way that they can find a passion for learning math. I was lucky enough to have teachers approach math in a variety of exciting ways and I hope to use many of those same methods.

Anthony, Hunter, and Hunter (2019) discuss the need for differentiation, but some of the difficulties in applying this practice. The authors describe differentiation as "slippery in terms of goals, teacher understanding, and practice within mathematics classrooms" (Anthony, Hunter, and Hunter, 2019, p. 117) when viewed at both the school-level and classroom-level. The authors go on to point out that when differentiation is applied, it is often deficit-based rather than focusing on students' strengths and how best to adjust lesson plans to allow students to use their strengths. The dynamics of a classroom are ever-changing, so being culturally responsive and aware of the classroom's makeup is highly important for teachers. With the added issue of balancing instruction to meet the needs of students that are exceeding in the classroom as well as

struggling in the classroom, it is understandable that the application of differentiation within the classroom can be difficult.

An article written by Bikić, Maričić, and Pikula (2016) focuses on how differentiation was applied in one study. The authors used a pretest to group students into categories of below-average, average, and above-average understanding of the material and had those students solve differentiated problems that were ascribed to their corresponding level. The study found that students in the above-average group were unaffected by the approach, but the other two groups benefited from having the problem tailored to their level of understanding (p. 2792). I liked that this article showed an example of how a problem was differentiated for each group in detail and allowed the readers to have a better insight to their approach in the implementation of differentiation. Several similar articles were not reviewed due to their focus on what they were doing rather than how they were doing it and in the early stages of my teaching career, clear examples are invaluable.

The last article I reviewed for Theme 1 was by Heinrich, Collins, Knight, and Spriggs (2016). I have often agreed that inclusion is beneficial to both students with moderate disabilities and their peers without disabilities. This article highlighted how the Common Core State Standards were a detriment to students with disabilities in the sense of academic success, but constructive in re-establishing inclusive classrooms for many students that were not allowed that option previously (p. 42). Sometimes the key to understanding differences between individuals is immersion in their environment. Seeing someone with disabilities adapt and overcome a difficulty that seems insurmountable is inspiring and these victories can be witnessed daily. Not only do their peers learn to understand the hardships of their disability, but they learn to support others when help is needed.

The articles used for this theme focused on accessibility of instruction, autonomy within the classroom, differentiation of instruction, and inclusion for marginalized students within the classroom. Each of these ideas with Culturally Responsive Pedagogy (Gay, 2002) play into the overall theme of Universal Design for Learning which will be applied to my own teaching. It was very beneficial to see how these ideas were applied in classroom environments and have the depictions of the results to preclude my own studies for the future.

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

The first article I reviewed for Theme 2 could very well have been found in Theme 1. The article by Bell and Pape (2012) focused on two teachers in urban Algebra 1 classrooms and how they effectively used their awareness of their students' background and experiences to engage students in problem-solving and discourse related to explaining, defending, and justifying their methods. Rather than focus on instruction, the teachers acted as mediators which has been a method I have recently discovered in the form of "Number Talks." These practices have several ways to achieve an answer and allow students to share, discuss, and defend their methods. From my experience so far, they are a great way for students to lead the discussion and learn to become mathematically literate.

The article by Kim, Belland, and Walker (2018) was chosen for review due to its correlation with my placement's current use of Canvas as a Learning Management System for problem-based learning. The downside of this article was the small sample size, but this was countered with Bayesian meta-analysis which helps prevent "publication bias" and "low statistical power" (p. 398). This quantitative approach is similar to my original idea of comparing

the effectiveness of two learning management systems in addressing formative and summative assessments separately before I adjusted to a qualitative approach. The study found that computer-based scaffolding was problematic due to the nature of problem-based learning and an infinite number of steps that can be made in the problem-solving process (p. 421). With the inability of computer-based scaffolding to provide effective feedback, it was not necessarily as practical as teacher-based scaffolding. This information was understandable as my cooperating teacher uses Canvas for the initial instruction, but feedback comes directly from her.

Boaler's *Ability and mathematics: The mindset revolution that is reshaping education* (2013) is a very useful article to most teachers as it spoke of brain plasticity and students' ability to achieve beyond expectations. One part that spoke to me was "when students think about why something is wrong, new synaptic connections are sparked that cause the brain to grow" (p. 149). Thinking of mistakes as an opportunity to learn is important for students and teachers alike to recognize. While some people may be deterred by mistakes, the idea can be re-routed as a learning tool and used as motivation to achieve the correct answer. This may have been why I pursued a degree in mathematics as I saw the potential for advanced mathematics to be challenging, thus something to keep my interest and help me learn. If students can be taught to learn from their mistakes rather than dwell on them, math in particular may become more enjoyable and students may learn to embrace the challenge.

I found the next article to be an interesting contrast to the previous article by Boaler I reviewed. The idea behind Watts, Duncan, Siegler, and Davis-Kean (2014) is that preschool math skills for children 54 months old to first grade is a great predictor for future mathematical achievement. The study took into account the early skills the children had developed and the characteristics of the child and their family. While this study's results make sense, I feel like the

negation to this is not true: students with deficits in mathematical abilities before school are not bound to struggle to find mathematical achievement in the future. With the right teachers providing engaging instruction to promote motivation, students can gain traction in mathematical understanding which will lead to further success as their education continues.

The final article I chose for Theme 2 focused on scaffolding and dialogic teaching as described by various articles. The article written by Bakker, Smit, and Wegerif (2015) went into great depth of what scaffolding and dialogic teaching entail, including their history, their uses, and their benefits. I like that they used the strengths of dialogic teaching to complement the popular concept of scaffolding. I particularly liked the following passage (p. 1061):

> Like a story or a teaching unit, scaffolding has a beginning, a development and an end. Diagnosis comes first: what do students actually know? Where are the problems? Then, in a scaffolding approach, teaching is responsive to whatever is diagnosed on the fly or in student work. At the end of a unit, students have ideally achieved particular learning goals. Storytelling has always been a go-to resource of mine and to look at scaffolding as an extension of that by using dialogic teaching was eye-opening to me.

The articles in this theme focus on an ideology that I believe is highly beneficial for classroom management: using the design of the material and the accessibility of the material to alleviate classroom management rather than focus on students acting appropriately. By being aware of the student's backgrounds and creating lessons that are accessible to the students and focus on projects or problems rather than rote learning, students will be more apt to learn from their mistakes and show more interest in the material. My hope was to employ these methods in

my own classroom in order to avoid the “daycare” teacher persona that is sometimes associated with older practices.

Theme 3: Math-Specific, Disciplinary Issues Related to My Goals for Balancing Learning Management Systems and Lecture

One article I found relevant for Theme 3 was by Kiwanuka, Van Damme, Van Den Noortgate, Anumendem, Vanlaar, Reynolds, and Namusisi (2017) which discussed results from a study regarding math self-confidence, perceived usefulness, and enjoyment of mathematics as it related to attitude towards math. I felt that this article was particularly relevant as it is well documented that math is a polarizing subject for many students and in order to teach math effectively, teachers must overcome some preconceived notions of math and prior negative opinions of math from the students. One finding of the study was that “the negative effect of classroom assessment on the three attitudinal indicators indicates that the more the teachers offer feedback on assessments, the less the students have confidence, interest, and enjoyment in mathematics” (p. 13) which is in line with previous studies but was not apparent to me. I found it fascinating that this sort of coaching students through feedback on assignments could have an overall negative impact. This is something I will take into account with my grading practices.

Kranendonk (2010) discussed how high school mathematics standards and reforms and how high school teachers should employ a variety of strategies to create a more enhanced learning environment for high school students. This article caught my eye because it specifically talks about creating math problems for high school students that are relevant to what they see in their everyday lives. By tailor-making the material for the students, the students will be more invested in lessons. This directly correlates to my philosophy for teaching math and how I plan

to create lesson plans that not only make sense mathematically but apply to the students and their interests. For example, I will not have a person eating 30 candy bars in one sitting or purchasing fruit for a quarter as those examples do not represent real-life situations.

In finding ways for math lesson plans to be relevant to students, there is a fair amount of overlap between math and science. One article that explores this idea is written by Wong and Dillon (2019). The overall consensus of the article is that while science is oftentimes dependent on math, the reverse is not true. The study found "collaboration across those boundaries was always described by participants as challenging, and there was even disagreement about where the boundary should be drawn with some policy-maker participants suggesting that science includes mathematics" (p. 789). Rather than muddy up the learning atmosphere by introducing a collaboration between a math and science teacher, separate lesson plans where science teachers can use math to solve their problems and math teachers can use science as relevant background information may be more beneficial to the students.

