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A COLLABORATIVE APPROACH AT BUILDING PROFESSIONAL
DEVELOPMENT AROUND INCLUSIVE SCIENCE CLASSROOMS

by

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A capstone project submitted in partial fulfillment of the requirements for the degree of
Master of Arts in Teaching.

Hamline University

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CHAPTER ONE

Introduction

In the world of “alternative facts,” conspiracies accepted as mainstream, and general abundance of mistrust of science, I have the invigorating challenge of being a science educator at the high school level. I am continually challenging myself to find the learning and teaching strategies that will challenge and excite learners to master the learning targets and achieve real understanding so that they can critically think about science in our world today at a sophisticated and thoughtful level. To make an environment where every student can be successful, the teaching team, general education teacher, special education teacher, and paraprofessionals need to have the best tools to support a diverse group of students.

My research question is: *What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom?*

My experience has shown me that there is a diversity of learners entering my classroom, and I need to rely on my team to have the best chance of helping everyone succeed.

My Early Learning

The closest high school experience I had with co-teaching was a combined AP Calculus and Physics class with two licensed teachers: a math teacher, and a science teacher. This class was beneficial as there were two adults in the room, and they structured the course in a way that encouraged a lot of small group collaboration. Teachers were available for small group collaboration and extra support. My student

experience taught me that most successful students needed the least amount of support from peers or educators, and the smartest students were the ones that achieved the highest test score. Since I started my career as a teacher, I have tried to unlearn this as I now understand that high rigor, paired with high scaffolding, leads to higher levels of student success.

The two most impactful experiences at college were a summer internship in the Education dept of the Zoo, where I was able to write curriculum and run the day camps during the summer. This zoo allowed us to interact and care for the animals, but what I learned about myself is that I cared more about the discovery and passion that I saw in the children. They were so curious, excited, and brought their knowledge into the camps that made my time with the zoo so exciting. This experience made me want to get into education.

My second experience was in Mexico, where I had earned a fellowship in training dolphins, and lead dolphin swims with small groups of tourists and on Tuesdays, local school groups. This allowed me to get out of my comfort zone and work in a foreign country and also allowed me to work with a diverse group of people and interact with tourists from countries around the globe. Tuesdays, though, were my favorite when I would be able again to work with students. I made accommodations for students with mobility issues, including those in wheelchairs. While working with their classroom teacher, I found it interesting to give these students close to a water experience with their peers. Transitioning into the classroom, I knew that I wanted to bring a lot of experiential learning to science and have my classroom centered around the curiosity of learners to

guide how the class would operate. I saw in Mexico that each educator had good ideas on how to make learning accessible to all and that teamwork made it possible for all students to succeed.

Office of Community Partnerships and Community Engagement

Going back to school to obtain my teaching license, I was fortunate to work in the district office of a midwestern city school. I didn't have my teaching license, but I worked closely with family liaisons and the district ombudsperson of many different cultures and backgrounds. This was also the first time that I was able to hear from parents whose child was in special education and the challenges that come from the expectation that their child deserves a high-quality education. Parents would get together every month to discuss and share strategies on how to navigate the system of this big district. Every meeting that I was a part of had the parents echoing a very similar message: We want our children to succeed in school and be successful.

The best way to meet these students' needs wasn't clear before I entered the classroom, but I genuinely believe that the team approach in the classroom is better than one teacher. If that team has the right tools and time to strategize and follow-through, students' needs will be met, and they will be doing what is best for them.

Teaching in Alaska

After teaching math for one year, it was clear that a curriculum and math textbooks developed for a broad audience wouldn't work in this unique environment. Being frustrated with the mandated curriculum, the veteran special education teacher and I wrote a proposal and created a curriculum that would be taught by both us, her using her

special education and knowledge of the culture, and I using my knowledge of math in this village. We called it construction math, and instead of reading word problems that had very little to do with these students' lives, I taught the math principles, and then the special education teacher would help us apply it to job skills. This was my first experience at co-teaching, and while it wasn't perfect, it made a lasting impact on those students and myself.