In continuing the thread of mathematics being relevant to students, Marco-Bujosa (2021) performed a study where student teachers applied an approach in secondary math classes that incorporated and reinforced STEM careers. This approach is tailored towards project-based learning and creates motivation for students to learn math as they see it becoming more relevant and useful to potential career opportunities. By creating an atmosphere where real-world problems are being used, students are better able to understand why they are learning the subject and may become more focused on how math can be applied.

One phrase I have heard often over the years is "I hate word problems." While the idea of a word problem is to develop the idea that math can be applied to many real world problems, it is easy to see that word problems are not nearly as straightforward as problems that state

"solve for x." Bahr (2017) conducted a study regarding the issue of reading comprehension when solving a math problem and found that with difficult math problems there was little correlation between reading comprehension and solving the problem, but with easier math problems, word count and variety of vocabulary could play a role in misleading students within the problem. This issue can be exacerbated by the growing population of emergent bilinguals and second language learners in the United States and is something to keep in mind as a future teacher.

With the current educational atmosphere being that of distance learning, there are a variety of learning management systems available to teachers, schools, and school districts. An article by Mlotshwa, Tunjera, and Chigona (2020) explores one such learning management system and its impact within a high school classroom. Their study was performed using a hybridized format with in-person instruction and a learning management system both being employed. Overall, they found the use of the learning management system to be extremely useful in helping the Grade 10 students understand functions. While our current format does not allow for hybridized learning, the in-person instruction can somewhat mirror our synchronous instruction. I feel like this study was definitely useful in showing that students with additional resources in the form of a learning management system are beneficial.

Another study that implemented a learning management system in the form of a mobile application was detailed in Etcuban and Pantinople (2018). In this study, a class was randomly divided into students that received lecture-based instruction as a control group and students that received intermittent lecture-based instruction with use of a mobile application. The study found that the students that had instruction from the mobile application as well as the lecture-based instruction performed better as a group compared to the control group. There are several similar

studies that have been performed and the consensus is that lecture-based instruction on its own does not perform as well as lecture-based instruction with an additional resource or an additional form of teaching, such as flipped classrooms, group applications, and many other methods.

The last theme was highly specific to my study as the learning management system used by the school had been well-established without direct instruction, so it was critical for me to properly balance between my instruction and the students' obligation to complete a percentage of the math topics. It was important for me to understand that other studies had been successful in including direct instruction with a learning management system and the instruction helped prepare the students for the upcoming assessments rather than negatively impacted their abilities. It was also important to understand the concepts behind the math and best implement those practices to better showcase the lessons, making them memorable and more accessible for recollection when working within the learning management system.

Summary

From the articles within the literature review, it is clear that my focus is on the subject of math and how it can be differentiated and scaffolded to best fit the students that are in the classroom. I consider math to be a universal language that can be engaging if presented properly. Communication between the teacher and the students is key and losing that flow of discourse typically results in frustration and dysfunction between both parties. What I have learned so far within the program has been compounded by the literature I have read and expanded upon tremendously. While there are some articles that may appear to have conflicting results or perspectives, I feel that can be summed up to the great amount of diversity that can be found within a population and between different populations. It shows that there is always

additional knowledge that can be found and that continued research, experiments, and studies are necessary to document the ever-changing dynamic of classrooms.

This literature from each of the three themes ties in directly with the action research to follow and my research questions: “How have I increased my knowledge and use of the principles of Universal Design in my lesson planning?”, How can I improve my knowledge and skills for classroom management in mathematics?”, and “How have I increased in my readiness to incorporate the ALEKS learning management system in my lesson design?” By using the literature review as a stepping-stone to access other’s experiences as they relate to these questions, I am able to use that background knowledge to further my experience.

Chapter 3

Methods

Research Methods

The present study follows a qualitative methodology with an action research design focused on exploring the principles and practices that I have learned and interpreting my improvement in three specific areas. Those three areas for improvement are specified by my research questions as they align with teaching standards. The artifacts used for interpretation will include staff interviews, observation feedback, lesson plans, observational notes, and journal reflections as a means of gathering data to show improvement. I will also detail my specific methods for collecting data through these artifacts and the decisions I have made to attempt to eliminate bias and be as objective as possible during a self-study. Included will be a background of my placement and the different dynamics experienced through the current educational atmosphere including the diversity within my classroom, the school's model for math instruction, and the effects of distance learning during a pandemic. To sum up this chapter, I will reflect on how my methods will be analyzed and discussed by credibility as a researcher in a qualitative self-study.

The root word for practicum is practice and the idea of practice is focused improvement. A basketball player may shoot free throws daily to improve their field goal percentage from the free throw line. A piano player may spend several hours a week developing finger dexterity and familiarization with the keys to improve their abilities in playing music. For me as a student teacher, practicum is a time to both see proper teaching methods as modeled by my cooperating teacher and applying the teaching methods I have seen modeled and learned through the education program within the classroom. As I became more familiar with the different methods,

practices, and standards, I identified three areas that were critical to becoming an effective teacher within my placement. These areas for improvement were to have lesson plans that aligned with culturally responsive teaching, create engaging lesson plans that influenced student engagement, and by creating a balance between the existing learning management system utilized by the school and my lesson plans. Specifically, those research questions are:

1. *How have I increased my knowledge and use of the principles of Universal Design in my lesson planning?* By adopting a culturally responsive teaching lens through which I write, I hope to create insightful lesson plans that further develop an inclusive environment that allows students of different backgrounds better access to the content. Using diversity, differentiation, and culturally responsive teaching, the idea is that the material will be more relevant to marginalized students and allow them better access to the mathematical topics being presented. With focus on this question, data will be gathered to reflect how the changes to the lesson plans were made in striving to create accessible material.

2. How can I improve my knowledge and skills for classroom management in mathematics? With the current use of online and hybrid class models, keeping students engaged is especially critical. There are a plethora of distractions in students' homes and the temptation for students to do something other than participate in class is ever present. Classroom management includes various perspectives, both social and behavioral, that may help me analyze my teaching for strategies to boost classroom engagement in online and face to face formats. Lesson planning with this in mind creates a better opportunity to overcome these distractions and temptations, especially when it comes to Mathematics, a class many students deem as boring.

3. How have I increased in my readiness to incorporate the ALEKS learning management system in my lesson design? The school has adopted a curriculum that uses the ALEKS learning management system which gauges individual student's readiness in learning and performing different mathematical topics. This learning management system was in place before the COVID-19 pandemic, so many students that have been at the school previously are familiar with navigating the learning management system. Because of the school's overall model of being self-paced, students in the same math classes are at varying degrees of knowledge and a lesson plan that may be highly relevant to one student in terms of readiness, it may be beyond another student's readiness or may have already been learned by other students. Thus, balancing between the learning management system and the lesson plan becomes important by allowing checkpoints within the lesson plan for those that are beyond the tasks to opt out and continue using the learning management system and other students to receive further assistance to prepare them for the future topics in the learning management system.

InTASC Standards

The Interstate Teacher Assessment and Support Consortium (InTASC) standards (www.ccsso.org, 2011) are designed to support K-12 teachers in the overarching goal of achieving student success and readiness for life after school. By creating this common goal for teachers of all levels, focus among teachers is generally aligned and the framework provided to nurture success. In this way, the Council of Chief State School Officers (CCSSO) have aimed to specifically support new teachers by providing the guidelines necessary to meet the goals of student success and readiness through ten principles.

The ten principles to support teachers as defined by the InTASC standards on their official website are:

1. *Learner Development*: The teacher understands the central concepts, tools, of inquiry, and the structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.
2. *Learning Differences*: The teacher understands how children learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development.
3. *Learning Environments*: The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
4. *Content Knowledge*: The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.
5. *Application of Content*: The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.
6. *Assessment*: The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
7. *Planning for Instruction*: The teacher plans instruction based upon knowledge of subject matter, the community, and curriculum goals.

8. *Instructional Strategies*: The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.

9. *Professional Learning and Ethical Practice*: The teacher is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

10. *Leadership and Collaboration*: The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.

In aligning these principles with my research questions, "Learning Differences" is most closely aligned with my first research question as a big part of the Universal Design for Learning is recognizing and addressing student differences in terms of equity. The "Application of Content" principle is addressed with my second research question as it pertains to classroom management. My third research question ties in with the "Planning for Instruction" principle as I will be incorporating the ALEKS learning management system into my lesson design. Other principles are also addressed by my research questions, but these three are the most closely associated of the principles within the InTASC standards.