Reflecting further, having a professional development along with weekly collaboration sessions, would have allowed me to partner with the community elders and parents who could have come into the classroom as teaching aides to close the school-family gap and bring a sense of community inside the school to help more of the students. This professional development is designed to empower staff to feel like they can help students in science.

Back teaching in Minnesota

Officially co-teaching for the first time. My first classroom teaching position in Minnesota was a long-term substitute with a high school that had a graduation size of about 150 students each year. I was told that I would be co-teaching one Biology class and was assigned a special education teacher. We both were new at co-teaching and had minimal direction from either the special education team or the science team. We had brief discussions before the term about the upcoming week and the students. Since I was a first-year teacher at that school, the special education teacher wanted to see if I was committed to the students and school before he offered any support to make the education in that room more meaningful for the learners. Through the term, he would sit in the back

of the classroom, often participate as a student and then give cursory feedback when asked. I still regret the lost opportunity of that year as one where we didn't have the tools or strategies to make a successful co-taught classroom.

From that year forward, I have been much more intentional about collaborating with special education teachers and paraprofessionals. I still feel that I need more "tools" and professional development. I have not found any through my district. So I am using this opportunity to accomplish this goal and hopefully help other science teachers, special education teachers, and paraprofessionals who have had similar experiences.

Paraprofessionals in the classroom

I have at least one paraprofessional in at least one of my classes every single term. I have gotten used to not knowing who my paraprofessional will be until the first day of the course, or they often enter the same time as the students, or more frequently, 15-20 minutes into the first day. This leads to an awkward introduction to the class and often puts them on the spot. I immediately incorporate them into the community building activity that we are engaged. During independent student work, I will introduce myself. I often hear them apologize for arriving late, as they had a last-minute change of schedule or had to discuss a student with a special education teacher. After the apology, I almost always hear, "Oh, just so you know, I am NOT a science person." This is a part of why I want to create a professional development before the first day of class, to help empower new paraprofessionals into the science classroom and to collaborate on an on-going basis so that the students can be the most successful in a science classroom. Even after teaching

for several years, I still am seeking more tools and resources to be a productive team member in my class so that each adult has what they need so the student can thrive.

Even if students are not going into high technical fields or majoring in science at the university level, every citizen needs to be literate in science. These issues support schools' need to provide as much scaffolding in general education science classrooms for all students to be successful. While it may feel overwhelming for the students to already be entering a high school science classroom with this large gap, it urges the high school educators to be as persistent as possible in utilizing every resource to ensure that each learner can meet the state standards in science.

Need for Professional Development

Continuing to “reinvent the wheel” each term with different strategic plans around team teaching and collaborating with a new special education teacher or a new paraprofessional every quarter, I have realized that I needed to stop. A more effective approach to help foster collaboration is to create a professional development that allows the science team and special education team to develop a common language around collaborative classrooms that includes different models of co-teaching, specific strategies and challenges of a science classroom and a modeled approach on how to continue collaboration throughout the duration of the course.

Summary

My journey of providing the best science education began with the realization that I can not do it all by myself. This was reinforced when I had to use teamwork to make accommodations for students with disabilities in Mexico and continued through the

students in Alaska and back to Minnesota. Education is not an individual endeavor. The school that I am a member of has special education teachers and paraprofessionals that are in my classroom for at least one period of the day. The experience of the paraprofessional and special education teacher was very variable and it was often the case that they were intimidated by the science content. This made it more difficult for them to help the students and also for me to be as effective as possible. A professional development where all the adults who will be leading a science class can be in the same room, share previous successes, and learn new strategies was how I tackled this problem. I view it as my challenge of advancing science education at my school by taking a team approach and empowering everyone in the classroom to become a stronger team through collaboration and continual reflection. In the next chapter, I dive deep into the literature to seek to understand the research behind co-taught classrooms, the best practices in inclusive science classrooms and the best strategies for paraprofessionals to be effective in a science classroom. Chapter three will discuss the framework and learning theories that I utilized to create a professional development that is centered around communication and collaboration. Chapter four is a critical reflection of the major learning opportunities embedded in the project, reflecting is the literature discussed in chapter two and limitations to this capstone project.

CHAPTER TWO

Literature Review

“Coming together is a beginning; keeping together is progress; working together is success.”

– Henry Ford

Introduction

To provide the best education to all of the students coming through our doors requires our staff to become a team that is unified in common goals. Coming together before classes start will allow this team to understand it’s “why”, collaborate around a shared philosophy, and build a strong working relationship that the students will be able to feel on the very first day. Shared goals, best practices, and building a strong team will lead to a strong start that will benefit the students for the entire term. Often though, adults are placed together in classrooms before real communication and planning can take place. This creates an atmosphere of playing catch up even on the first day of school. Co-teaching has been shown to be very effective when done well but most teachers would like more collaboration time and a framework in which to build their personal collaborative classroom. Because of this, I will explore the question in this capstone project: *What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom?*

This chapter will examine the components to answering this question: a review of co-teaching models, gaps in knowledge about co-teaching in a science classroom, and an analysis of the argument that co-taught classrooms are worth the investment. A result of this examination will be the creation of a professional development model that will aim to bring the educators in the science classroom, general education teacher, special education teacher, and paraprofessionals together before the course starts and set up a model for weekly planning meetings that will continue to ensure that the science classroom is set up for all students to succeed.

Co-taught Classrooms

History. Before 1975, many students with disabilities and learning differences were left out of the public schools. They were placed in restrictive settings such as state institutions whose missions were to accommodate students, rather than providing appropriate education ("History Twenty-five," 2007). The Education for All Handicapped Children Act (1975) was enacted to ensure the rights and protections of all children with disabilities and their families have local access to their public schools and appropriate education. This law was updated to the *Individuals with Disabilities Education Act (IDEA)* which has had its most recent amendment in 2004. This legislation has helped ensure that students with disabilities have access to early interventions, best practices that are rooted in research, and special education programs. This has led to the majority of children with disabilities going to their neighborhood school, included in the general education classroom and graduating with a high school diploma ("History Twenty-five," 2007). Today, classrooms are more diverse than ever, and having the highest quality

learning environment that works for all types of learners is more important than ever (Hamilton-Jones & Moore, 2013, p. 156). Through the legislation of inclusion in the classroom, the practice of co-teaching classrooms started.

Co-teaching models. Villa, Thousand & Nevin (2004) describe co-teaching as a framework where there are two licensed staff who share responsibility and serve students in the same classroom. Dugan & Letterman (2008) find that co-taught classrooms increase learning outcomes for students by comparing assessment scores in co-taught classes and traditional classrooms. Through this study they also found that students preferred team-taught courses. At the high school science level, this will be a licensed science teacher and a licensed special education teacher. Although there are many variations in how this looks in practice, it has been shown to have many benefits to all of the students in the classroom (Dieker & Murawski, 2003, p. 5).

Brouck (2007) finds that there are five categories that co-teaching models can fall under: one teacher, one drifter, station teaching, parallel teaching, alternate teaching, and team teaching. There is a spectrum within each of these five categories of how co-teaching can be implemented in the mainstream classroom. Each class can mix and match these variations to suit the needs of the learning target and the needs of individual students and the class as a whole. Graziano & Navarrete (2012) emphasized that through observational studies the general education teacher is in charge of the general education students and the special education teacher is in charge of the students in special education. Although seen in practice, this is the opposite of the philosophy of co-teaching. The co-teaching model is an equal partnership of both teachers and that the

teachers are equally responsible for all of the students in the classroom. An additional benefit of having two educators in the classroom can have the teachers debate, participate in demonstrations, model, or role-play to teach or introduce new topics. Best practice has the educators discussing proactively the goals of the lessons and tailoring the best form of co-teaching to the class. Although classrooms tend to fall into one or two of these categories, a science classroom lends itself to requiring a form of each of these models, depending on the learners, content, and lab or activity that is being executed in any given class period.