Methodology and Research Design

Between the two types of research, qualitative and quantitative, I have much more experience in quantitative research. While I often prefer quantitative research due to its highly mathematical nature, it requires a higher degree of separation between the person conducting the

study and the participants of the study. As a student teacher focusing on improving different aspects of my teaching, this was not feasible. Thus, a qualitative approach was used. Since I was less familiar with qualitative methodology, I used the definition by Creswell (2013) to guide me:

> Qualitative research begins with assumptions and the use of interpretive/theoretical frameworks that inform the study of research problems addressing the meaning individuals or groups ascribe to a social or human problem. To study this problem, qualitative researchers use a qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is both inductive and deductive and establishes patterns or themes. The final written report or presentation includes the voices of participants, the reflexivity of the researcher, a complex description and interpretation of the problem, and its contribution to the literature or a call for change (p. 44).

By using this methodology, I am making allowances for my immersion within the educational environment that could not be afforded through quantitative research. Therefore, qualitative research was the only true option for this study.

Action research is an immersive process unlike many other types of research. Quantitative research most often requires a hands-off approach to avoid contamination or corruption of the resulting data. In those types of research, the researcher becomes an observer of outcomes with steps taken to not influence the process. My qualitative research has a much different approach. While I attempt to remove bias from my data collection, my goal is to actually influence change within my own teaching practices to improve student engagement and

to use what I learn through my data collection to improve my culturally responsive teaching and my balancing of lesson plans and the learning management system. The action research process then becomes a three-stage process of planning, taking action, and getting results with feedback loops between each of the steps. Stringer (2013) described this as the "Look-Think-Act" approach and it will be an ongoing process throughout my taught lessons.

Methods for Data Collection

In the development of my research questions, it was important to determine how those questions may be answered. I first focused on the specific questions I was asking:

1. How have I increased my knowledge and use of the principles of Universal Design in my lesson planning?
2. How can I improve my knowledge and skills for classroom management in mathematics?
3. How have I increased in my readiness to incorporate the ALEKS learning management system in my lesson design?

With these questions in mind, several data sources for answering these questions came to mind:

- Observational Notes
- Journal Entries
- Lesson Plans
- Observation Feedback
- Staff Interviews

Table 3.1 (below) will summarize the details of my data collection plan.

Table 3.1

Data Collection Procedures

Research Question	**Data Sources**	**Procedures**	**Purpose**	**Timeline**
1. How have I increased my knowledge and use of the principles of Universal Design in my lesson planning?	Lesson Plans: methods and word choice are analyzed for student access, flexibility, and focus on the goal.	My lesson plans are stored on Google Drive and will be accessed for review through that format.	I am looking for planned moments in my lesson plans where I have utilized the Universal Design of Learning.	My unit was taught from February 22, 2021 through March 16, 2021 and will be reviewed March 22, 2021 through April 9, 2021.
	Observation Feedback: comments from my University Supervisor regarding lesson plan use.	My University Supervisor will submit their written comments via TK20 after each observation.	Having seen the lesson plans before the lesson is taught, the University Supervisor has insight to how well I adhered to the lesson plan and opportunities missed.	
	Observation feedback: comments from my Cooperating Teacher regarding lesson plan use.	My Cooperating Teacher will have a short meeting with me after each taught lesson to discuss my use of the lesson plan. Additional written comments will be submitted via TK20 after each official observation.	Having seen the lesson plans before the lesson is taught and being familiar with the students in the class, the Cooperating Teacher has insight to how well I adhered to the lesson plan and opportunities missed.	

2. How can I improve my knowledge and skills for classroom management in mathematics?	Observation Feedback: comments from my Cooperating Teacher regarding lesson plan use.	My Cooperating Teacher will have a short meeting with me after each taught lesson to discuss my use of the lesson plan. Additional written comments will be submitted via TK20 after each official observation.	Having an experienced teacher observe my taught lessons, they can provide essential feedback for classroom management in mathematics.	My unit was taught from February 22, 2021 through March 16, 2021 and will be reviewed March 22, 2021 through April 9, 2021.
	Observational Notes: daily observations written after each taught class.	I will record my observational notes in a notebook for analysis after I have finished compiling all of my notes.	I have my own insight into the reasons for the decisions made and can gauge the negative or positive representation of those decisions.	
	Staff Interviews: discussions with Distance Learning Coaches after each taught lesson.	I will make notes during these staff interviews in a notebook for analysis after I have finished compiling all of my notes.	The Distance Learning Coaches work closely with the students inside and outside the classroom for the duration of the school year and have unique knowledge of student reception.	

3. How have I increased in my readiness to incorporate the ALEKS learning management system in my lesson design?	Journal Entries: weekly notes that give an overview of the weeks lessons and adjustments made.	The journal entries will be written in a notebook after each week's lessons have been completed.	By having a weekly overview of how adjustments made over multiple lessons, I can see how my decisions carry over from lesson plans and create time for the ALEKS learning management system.	My unit was taught from February 22, 2021 through March 16, 2021 and will be reviewed March 22, 2021 through April 9, 2021.
	Observational Notes: daily observations written after each taught class.	I will record my observational notes in a notebook for analysis after I have finished compiling all of my notes.	These notes will examine how my readiness allowed for the incorporation of the ALEKS learning management system.	
	Lesson Plans: analyzed for the incorporation of the ALEKS learning management system.	My lesson plans are stored on Google Drive and will be accessed for review through that format.	The lesson plans will be useful artifacts to show readiness for each lesson and show how the students are given an opportunity to progress in the ALEKS learning management system.	

Data Sources

The data collection will come from a variety of sources that will include staff interviews, observation feedback, lesson plans, observational notes, and journal reflections. It is important to note that steps have been taken to provide anonymity for students and staff. The types of data

collection are also created so that they can have comparisons drawn between them in order to provide definitive results that are relevant to the research questions. The collection of data will occur throughout the action research process including the planning, taking action, and results sections to provide a constant feedback loop. The focus of this data collection will be regarding culturally responsive teaching, engagement by the students, and balance between the lesson plan and the learning management system. Descriptions of each data collection type are detailed in the following sections.

Staff Interviews. In math classes, two Distance Learning Coaches (DLCs) were present to assist students in navigational or instructional needs. These staff members have a unique insight into the students' lives as they were involved with communication with the students and the students' parents or guardians outside of the classroom. Informal interviews with these staff members were conducted after synchronous instruction or in-person instruction and notes from these interviews are used in my data collection.

Observation Feedback. Similar to the staff interviews, the observation feedback is an outside source of information that gives great insight to how others perceive my effectiveness. The two sources of observation feedback come from observations by my supervisor and observations by my cooperating teacher. This feedback is essential because it falls directly in line with teaching standards and coordinating teaching practices with the existing framework. Written copies of the supervisor feedback will be used to show progress over time.

Lesson Plans. The lesson plans I have written throughout my practicum will indicate how well I have progressed in including culturally responsive teaching in making my lesson

plans accessible, creating engaging material for the students, and the balance I have created between the lesson plan and the learning management system. By showing adjustments from lesson plan to lesson plan, I will be able to verify the implementation of the feedback received. This may be one of the most important articles of data collection as it shows how each part of the action research has connected to create a result.

Observational Notes. This portion of data collection will mostly be present in the planning portion of the action research as I become more familiar with the students I will be working with and their needs, interests, and backgrounds. These notes will pertain heavily to my first and second research questions with some application to my third research question. The notes will range from simple observations of student activity to questions to investigate at a later date and possible strategies to use with individual students. My note taking will infer how well I know and understand my students and how I can better create lesson plans to be accessible and engaging to them. This will be a daily task before implementation of the prepared lesson plans.

Journal Entries. This form of data collection will take place every Wednesday throughout the action research process. The idea of the journal entry is to get an overview of each week and to show progress from week to week that may not be as apparent in the daily observational notes. Rather than shorthand observations, journal entries will be created with greater care and interpretation of the events of the week. Some inclusions of the journal entries will be strategies that were effective or ineffective, student progress, student participation, and general feeling of the week. This data is important as it provides more reflection on the week and more depth of detail than the observational notes.

Context of the Study

I teach at an alternative high school that serves a larger school district comprised of two high schools. The population of students roughly sits at 120 students at any given moment that are divided among four "Houses". The racial diversity of the students consists of 35% "Latinx or Hispanic", 8% "Black or African American", 5% "Native American or Native Alaskan", 1% "Asian", 8% "Multiracial", and 44% "White". Of the known gender expressions, 8% of the students identify differently than the gender they were given at birth, 40% identify as female, and 52% identify as male. There are currently three full-time teachers, two part-time teachers, eight non-certified staff, and one counselor.