Brouck (2007) describes one teacher, one drifter with the main teacher (typically the content level teacher) being the main deliverer of the content, instruction, and grades. The drifter (the assistant) supports the general education teacher by providing clarifying questions, redirection to students and helping with attendance, make-up work or pull-out during assessments.

Station teaching tends to be mostly seen at the elementary level with the special education teacher leading one station and the general education leading another. Students rotate between fixed stations at a set amount of time. Dieker & Murawski, (2003) describe station teaching as something that tends to happen in the same room. This can be particularly useful when there needs to be more advanced instruction happening at an individual or small group level. Stations can also be used to build fluency in new concepts or further explore a topic in different ways. Having multiple opportunities to engage in the content will bring a greater understanding and mastery of the content.

Stations can also be planned at a high rigor, and tailored for the individual teacher's strengths if there are two teachers in the classroom.

Parallel teaching is when the two teachers divide the class into two groups and then they lead the lesson. This includes teaching the two groups separately. Parallel teaching is when both educators are teaching the same concepts in different locations. The advantage of this method is the delivery of instruction can be adapted to the needs of the smaller groups (Murawski & Dieker, 2004).

Alternate teaching is one where one teacher is taking a smaller group to pre-teach, teach again, review, or complete assignments. This tends to be the special education teacher while the general education teacher delivers whole group instruction and monitors behaviors, work completion, and fields questions at the whole group level.

Team teaching is the rarest and is when both teachers are sharing the whole class instruction for the entire class period.

Benefits of Co-Teaching. Dieker & Murawski (2003) have listed several benefits to a co-teaching model. The first one is the increased instructional options for all students. This is due to being more flexible in how two teachers can deliver instruction, either parallel teaching or station teaching. This leads to the second benefit defined as improving program intensity and continuity. Beyond two teachers supporting an active learning environment, this team can ensure that every minute of class is utilized for meeting the learning target (Dieker & Murawski, 2003).

Graziano & Navarrete (2012) discuss the third benefit listed was to reduce stigma for students with special needs. As groups are made and remade based on formative

assessment, there will be responsiveness as an entire class to be receptive to the strengths of individual learners and at some point during the course, every learner will struggle. Since both teachers are equal in the classroom, students with special needs do not need to be individually targeted or labeled, which could lead to an unintentional detrimental effect (Dieker & Murawski, 2003).

Guidelines and recommendations. Brouck (2007) offers five considerations that all teacher teams should discuss before diving into a co-taught classroom. The first is the holistic survey of the curriculum. In a science classroom, this would include looking at the standards, the labs, assessments as well as on-going projects. Is it accessible and appropriate for the students? If so, what modifications and accommodations can be made in order to have it work for even more students? Starting this discussion as a predictive exercise and then continuing it as the course progresses will allow the instructors to be flexible to the needs of the students. How is the layout of the classroom appropriate for diverse learners? This includes looking at desk arrangement, lab supplies, teacher desk placement, and where the groups will meet during different tasks. Finally, surveying the class roster, and discussing the needs of other students, predicting group dynamics and other needs, modifications, and structures that should be set up before the start of class. Ploessl et al. (2009) in contrast suggested ways of working professionally with a co-teacher as many of the challenges that tend to occur in these classrooms are due to conflicts between teachers.

Dieker & Murawski (2003) recommend the use of pre-planning, being intentional about the learning goals for the day, and trying to keep all learning styles in mind will

help meet the most students and two teachers can better meet these needs than only one. Continual educators' reflection of how the activities are meeting the needs of the learners and the learning targets will increase student success. It was suggested that educators think about the senses while planning educational activities and ensure that students who learn best by seeing, hearing, and moving their body can be successful in the lesson. Further strategies include proactive discussions and various instructional practices including peer tutoring and cooperative learning with infusing as much active learning as possible. Potts & Howard (2011) further suggest that the two teachers need to have strategic planning together, time commitment to the model, assess their own familiarity to content, and take into consideration the size of the classroom. Dieker & Murawski (2003) discussed peer tutoring as a way for students to explain to each other how they are making sense of the learning target or new science concept and how to apply it to real-life or novel situations.