Each of the full-time teachers and the pairing of the two part-time teachers are assigned a House that rotates each quarter for Academy Classes. Classes such as English and Math are year-long classes that are self-paced for students to finish as quickly as they desire. Some students are able to finish math classes in a matter of weeks while other students may stay in the same math class for several years with little progress. Additional staff include Distance Learning Coaches (DLCs) and the school counselor. The school counselor regularly meets with students to develop their educational plans (transfer to public school, graduation, GED, etc) and determine their progress toward their educational plans. DLCs were previously titled Educational Assistants (EAs) and each student is assigned a DLC that will rotate with them to each Academy Class throughout the year and the students from two DLC groups comprise each House.

The DLCs are essential to the school's current education format as they have the contact information for both the students and the students' parents or guardians. Many of these students are high risk or high need students and often need additional assistance in achieving their goals.

This issue has been compounded by the COVID-19 pandemic which forced distance learning for the majority of this school year. The first quarter of the school year, distance learning was the only option for all students and only the Academy Classes occurred synchronously on Zoom for 90 minutes Mondays, Tuesdays, Thursdays, and Fridays. During the second quarter, the synchronous Academy classes were reduced to 60 minutes each and Limited In-Person (LIP) learning was established to allow a small portion of the student body to return for short amounts of time no more than two days a week. During this time, English and Math classes were also established individually with Algebra 1A and Algebra 1B being taught for one hour on Thursdays and Fridays, Geometry being taught for one hour on Mondays and Tuesdays, and Advanced Math and Algebra 2 being taught for one hour on Mondays and Tuesdays. The math classes have the same two DLCs for all math classes and do not rotate as they do with the Academy Classes. For the final quarter of the school year, a hybrid model was established so all students that opted to LIP could return to school for three hours Mondays, Tuesdays, Thursdays, and Fridays as a study hall model with Academy Classes being taught those afternoons synchronously online for 90 minutes. With the variety of changes over the school year, DLCs have been tasked with ensuring students have the technology and internet access available and communicating with the students about any scheduling issues or personal issues the students may have.

At the time of the submission, I had been working with my cooperating teacher for seven months since the beginning of September 2020. For the first quarter, my cooperating teacher would refer to me for some input with my direct instruction only being applied in Zoom breakout rooms during Academy Classes. When the second quarter introduced the individual math classes, my role became more prominent as my cooperating teacher engaged in managing activities while

I led instructional activities with the students with assistance from the DLCs and my cooperating teacher. During the third quarter, I assumed all managing and instructional activities within synchronous math classes with minimal support from my cooperating teacher and the DLCs.

Participants

Due to the nature of this action research and its focus on the improvement of three aspects of my teaching, I am the main participant. Decisions regarding the research questions, methods and procedures for data collection and analysis, and the choices made to adapt my teaching practices to reflect the feedback I received ultimately falls upon my shoulders and have sculpted the results. While I was the driving force for many aspects of the study, the influence of the students and staff members as participants were also essential to the study.

Currently there are 96 students enrolled in Math classes: 9 students in Algebra 1A, 16 students in Algebra 1B, 23 students in Geometry, 33 students in Advanced Math, and 15 students in Algebra 2. The focus of this study is on the 23 students within the Geometry class. Of those students, 8 students are “Latinx or Hispanic”, 2 students are “Black or African American”, 2 students are “Multiracial”, and 11 students are “White”. Of the known gender identities, 2 students identify with pronouns different to those given at birth, 15 students are male, and 6 students are female. The class includes 5 sophomores, 12 juniors, and 6 seniors. This group became the focus because it was the only math class that had its own individual meeting time and the class that was being used for my edTPA. Of the 23 students, 7 students did not participate in any of the synchronous meeting and did not access ALEKS during the action research. Of the remaining students, 8 attended class regularly while the other 8 attended with varying degrees of frequency. The students were a huge influence to the structure of the research

questions and the ensuing adaptations made to my lesson plans and teaching practices. My overall goal was creating an environment where students could learn and succeed in their journey to either continue their math studies or earn credit towards graduation.

The staff at my placement, more specifically my cooperating teacher and the two DLCs, also become participants within this study as they observe the daily interactions of the students that experience my teaching, provide feedback, and offer insight to individual students' motivations, interests, and background. I have also modeled many of my interactions with my students after my cooperating teacher. My cooperating teacher has been with this school for over a decade and has been teaching nearly four decades and is a wealth of knowledge. Many of the students that are upperclassmen have had my cooperating teacher for math or other subjects, so the teacher has direct knowledge of each student's progress and overall study habits. This teacher has also worked within other programs that have more extreme cases of high-need and high-risk students that may experience addiction problems or may be enrolled in special education, so their knowledge for differentiation, scaffolding, and project-based learning is quite developed.

Other participants of my study, either directly or indirectly, are some of the Western Oregon University staff. One direct participant is my supervisor who has made observations and provided feedback on my instruction. They also reviewed my lesson plans and offered suggestions prior to teaching those lesson plans, so while the lesson plans are my own, they have been reviewed and edited as needed. Indirect participants were my Content Pedagogy and Seminar professors. My Content Pedagogy professor was crucial in the development of my lesson planning style and many of the activities and applications used within my lesson plans were introduced to me during their class. My Seminar professor developed my understanding of

action research and assisted in creating ideas for research questions that were both relevant to my teaching and obtainable in terms of determining my progress through a qualitative study.

Analysis

Developing the structure for my data collection led to the structure for analyzing this data on a regular basis. By garnering feedback from the DLCs on a daily basis, I was able to apply that knowledge directly to the next taught class. Reviewing my observations daily also contributed to adjustments made in subsequent classes. The observations from my cooperating teacher and my university supervisor were staggered in a way that the feedback received would determine how well I applied their notes to my teaching over time. With my journal reflections made on a weekly basis, I was able to show how my observations and the feedback received from the DLCs was utilized over time. Changes to each lesson plan show how I have improved my teaching utilizing the information received from each particular source of feedback.

After some data collection and planning, I will be utilizing more of a trial-and-error method to determine what materials or practices are effective with my students and making adjustments to those practices to improve upon my future lesson plans. My approach will be ever-changing, but with the overall focus to achieve my goals as described by my research questions. Specifically, my lesson plans will change to accommodate the information I have gained through my action research. While achieving my goals is my focus for the action research, it is really a means to an end as I uphold the InTASC standards and create an environment where my students can not only be successful in the moment, but also continue on to future success. Thus, my approach to my lesson plans will never be aimed to hinder student learning and will only be modified in ways to increase their effectiveness. Ideally, after the data

collection, planning, and taking action with the feedback loops, the ending results will show improvement in my methods and progress toward achieving my goals.

Data Analysis Plan

The vast amount of data I will be compiling through my different data sources will take much organization to be able to analyze. The following table (Table 3.2) was adapted from Braun and Clarke (2006) as the process I will be using for analyzing data.

Table 3.2

Data Analysis Steps

Phase 1 **Familiarize myself with data**	Send interviewees individual transcripts for them to check for accuracy and note additional information they desire to add Read transcripts against audio recording for orthographic accuracy Begin digital diary of thoughts concerning themes and any "surprises" of information
Phase 2 **Generate initial codes**	Organize data into meaningful groups with UDL, classroom management, and incorporating ALEKS LMS in mind Manually code with notes in transcribed text Begin digital code book, collating data within groups Code for all potential themes Note tensions & inconsistencies of codes in digital diary
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
Phase 4 **Review themes**	Revise table of potential themes, considering internal homogeneity and external heterogeneity Read collated data extracts for each theme, checking for coherent pattern For extracts with no coherent pattern, re-examine theme and related coded data for sub-theme or renaming of theme For themes where a coherent pattern exists, examine for individual theme validity in relation to entire data. Examine transcripts for any missed data extracts needing coded for theme Re-read entire transcripts for any new themes that may have been missed Stop when no more substantial and relevant themes emerge Examine how themes fit together in relation to research questions and note thoughts and considerations in digital journal Create thematic map
Phase 5 **Define & name themes**	Adjust digital table of them to organize collated data extracts within each theme for consistency Identify relative narrative for each theme in the digital diary 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 Examine each theme for any sub-themes needing to be identified and explained For each theme, describe scope and content in no more than two sentences, adding potential names to each theme
Phase 6 **Write the thematic report**	Write an analysis within and across themes Assure there is written evidence within each theme with related data extracts

	Choose vivid and relevant extract examples for each point of evidence in answering research questions Create analytic narrative that incorporates evidential answers to each research question

Limitations

Some of the limitations of this study will be due to the nature of action research methodology. While action research is meant to be cyclical with multiple attempts after each cycle of research, the restraints of the program only allow for one such cycle. Ideally, I would complete my research, reflect on the findings, and perform another cycle for an undetermined number of cycles, but my time as a student teacher is short. Another limitation due to my methodology is that it is not an objective or experimental form of research, so my findings should not be generalized. The focus of the study is my teaching methods and practice specifically in the location of my placement. As a result, I will need much more time to attempt to perfect my methods.

Several delimitations can be described for my study including time frame, class schedule, class format, content area, and attendance. The third quarter of the school year was chosen because it allowed for the preparation to begin the study and the ample time to complete and analyze the study. The class schedule had also changed at this time to allow for synchronous instruction of math subjects. Although the synchronous Zoom classes for math were made available, the school was unclear with the students regarding whether or not these classes were mandatory, so attendance was an issue among all of the math classes. This was compounded by the focus of independent study through the ALEKS learning management system. The

Geometry class was chosen because of its better attendance and separation of content as an individual class.

While I have experience in research, that experience was previously limited to quantitative research. Qualitative research, especially action research, is an entirely new experience for me as a researcher and my effectiveness as a qualitative researcher is limited in that regard. It is also important to point out that while attempts to remove bias from data analysis are made, my own reflections of my teaching are inherently skewed to perceive my teaching as ever improving, though I know there may be some fallbacks. In analyzing the notes from my cooperating teacher or my university supervisor, some of the feedback is open to interpretation, so attempts have been made to remove bias from those interpretations. Naturally, I want to succeed in my pursuits to make progress regarding my research questions, but I also do not want to taint the study with inaccuracies. Some other limitations from the study include the aspect of distance learning and the lack of communication from students that either have their microphone off, have their camera off, or do not attend Zoom meetings at all. The schedule for the classes also limits the number of interactions with the students as this class only meets twice a week for an hour at a time. All of these limitations and biases have been recognized by the researcher and the proper steps have been taken to consider these at the time of data analysis.

Credibility

Validity and reliability are important aspects of social research and can be accounted for in a variety of ways (Torrance, 2012). Both validity, the quality of being logically sound, and reliability, the degree to which accuracy can be considered dependable, are components of credibility, the quality of being trusted or believed in. Eisner (1991) believes that credibility of

qualitative research is grown through a "confluence of evidence" that includes multiple types of data (p. 110). Validity of research is one component of providing credibility and can be done through triangulation of data (Lather, 1991). Carter, Bryant-Lukosius, DiCesno, Blythe, and Neville (2014) explain that one method of triangulation is method triangulation which includes using multiple methods of data collection. This is similar to Eisner's method of structural corroboration (1991). Eisner (1991) also believes that getting input and opinions from others in the same field serves as a means of consensual validation. This helps to further demonstrate credibility.

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 staff interviews, observation feedback, lesson plans, observational notes, and journal reflections. 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

Results and Findings

Typically, when someone reads the results of a research project, there is an expectation of hard data represented by tables of numbers, bar graphs, scatter plots, linear correlations, or a plethora of other graphical depictions. As a mathematician this is where my strengths would

shine through in correlating the numbers found to cohesively represent the findings of the study. With the qualitative study through action research, the data I am using is not numerical, so rather than focus on independent and dependent variables, I am looking at the frequency of words or ideas. Using this data, I will have evidence of progress towards my research questions: how have I increased my knowledge and use of the principles of Universal Design in my lesson planning, how can I improve my knowledge and skills for classroom management in mathematics, and how have I increased in my readiness to incorporate the ALEKS learning management system in my lesson design?

The evidence of progress was found by reviewing the collected artifacts and identifying common themes that relate to the research questions. Artifacts being used are my observational notes, my journal entries, my lesson plans, staff interviews, and observations from my University Supervisor and my Cooperating Teacher. After reviewing these artifacts multiple times and coding each document, common themes and sub-themes were identified relating to each research question. Exemplars of each theme or sub-theme are provided with proper context and are dissected with the initial reasoning for the strategy, the resulting effect, and the implications of this evidence.

Data Analysis

Before we can have evidence, we must have data to analyze that we can then interpret into evidence of a theme. The sources of information included Observation Feedback from my University Supervisor and Cooperating Teacher, Staff Interviews from Distance Learning Coaches, my Journal Entries, my Observational Notes, and my Lesson Plans. Details of how each source was examined will follow.

Observation Feedback

During two of my lessons via Zoom, I was joined by my University Supervisor who used an observation form to provide feedback after each lesson. Prompts on the form included Lesson Planning, Classroom Management, Instructional Delivery, Assessment, and Analysis of Teaching. While the form was only one page, my University Supervisor used additional pages to expand on their notes when necessary. My Cooperating Teacher also used this form to provide feedback on two separate lessons. These observations tended to have more insights to specific students as my Cooperating Teacher participated in all of the Zoom meetings of my lessons and had more direct knowledge of student progress through the ALEKS learning management system. Coding was used to analyze these forms for keywords that could be organized into eventual themes.

Staff Interviews

Two Distance Learning Coaches also observed every Zoom lesson that I taught and after each lesson, we had a 10- to 15-minute window where we could discuss the lesson, students, and any other pertinent information. During this time, I made notes of the feedback provided by the Distance Learning Coaches and applied the same coding methods to discover keywords that may lead to themes.

Observational Notes

Throughout my lessons, I would make shorthand notes of moments that stuck out during the lesson, such as an opportunity missed, candid moments from the students, and any

information or feedback received from students regarding their understanding of the concepts. After the lessons, these notes were compiled and coded to see what keywords could be identified.

Journal Entries

Journal entries were composed after the last lesson had been taught and I could reflect on the other materials compiled to identify any changes that should be made for the following week and how they may be implemented. After the last journal entry, these were dissected using the coding method previously described and organized into themes. Being that this information was somewhat an overview of the details described in other formats with more of an analytical approach, much of the data was recycled.

Lesson Plans

The lesson plans may have been one of the best indicators of data as they showed the methods and reasoning for the actions that were to take place in class and were the best example of how the feedback from other sources was understood and implemented for the subsequent lessons. The amount of data presented on the lesson plans also provided a more substantial source for determining the evidence and coding process.

Coding

The process for coding entailed a rigorous scouring of the data to best determine common themes found amongst the sources. With my research questions in mind and the frequency of

some key words, I devised the following codes for analyzing the data sources as seen in Table 4.1 below:

Table 4.1

Coding Guide for Data Sources

Code	Design	Example
Universal Design		"multiple attempts as needed" from Lesson Plan 3.
Classroom Management		"cold call [student name] (was not following)" from University Supervisor's Observation Feedback #1.
ALEKS Program		"ALEKS analytics determines the class 90% ready to learn this topic" from Lesson Plan 1.
Positive Feedback		"you were very patient with [student name]" from Staff Interview #2.
Negative Feedback		"Students that are participating in direct instruction have dipped in the number of ALEKS topics they are completing." From Journal Entry #3.

Themes

For each research question, three overall themes were identified. Within each theme, three sub-themes were identified. Table 4.2 below shows the breakdown of each layer:

Table 4.2

Breakdown of Research Questions, Themes, and Sub-Themes

Research Question	Theme	Sub-Theme
How have I increased my knowledge and use of the principles of Universal Design in my lesson planning?	Differentiation	Accommodations for IEPs/504 Plans
		Challenge for Students Above Level
		Accessibility for Students Below Level
	Scaffolding	Teacher-Led Instruction
		Student-Led Instruction
		Independent Work
		Awareness of Culture

	Culturally Responsive Teaching	Planned Inclusion of Culture
		Unplanned Inclusion of Culture
How can I improve my knowledge and skills for classroom management in mathematics?	Student-Centric Learning	Student Discourse
		Advancing Questions
		Student Responses
	Rapport	Positive Interactions
		Off-Topic Conversations
		Candid Moments
	Responsiveness	Quick Response
		Delayed Response
		Lack of Response
How have I increased in my readiness to incorporate the ALEKS learning management system in my lesson design?	Inclusion of ALEKS	Designated Amount of Time
		Actual Amount of Time
		Transition
	Focus on ALEKS	Logging Out
		Topics Completed
		Breakout Rooms
	Troubleshooting	Logging In
		Navigation
		Student vs. Teacher Version

Differentiation

The first common theme I found that correlated with the Universal Design of Learning was the use of differentiation to assist students based on their needs. The sub-themes found within this theme were "Accommodations for Students with IEPs or 504 Plans", "Challenges for Students Above Level", and "Accessibility for Students Below Level". Evidence of these sub-themes were found in my lesson plans, my University Supervisor's observation feedback, and my Cooperating Teacher's observation feedback.