Hamilton-Jones & Moore (2013) give five alternative specific recommendations to offering a high quality co-taught classroom include: sharing responsibility and accountability, use a variety of co-teaching models, use evidence-based practices, considering Universal Design of Learning (UDL), avoid bias and continually assess how inclusion is working in a co-teaching partnership. This is different than looking at the physical differences between the different models as previously discussed but focused more on what should happen throughout all of team-teaching. Sharing responsibility and accountability was described as both taking ownership of the science content and in the modifications of how to make the content more accessible to more learners. There is a

tendency for educator teams to get comfortable in sticking with one or two co-teaching models, having time planned ahead of time to assess the best co-teaching model to meet the needs of the learners for the particular learning goal will help increase the success for the students and ensure that best practices are being utilized for every lesson.

Hamilton-Jones & Moore (2013) addressed avoiding bias by drilling into the data and looking at weekly assessment scores based on the standards and ensuring that all student's needs are being met. For example, if a particular category of learning disability consistently was scoring below expectations, there may be a concern of bias. This was seen especially with active learning preferences but can have a gender bias and racial bias that was addressed in the study. Weekly meetings will be designed for continual reflection as activities can be modified so that they are stronger for future learners and so that all learning activities are continually being reviewed for their effectiveness. These frameworks will be instrumental in creating an instructional environment that is inclusive for all learners.

There are approximately 16.7% of public school students in grades K-12 receiving special education services (Minnesota Education, 2020). In the United States, approximately 80% of students who are in special education spend 40% or more of their time in the general education class environment due to ensuring that students are in the least restrictive environment (Brusca-Vega, Alexander, & Kamin, 2014). With more and more students in general education classrooms, it makes sense that special education teachers would also be meeting the students where they are, in the general education setting. Educators need to feel effective in the general education setting and that their

skills are being utilized. Creating a professional development before the course starts will set up the team to be collaborative in the general education science classroom and ensure that all students are able to be successful.

Brusca-Vega, Alexander, & Kamin, (2014) state that students with disabilities fall behind their classmates by 4th grade and only get further behind as they progress through school. They found that in 4th grade, students in special education are already 51% below their minimum standards and that increases to 70% in 8th grade and 75% of students in special education do not meet standards by the time they are seniors. This gap must be closed and it can be closed through the close relationship between the special education teacher and the general education teacher.

Case studies of Co-taught classrooms. Brouck (2007) studied two successful co-taught classrooms in middle schools. The findings suggest that there are several key practices that should be in place to be successful. First, both teachers need to volunteer to teach together. This will ensure that both educators want the co-taught classroom to succeed. Teachers who volunteer to teach together tend to have shared educational philosophies and classroom management strategies. Third, and this seemed to be crucial in the study, the teachers had weekly shared planning time. This is where they were able to decide on the learning targets, educational activities, classroom models for each day and roles that they would assume for each objective. The physical space was discussed, how to group, and what material would be modified to meet all the learners' needs in the classroom. Both teachers were open to sharing instruction at the whole group level. This meant that the teachers actively discussed the roles and how they would work together to

fulfill all of the roles. Finally, teachers discussed the policies on grading, student participation, student behaviors, and interventions.

Ledbetter (2016) followed six special education teachers into their co-taught classrooms and found that students were successful when student's prior knowledge was activated, use of evidence was integrated into the lessons, and sense-making of the learning targets was engaged in lessons. This supports the research of previous authors. Dieker et al. (2013) described a framework for planning with a general education teacher and special education teacher for these critical concepts with only having one 50 minute block of planning time a week. Due to the very limited amount of time, it was agreed upon to not discuss individual student situations or life outside the classroom. For the first ten minutes, the upcoming week's big ideas, concepts, and labs were discussed. After discussing the week, the two would focus on each day, with each day getting eight minutes, making sure that the necessary accommodations are created, discussing the role that each would take in the classroom each day and how the paraprofessional could be best utilized in the class periods that are not co-taught. This pair of teachers in the case study had training before school started in five focus areas: teaming, reading, writing, cooperative learning/disciplining, and assessing, which was also present in the weekly planning sessions. Students in the given case study observed that two teachers, "helped everyone faster," and "you don't have to ask the same teacher every time" (Dieker, Finnegan, Grillo, & Garland, 2013, p. 21).