Accommodations for Students with IEPs or 504 Plans. My placement's practice of extending accommodations from IEPs and 504 Plans to all students, much of this was modeled for me before I had an opportunity to prepare and teach my own lesson plans. When referring to students with accommodations, each lesson plan states that students are "given additional time to complete assignments as well as multiple attempts as needed." Many of the other accommodations, such as preferred seating, quiet spaces to work, and breaks upon request were mostly resolved with the application of Distance Learning. At the beginning of the year, DLCs reached out to parents and guardians to suggest creating a designated learning space for students to participate in Zoom meetings and work asynchronously, but we were aware of circumstances where this was not possible due to limited space within the home or the chaos that can occur from multiple younger siblings. One request that was granted from time to time was creating a Breakout Room for students to work quietly. This was suggested in the Cooperating Teacher's Observational Feedback for the second lesson and was implemented in subsequent lessons. This was also a useful practice for students that were experiencing sensory overload which occurred with one student during the Desmos Activity of Lesson Plan 4. Rather than have the student leave the meeting completely, it was suggested that they work in a Breakout Room. When the student returned, they stated "it helped".

Challenge for Students Above Level. Many of the activities were devised as "high ceiling, low floor" tasks in order to allow opportunities for students to either challenge themselves, develop multiple methods, or think beyond the problem. For example, the "Pick 6" Activity in Lesson Plan 2 has students describing a sequence of transformations to create one triangle from another with triangles listed from A through J. Students that were above level were

challenged to recreate the sequence of transformations in order of the sequence of triangles rather than choose to sequence whatever appeared easiest. Where a student could easily show that a transformation from Triangle A to Triangle D was a translation, the student now had to determine the transformations from Triangle A to Triangle B to Triangle C to Triangle D. This became increasingly complicated as more transformations were needed in the sequence to get to the next triangle.

Accessibility for Students Below Level. In the Observational Feedback from my University Supervisor from my second lesson, I was encouraged to better represent transformations through modeling being that arrows depicting motion did not capture the visualization as might be needed. For the next lesson plan, I introduced a digital geoboard application via MathApps.com to showcase a tool that students could use to better represent the idea of rotation and reflection with lines of symmetry. Lesson Plan 4 also introduced a Desmos activity that allowed students to explore different transformations and better understand what they were least comfortable with. In my materials for the class, I included written definitions as a visual aid when speaking definitions and included vocabulary words on activities so that they were readily available to students that may need them.

Scaffolding

Another common theme I found that applied to the Universal Design of Learning was scaffolding. In each lesson plan, there is a section to denote my pedagogical and theoretical influences that support my choices in the lesson and one practice I cited in each lesson was the idea of scaffolding. The sub-themes described in scaffolding include “Teacher-Led”, “Student-

Led", and "Independent Work". The coding for scaffolding was fairly straightforward in that the template used for lesson planning utilizes the phrasing of "Teaching Application", "Group Application", and "Independent Application" to describe where the focus will be during that designated part of the lesson.

Teacher-Led Instruction. In each of the lesson plans, teacher-led activities occur near the beginning of the lesson, typically after an introduction and some form of review or pre-assessment. These parts of the lesson typically include phrasing such as "displaying slides", "draw example", and "use prompt questions" in order to develop the baseline of understanding for the problem. Observational Feedback from my University Supervisor stated I "discussed clear focus for the lesson" from my last taught lesson. They also discussed in Observational Feedback from my second lesson that modeling should be developed more, stating "I think it would end up taking less time because they will have a better idea of what to do (gradual release)".

Student-Led Instruction. As I developed my ability to implement a "gradual release", my later lesson plans included more details for how to facilitate student discourse and ensure their understanding of the concepts during the Teaching Application portions of lesson plans before beginning their own work. Phrases such as "The teacher will facilitate the discourse with advancing questions such as 'Why?', 'Can you justify your reasoning?', and 'What evidence can you provide?'" found in Lesson Plan 7 become more frequent. Other examples of students leading the learning include this example from Lesson Plan 5 that states "The teacher will use prompt questions to have the students direct the steps needed to draw the transformation." This

was also recognized in Observation Feedback from my Cooperating Teacher in my fifth lesson when a student stated that they believed they had the answer, but they wanted to hear from another student so they could discuss the problem more and my Cooperating Teacher wrote "Great job letting them take initiative."

Independent Work. For this sub-theme, I did some combining of Independent Application and Group Application within my lesson plans due to lack of attendance making Group Application revert to Independent Application in almost every instance. In each lesson plan there are two sections for students to focus on work with either light support or no support from the teacher. These sections occur after the Teaching Application for when the students are working on the main formative assessment for the lesson or when they begin to work on the ALEKS learning management system independently.

Culturally Responsive Teaching

Having had the opportunity to meet and speak to Dr. Geneva Gay, her idea of Culturally Responsive Teaching (2002) was forefront in my mind when developing lesson plans for my students, many of which were people of color or from another marginalized group. Acknowledging the heritage of these students and understanding the different approaches that can be implemented to better reach these students was important in developing appropriate and engaging lesson plans.

Awareness of Culture. One benefit of having the lesson plan template structured to include a section for how diverse learners are addressed is that it highlights the makeup of the

student population and forces the teacher to think about what dynamic may be missed during instruction. I was distinctly aware of my Latinx students, my African American student, my Native American student, and my nonbinary students. It was unfortunate that many of these students did not participate in the direct instruction. The lack of attendance was a combination of direct instruction not being the model for math at my placement, attendance not being a requirement while Distance Learning, and a change in schedule and class times throughout the year that led to conflicts in work schedules, transportation, and other obligations. The students that were able to attend were always recognized for their contributions to the classroom and encouraged in their work.

Planned Inclusion of Culture. While I included Culturally Responsive Teaching as a focus in my theoretical section of my lesson plans, I found that there was little use of any sort of culture within my instruction. Much of this unit's focus was the theoretical side of geometry with limited room to explore application for real world problems. Thus, the sole examples of Culturally Responsive Teaching were impromptu.

Unplanned Inclusion of Culture. Having taken three years of Spanish in high school and having worked with emergent bilinguals in several work environments in my adult life, I have some limited conversational Spanish that I am able to use. If there is a word I do not know, I often ask "como se dice…?" in order to learn the word I would like to use. This has been a great way to engage with students that are emergent bilinguals as I can answer a quick "sí" or "no" to spoken Spanish questions or responses or ask for clarification when needed. One of the students that frequented all of my direct instruction classes and was an emergent bilingual

preferred to only speak Spanish at home or among friends, so I honored their request and only spoke English to them.

Student-Centric Learning

While there is some overlap with this theme and the sub-theme of Student-Led Instruction, I felt like it was important to recognize this theme as a part of classroom management. Observation Feedback, Observational Notes, and Staff Interviews were the main sources for providing evidence.

Student Discourse. In my Observational Notes from my second taught lesson, I found a difficult hurdle with the model of Distance Learning. While in a classroom, students are all able to look at the same whiteboard and easily refer to what they are discussing. Distance Learning requires navigation among several screens at a time in some instances which can make it difficult for students that are trying to point out evidence to support their ideas when others may not be looking at the same information. The other anomaly with Distance Learning is the option of speaking over the microphone or typing responses into the chat. This is compounded by sometimes the person writing in the chat making that message private to the instructor, thus other students miss that conversational piece that may be very important for fueling the discourse.

Advancing Questions. When asked by my University Supervisor after our first observation what one of my goals was for future lessons, I stated that asking advancing questions as depicted by Boston, Dillon, Smith & Miller (2017) was very important to me as it drove more depth in understanding. In the second Observation Feedback supplied by my University

Supervisor, they pointed out a missed opportunity where I could have asked "is it possible? Why not? What's wrong?" This became more substantial in my later lessons as I began to tally in my Observational Notes the number of times I asked "why?" or asked a student to explain.

Student Responses. One of the biggest parts of student-centric learning is getting students to respond to other students as a way to generate the student discourse needed. While this was originally generated by cold-calling students to respond to other students, this became a familiar interaction and students began asking for feedback from their peers. In my sixth lesson, one student responded to the first part of a question and suggested a specific student to answer the second part of the question as they were comfortable with the question and wanted to hear from their peer. In the Staff Interview after this lesson, one of the Distance Learning Coaches mentioned that this was a "big step for them" as they typically dominated conversations.

Rapport

Building rapport is an important part of connecting with students. By building rapport, a teacher can better understand their students' thought processes, engage in meaningful conversation about the concepts of the subject, and illicit more impactful responses from the students regarding their progress. Three sub-themes I identified while coding were "Positive Interactions", "Off-Topic Conversations", and "Candid Moments" by using Observation Feedback, Observational Notes, and Staff Interviews.