Using collaborative pre-teaching as a strategy has been shown to improve student success in both formative and summative assessments in the Biology classroom,

especially students with a Specific Learning Disability (SLD) (Thorton, McKissick, Spooner, Lo, & Anderson, 2015). Pre-teaching methods include teaching essential vocabulary, scientific theories and discussing upcoming labs. A result of this intervention was also found to increase reading comprehension and fluency, which can translate to success in the science classroom and other subjects. This strategy is thought to have been especially effective due to the complexity and abstract nature of science as well as the deficiencies in traditional teaching in the science classroom. This study found that this is an incredibly effective strategy but isn't used in the majority of science classrooms.

Challenges. Keefe and Moore (2004) found that high school tends to have more challenges to a successful co-teaching classroom than at lower levels. They continued that the faster pace instruction at the high school level as well as testing requirements, less student desire to be approved by the teacher and other factors contributed to the greater challenge of inclusive classrooms. Through this survey, it was determined that the three main concerns of inclusive teaching at the high school level were the nature of collaboration, roles of educators in the classroom and the outcomes of the students. Through another survey, students found co-taught classrooms challenging due to unclear expectations from multiple educators and organizational issues surrounding two leaders in the classroom (Dugan & Letterman, 2008).

The collaboration was a challenge especially if it wasn't a voluntary situation and that tended to lead to issues with communication and compatibility. It takes a lot of time and effort (Rytivaara et al., 2019). It was also to find time to collaborate on the large student population as well as find time to be reflective and proactive (Allen-Malley &

Bishop, 2000). Roles seemed the biggest issue when the special education teacher felt more like a classroom aide and not an equal partner in the education of the classroom. This division of labor could grow both teachers to become resentful and a feeling of lost trust and respect. The biggest concern for student outcomes in an inclusive classroom is when students are placed in there that is not appropriate based on the goals for the individual student. The implications in this study revealed that there needed to be better preparations, possibly a professional development and collaboration time before school starts to address these concerns, and recommend explicit strategies for co-teaching teams to be successful in the classroom for the students to have successful outcomes in their high school courses.

Gaps in Knowledge

Most special education teachers have never taken college-level science classes which makes it unrealistic to expect them to have the same knowledge base (Dieker & Murawski, 2003, p. 2). Specific praise and opportunities to respond (OTR) was not found to be significant in terms of student behavior or class behavior during an observational student of an English and math classroom (McKenna, Muething, Flower, Bryant, & Bryant, 2015). Strieker, Gillis, & Zong, (2013) found that although co-teaching is one of the most widely used methods of including all students in a classroom, there is very little preparation at the college level and so, therefore, teachers are not prepared to successfully implement this model in a classroom. There were no studies found in science classrooms.

Paraprofessionals in the classroom. Paraprofessionals are also known as instructional assistants, teacher aides, and educational aides are being relied on more and

more as a key team member for student success in schools (Capizzi & Da Fonte, 2012, p. 1). Paraprofessionals are tasked to work with some of the most high-need students but often have the lowest level of training (Devlin, 2008). There may be one class that has a co-teacher but several other classes that don't. These gaps can be filled by effectively utilizing paraprofessionals. Devlin (2008) outlines 20 specific strategies to partner with a paraprofessional which are common sense and include discovering paraprofessionals interests and skills, creating an atmosphere of teamwork, discuss expectations in the classroom, work style preferences, punctuality, organization, and supervision style. Hamilton-Jones & Moore (2013) give specific examples of how paraprofessionals can add value to the classroom including working in small groups with students, supporting behavior plans, and redirecting student behavior by encouraging work completion in the classroom. Although these make a lot of sense, there is very little research into actually putting these strategies to the test and measuring the impact that it makes on student achievement.