Positive Interactions. One thing I wholeheartedly believe is that nothing is benefitted from shaming students for incorrect answers. While correct answers often receive recognition

with a response of “good”, “great job”, or “nicely done”, I prefer to respond to incorrect answers with questions. By asking a student their methods for arriving at an answer, teachers can have better insight to where the confusion may lie. This approach was recognized in the Staff Interviews after my third lesson when one of the Distance Learning Coaches mentioned that I “never directly told someone they were wrong” and instead used questions to help the students identify their error. I also made notes of these instances in my Observational Notes under the student’s name and “address [topic] later”.

Off-Topic Conversations. Part of building rapport is understanding when to engage in off-topic conversations and when to redirect those conversations back to the topic being learned. I jotted down when off-topic conversations occurred in my Observational Notes and found that this overwhelmingly occurred at the beginning of class and at the beginning of independent activity near the end of class. There were few instances of this happening at other points in the lesson plans, but those instances involved students entering the class late and math-related off-topic conversations. In the case of math-related topics, I encouraged the student to bring the topic up at the end of class so we could discuss the “math trick” they discovered more.

Candid Moments. Sometimes the best thing a teacher can hear is “I don’t understand”. While coding my Observational Notes, I compiled candid moments where students stated, “I’m lost”, “I’m stuck”, or “I need help”. One benefit of Distance Learning was the ability for students to have these candid moments discretely via the private chat function on Zoom. These instances were most prevalent in earlier lessons before the students had gained more knowledge of transformations. The candid moments began to take new form with more

instances of “I understand now”, “I’ve got this”, or “I’m good”. This was reflected in the Staff Interview after my sixth taught lesson when one of the DLCs commented “they are really getting a hang of [transformations]”.

Responsiveness

Dead air is very detrimental to radio and can be equally as detrimental to teaching. If a student asks a question and there is no response or a delayed response, the rapport previously built can deteriorate quickly. Rapid responses can in turn instill the students’ confidence in their teacher’s preparation and understanding of the material. Sub-themes I identified in my teaching through Observation Feedback, Observational Notes, and Staff Interviews included “Quick Response”, “Delayed Response”, and “Lack of Response”.

Quick Response. In the Observation Feedback from my Cooperating Teacher after my last lesson, they noted that I “responded to questions quickly and accurately showing understanding of the material”. In my Observational Notes, I had instances where a student’s question was answered with an advancing question. For example, in my fourth lesson, a student asked if a sequence of rotations was the only way to transform one shape to another and I asked “Could you use a sequence of reflections to do the same? How would that look?” Part of this ability to respond quickly was due to anticipating student questions within my lesson plans.

Delayed Response. Despite my efforts, there were instances where responses were delayed. This was seen most specifically in the Zoom chat because of the difficulty of navigating between a shared screen and the chat box without being too disruptive. In the

Observation Feedback from my University Supervisor from my last lesson taught, one student typed in the Zoom chat "I'm lost" and I did not have a chance to see it for several minutes. When I was able to connect with the student over the private chat function, the student said that they had figured it out. This also occurred in my second taught lesson in which a student had submitted a response via Zoom chat and another student answered shortly afterwards using their microphone, so I was addressing the student via chat before engaging in the spoken discussion.

Lack of Response. While rare, there were two instances where a student did not receive a response. In my observational notes, it occurred during my first and my fifth taught lessons. The first instance was when a student had a question in the Zoom chat and before they had received a response, they had sent another chat message saying that the bus had arrived for them to attend Limited In-Person learning. The second instance was a student who had written "I'm stuck" in the Zoom chat and immediately disconnected from the meeting. This was the first direct instruction lesson the student had attended and they had not participated in any of the activities outside of class. In the Staff Interviews after this lesson, the student's Distance Learning Coach stated that this was a common tactic they used in Zoom meetings to disengage from instruction. The student did not return to the subsequent lessons.

Inclusion of ALEKS

The school has been using the ALEKS learning management system for several years as the main source of mathematics, so introducing direct instruction to the limited time students had available for one-on-one help with ALEKS topics was an interesting point of contention. Thus,

it was important for me to incorporate the ALEKS learning management system into my direct instruction time to allow students a chance to ask the specific questions they had difficulty with when working on the learning management system asynchronously. The sub-themes I found in my resources relating to the inclusion of ALEKS were "Designated Amount of Time", "Actual Amount of Time", and "Transition" using my Journal Entries, Observational Notes, and Lesson Plans.

Designated Amount of Time. In my lesson plans, the designated amount of time for students to work in the ALEKS learning management system ranged from 10 to 15 minutes. If a student did not miss any questions on an ALEKS topic, they would only need to answer three problems to complete the topic. An incorrect response would allow for one revision of the answer before deducting one problem from their earned total. Topics the students were comfortable with may take less than 5 minutes to complete whereas more difficult topics could take an hour to complete if multiple problems are solved incorrectly. With four staff members available to answer questions (Cooperating Teacher, 2 Distance Learning Coaches, and myself), it was believed that this amount of time after the instruction would be sufficient, so the lesson plans reflected this commitment of time each day.

Actual Amount of Time. One thing mentioned each week in my Journal Entries was that I did not feel enough time was allowed for the students to work in the ALEKS learning management system. The first week of instruction, I wrote "Each lesson ran much longer than planned and ALEKS was not a focus." The second week of instruction, I wrote "Students that are participating in direct instruction have dipped in the number of ALEKS topics they are

completing." After the third week of instruction, I wrote "I need to devote more time to ALEKS." After the last week of direct instruction, I stated "It will be good for students to have more access to one-on-one ALEKS help". By the last week, adjustments had been made to the direct instruction to allow between 15 and 20 minutes for students to work in the ALEKS learning management system independently.

Transition. The transition from direct instruction to independent work in the ALEKS learning management system was more a diffusion of students from one focus to another than a uniform movement. In creating my lesson plans, I wanted to allow opportunities for students to ask questions about the lesson or to finish activities as needed before moving on to ALEKS topics. Thus, at the end of class, some students could be in very different places: either still working to comprehend the concepts introduced that day, attempting to log into the learning management system, or vigorously completing several topics and working on more. After my last taught lesson, my University Supervisor noted "Most finished earlier than expected. There was time for more modeling and discussion." While I agreed that more time could have been spent modeling and discussing the topic, the students' true obligation for completing the class is through the ALEKS learning management system, so I understand the students hurrying to complete the activity so they could move on to their goals for the day.

Focus on ALEKS

When the transition from direct instruction to independent work in the ALEKS learning management system occurred, there were three sub-themes found when coding that related to the

students' focus on ALEKS: "Logging Out", "Topics Completed", and "Breakout Rooms". I used my Observational Notes and Journal Entries to code for these topics.

Logging Out. One troubling pattern we found when initially transitioning to ALEKS topics was students logging out or becoming non-responsive for the rest of the Zoom meeting. One student in particular made a habit of disappearing at the end of class while staying logged into the Zoom meeting. Through ALEKS, instructors are able to monitor student activity in terms of a student's presence in Zoom, the students' progress on topics attempted and completed, and the time the student has spent logged into ALEKS. We found that the student in question was not logging into the ALEKS learning management system at all and had not logged into the program in several months. Unfortunately, several students exhibited similar behaviors in this class and other math classes before and after my research despite intervention by Distance Learning Coaches, teachers, and administration.

Topics Completed. With the lack of time in the first week, not many ALEKS topics were completed by students within class time due to the instruction taking longer than expected. As adjustments were made using the insight from my Journal Entries, students had more time to complete topics. This may have also been attributed to the students' increased understanding of the topics they were working on. One negative aspect we found was that some students that were participating in class and completing ALEKS topics in class were spending less time working on ALEKS topics outside of the class and were not fulfilling their obligatory number of topics. In the third week, I discovered this trend and made a note in my Journal Entries to "encourage work outside the class to meet daily goals."

Breakout Rooms. Because of the dip in work on ALEKS topics during the time of my direct instruction, Staff Interviews in the third week were more rigorous in planning ways to help students be more productive in their time in class to work independently. One solution that was decided to try out was utilizing Zoom breakout rooms in order to give students more of a quiet space to work and allow them to ask for a staff member to join them if one-on-one instruction was desired. We found this to hold students more accountable to work on ALEKS topics and it gave the staff a narrower focal point to assist the students. During the last day of instruction, I noted in my Observational Notes that there were more students than staff available, so students needed to be more direct in requesting assistance and the students were "overall more productive than previous weeks".

Troubleshooting

The last theme I found regarding the ALEKS learning management system was "Troubleshooting." Like many forms of software and hardware, there is a learning curve before familiarity begins to make navigation and overall use more smoothly performed. Three sub-themes found in my Observational Notes and Journal Entries were "Logging In," "Navigation," and "Student vs. Teacher Version." Many of the examples may have gone hand-in-hand with the lack of production seen in the initial implementation of ALEKS in the lesson plans.

Logging In. There are two main instances where logging into ALEKS caused a disruption in the flow of the program within direct instruction, but each time, these issues were addressed and allowed for future adjustments to lesson plans and classroom management. On

the first day of direct instruction, my lesson plan had students log into ALEKS at the beginning of class so they could quickly transition to their independent work right after they were finished with the day's activity. Unbeknownst to me, the ALEKS program times out due to inactivity within 15 minutes, so the time I had attempted to save was lost as student's had to once again log into the program. In future lesson plans, students were instructed to log into ALEKS after they were done with the activity. The other instance of disruption was in the second week when a student who had not been active in the class for several months stated that his information was not allowing him to log into the program. One staff member spent the remainder of the class attempting to solve this problem. While it was eventually resolved and that student once again had access to the program, it was a distraction to both staff and students that were in the Zoom meeting.

Navigation. There are many positive and negative aspects to ALEKS, but one that is particularly positive is the ability for students to navigate between topics and the autonomy they are given to choose what subject to work on. The topics are color coded with yellow and light orange topics being more introductory topics and a rainbow of sections concluding with dark blue topics that are more advanced. During my second lesson, I made an Observational Note that stated "focus on yellow topics" as a reminder to have students focus on the topics that would give basic understanding before moving onto more difficult topics. Another option for navigation was for a student to "Continue My Path" which allowed ALEKS analytics to gauge which topics the student was prepared to learn. I used these same analytics in determining which unit to teach to this class based on overall readiness to learn the subject. While this method of navigating ALEKS may allow for student to continue multiple topics within the same idea, it can

also quickly scale the difficulty of the problems to the edge of the student's readiness, creating frustration and confusion for the student when they had been doing well and then hit a plateau in their progress.

Student vs. Teacher Version. While navigation for the students tends to be clear cut, for instructors it is entirely different. Seeing what the students are working on and identifying their strengths and weaknesses takes a vast amount of sleuthing and tedious navigation to discover how a student has progressed. On my fourth day of instruction, I made an Observational Note stating "ask [student name] to show ALEKS". I had become comfortable with my version of the program but had not seen much of the student version. By having a student join a breakout room to share their screen and show their methods for selecting problems, the different ways data can be entered into the program for answers, and the overall structure of problems, I was able to have better understanding of how to assist students that were struggling with navigation, entering answers, or other issues in ALEKS. This practice was very eye-opening and fueled my decision to allow students more time to work within the program.

Chapter 5

Discussion and Implications

Implications

I have known for a long time that working with students to develop their abilities in mathematics and to increase their interest in the subject was going to be a rewarding endeavor, but I was previously unaware how much insight a process like action research could provide for my own teaching. Through the data I collected and the evidence I have obtained through this data, it is much clearer how I have already grown as a teacher and how much further I have to go to become a more effective teacher in practice and methodology. It has also stemmed further ideas for how to proceed with action research and how these processes can be more substantial in the future.

Future Practice

The feedback I have received from my University Supervisor, my Cooperating Teacher, the Distance Learning Coaches, and the students in my classroom has been invaluable to how I perceive my abilities as a teacher and how I can improve on my practices as I continue my career in education. While there is room for improvement in all aspects of my teaching and there are always adjustments that will need to be made, I need to narrow my focus on what I can improve upon in the immediate future. Some specific areas that I want to focus on for improvement are Culturally Responsive Teaching, modeling mathematical practices, and time management if there is a learning management system that the school has licensed.

Culturally Responsive Teaching

While I have acknowledged the different cultures and identities of the students within my classroom, I did not actively include planned pieces of that within my instruction. Some creative lesson planning to include Spanish into my curriculum may go a long way in reaching my emergent bilingual students and although I did some of that on the fly, it was not embedded into the lesson plan. The activities within my lesson plan were interactive from a Distance Learning standpoint in introducing different websites and applications that promote manipulatives and mathematical understanding, but I feel that creating a real-world connection to the students' lives and interests may have been even more impactful.

Modeling Mathematics

Distance Learning is a challenge and one part of the challenge I struggled with was finding a way to properly model the mathematics via Zoom. With a whiteboard in a classroom during direct instruction, it is easy to gauge how captive the audience is and draw attention to a specific portion of a problem. Navigating multiple screens and applications online with a laptop takes practice that at the best of times and I found myself not performing to the best of my abilities while using Google Slides, Zoom Whiteboard, and some of the other applications. My University Supervisor suggested other means to better model the mathematical practices and some of those ideas were applied in the following lessons but having a multitude of resources and manipulatives in the classroom would be much more efficient in allowing students to make use of the same resources. I did purchase a digital drawing pad that made modeling easier as I was better able to draw shapes and depict movement, transformation, and mathematical procedures effectively.

Time Management

Another difficulty I found was finding the balance between direct instruction and the learning management system licensed by the school. The feedback from the students was that they enjoyed the direct instruction, but this may have also been because it provided what they deemed as an escape from their obligation of completing ALEKS topics. While the topics explored in the lessons were identified as ready to learn for the students, the students did not necessarily see those topics during their time within the learning management system and my instruction. I would have preferred to have been able to assign topics that directly correlated to the concepts I was teaching so that the students had a better frame of reference and could apply what they learned.

Future Research

The qualitative study through action research was extremely beneficial to me as a student teacher and future high school mathematics teacher, but it may not be as beneficial to those with greater experience in the classroom. I believe that I could continue my qualitative study as students begin to return to classrooms in a hybrid model and eventually a completely in-person model to see how the change in settings improves my abilities in Culturally Responsive Teaching, modeling, and time management. For other researchers, they may be more interested in doing a quantitative study on balancing a learning management system and direct instruction. I believe that there are most likely many studies currently being conducted on the effects of the COVID-19 pandemic and distance learning on mathematical comprehension and it will be interesting to read the results in the upcoming years.

Strengths and Limitations

This study was performed at a unique time in educational history. Because of the many changes in the lives of the students and educators as well as the multitude of policy changes nationwide and at the school level, there are too many factors to count that contributed to different parts of this study. I was able to focus on a variety of strengths and weaknesses of the research performed.

Strengths

The overall structure of the action research process is very effective. By creating feedback loops to inform the subject of changes that could or should be implemented, my teaching was drastically improved in a short amount of time. I was also fortunate to have so many professionals provide feedback to me about my teaching. The number of perspectives definitely allowed me to see where my strengths and weaknesses as a teacher lie. The ability of the Distance Learning Coaches to provide further insight to the students' lives was extremely useful as I was able to focus on specific needs of those students to a greater degree than many teachers have the ability to determine. The overall model of my placement was also greatly effective as it showed how the proper support of high risk and high need students can lead to great success in education.

Limitations

The biggest limitation to the study would have to be the COVID-19 pandemic. With the ever-changing structure to the class schedule and the model of Distance Learning, many

interactions were very different to how they would have been in person. Ideally, a study would have had less factors creating drastic changes within the study so the researcher could better identify what adjustments were beneficial. Another limitation was the attendance within the class. Although the school is considered a small school, the data would have been more comprehensive with full attendance compared to the less than half on average attendance that was exhibited. The final limiting factor was the length of the study. By having a longer study, more data could have been accumulated and the effects of the adjustments made could have provided clearer evidence of improvement.

Conclusion

I feel that the action research was a unique opportunity to showcase my growth as a teacher. When I began the MAT Program and Western Oregon University, I had not pictured myself being granted such a chance to reflect on my teaching with the support of the staff at both my placement and Western Oregon University. I have made progress towards my goals of becoming an inclusive teacher with a student-centric focus as I had previously envisioned. I feel like I have also provided engaging, meaningful instruction to the students that will help them achieve or exceed their goals in mathematics. The additional research, resources, and evidence of my growth has shown me what new directions I can take the information and apply it to future classes. Although I still have plenty of room to grow, I have made strides in my knowledge and use of Universal Design, my knowledge and skills for classroom management in mathematics, and my knowledge and implementation of the ALEKS learning management system with instruction.

In the past year, I have gone from a graduate student that was confident in my subject matter with a broad idea of how education should be implemented to a humble, grateful teacher that is extremely proud of his students for their ability to overcome so many obstacles in a chaotic year that many students have struggled with. I have developed amazing connections with staff, peers, and students that will be remembered for many years to come and I am truly excited to see where my educational career takes me.

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