The negative effects of the use of paraprofessionals have been documented as separation from classmates, unnecessary dependence, interference with peer interactions, insular relationships, feeling stigmatized, limited access to competent instruction, interference with teacher engagement, loss of personal control, loss of gender identity and may provoke problem behaviors (Giangreco, Yuan, & McKenzie, 2005). These unintended consequences may have started as early at elementary school and have become ingrained in the student by the time that they reach high school. Having the paraprofessional view themselves as not only in the classroom to help one student, but to

help the learning of everyone could lead to greater success through the independence of the student that the paraprofessional was in the classroom for initially. This idea lends itself for paraprofessionals working in classrooms as an educational team member that assists with individual and small group interventions but is not only helping those with an individual educational plan.

Ledbetter (2016) led a group of six early career special education teachers and found that there was more success in classrooms when licensed staff viewed their role with paraprofessionals as a collaborative partnership instead of a hierarchical or supervisory role. When there was a time in the week for collaboration and reflection between paraeducators, general education teachers, and special education teachers, there was reported increased positive outcomes in student achievement. Although a small sample size, the results are hopeful that they could be repeated in a different educational setting and a different high school. This study was only followed for one year and didn't include the collaboration of the general education teacher as a resource or partner for increasing student success. This model though does support the project of creating a professional development that continues on a weekly basis that is centered around student success and achievement.

Missing Research

A metasynthesis review of qualitative research on science classrooms concluded that although certainly not best practice, it was found that the majority of co-taught classrooms were of the one teacher, one drifter which is described by the general education teacher being the primary/dominant figure in the classroom and the special

education teacher being the subordinate (Scruggs, Mastropieri, & McDuffie, 2007). This unhealthy relationship can lead to poor student outcomes in the classroom as there are better ways to teach and lead science classrooms that can be addressed through professional development and continued weekly planning meetings. Even more true with paraprofessionals, many were provided no training or orientation for new staff or at the beginning of the year (Capizzi & Da Fonte, 2012, p. 4). This can lead to a decrease in the paraprofessional's confidence and doesn't allow them to feel like a valued member of the school staff (Capizzi & Da Fonte, 2012, p. 4). Paraprofessionals were quoted as not knowing their role in the classroom when it comes to discipline, redirection, or correcting mistakes found on work activities. The science classroom can exacerbate these feelings. These authors continued to give guidance on how to set up training but there was no follow up on how that affected the educational outcomes of students.

Science paraprofessionals. There was no research found that connected paraprofessional training in the best practices of high school science classrooms to student achievement. This could be due to the narrow scope of the question looking at science achievement and paraprofessionals as well as the complexity of the content of many high school science courses. While this research was extremely limited, many of the strategies that were found effective for special education teachers could be modified so that a paraprofessional can implement them. This includes small group interventions, such as pre-teaching and vocabulary building. By including paraprofessionals in professional development and ongoing weekly meetings, they can be seen as an equal partner in creating a successful learning environment for all students.

Analysis and Argument

Co-taught classrooms are worth the investment

“Co-teaching is a worthwhile professional experience,” (Rodrigues, 2014, p. 93). Rodrigues (2014) found that only 14% of special education teachers with no experience agreed with the idea that co-teaching is worthwhile compared to 50% of special education educators after they have been in a co-taught classroom. Rodrigues (2014) hypothesized that there is a widespread belief that there is a subordinate role of the special education teacher in a general education classroom versus if they were able to run a pull-out or a self-contained resource science class. This same study found that general education teachers who had a co-teaching experience supported the practice 82% of the time. This survey to both general education and special education teachers who have co-taught and who have not co-taught shows that there needs to be more training and support at the school level for all the teachers who are going to create a successful co-taught classroom.

Professional development is beneficial

Brusca-Vega, Alexander, & Kamin, (2014) provide a structure of professional development that focuses on how to make science content accessible to all students which requires an amount of active learning or experiential learning. They focused on students learning through experiences, student-centered, and based on national science standards. Working together, teachers with the content knowledge and special education knowledge, were able to transfer what they learned in a summer intensive institute to an inclusive science program at their home schools. They also found that students benefited

in multiple ways as a result of this professional development including using strategic note-taking, graphic organizers, peer tutors, mnemonic instruction, and structured inquiry-based activities. Designing a course to meet all students' needs will make it a better classroom for all.

Dieker & Murawski (2003) argue that each team member has a specialty and that it is imperative that that expertise is used for the greatest level of student achievement. The biggest factor this study found to have successful collaboration was to have shared planning time on a weekly basis because of the time needed to work together to develop a plan. Highly effective meetings were outlined to first be reflective and then focused on the next week's learning targets and how to best adapt the learning activities to meet the needs of all learners. Reflective meetings include reviewing assessments for trends, successes, and continued misunderstanding that will have to be addressed before moving onto a new topic. Critically addressing the following week's instructional plan will ensure that it is ready for all learners to thrive. Through this weekly meeting, the educators will develop appropriate modifications, accommodations, and differentiation. This will be a critical feature of professional development and lead to greater student success.

Successful inclusion includes students with disabilities being in the general education classroom and the teamwork between special education teachers, general education teachers, and paraprofessionals which is vital to providing a successful inclusive classroom (Phelan, 2018). It would be infeasible to have every science classroom paired with a special education teacher and so relying on and utilizing

paraprofessionals will be absolutely necessary to drive up student achievement and success. Staples (2013) developed a three-year professional development plan at the middle school science level. This was a notable study because it created professional development for science teachers and paraprofessionals together.

There are many benefits to the block system that also benefits students in special education including more hands-on time, flexibility, active learning, and processing (Dieker & Murawski, 2003, p. 5). In a science classroom, block scheduling allows for more nuanced and longer experiments to take place. Oftentimes, experiments take time to set up, and with block scheduling, this can happen and students still have time to process the actual experiment and be able to derive meaning from the results. Longer processing time is allowed during block schedules. Negative aspects include longer periods with less support or negative behaviors that can happen for longer periods of time which can be mitigated if teachers are able to change their teaching in order to maximize the benefits of the block schedule (Dieker & Murawski, 2003, p. 5). Since block scheduling is the current schedule of this school, it can be utilized to take advantage of the long block of time to do inquiry-based learning, stations, and possibly pre-teaching future concepts. Since the educators will be working together for a greater percentage of his or her day, the weekly planning time can be used to discuss how to best utilize the entire block so that it can meet the needs of the individual learners.

Response to Intervention (RTI) is a process that relies on measuring student's responses to evidence-based interventions which can lead to students being identified with a learning disability (Hamilton-Jones & Moore, 2013, p. 157). It is a model that is

used to help identify students who qualify for special education but can also be used continually in a classroom as students are on the spectrum of mastery for different learning standards. This model can closely monitor a student's level of learning and if used correctly, can be an effective way to inform future instructional decisions. There are three tiers in RTI. Tier I is thought of as identifying students that are still making progress towards a learning goal and actively reteaching or using a different intervention to correct a misunderstanding or give greater context to the concept. Tier II tends to be a smaller group of students who are still struggling after receiving an intervention in the general education classroom. An example could be pulling out a small group of students to re-teach a concept in a different location. Tier III would be the students that are continuing to not master the concepts and require supplemental interventions.

Co-teaching is an ideal way to address the various learners in a classroom as the educators can proactively create tier I, II, and tier III level interventions on a daily basis which will allow students to be able to continually receive extra support (Murawski & Hughes, 2009). This can not be done well though without adequate planning and assessments. A weekly meeting will be able to make modifications and plan for interventions that will help meet the goals for the individual students in the classroom. This meeting will also plan for a different grouping of students based on formative assessments that checked for understanding made multiple times through each class period and utilized to drive decisions about pacing, grouping, and possibly reteaching and greater student reflection if there are still gaps found to be in students' understanding of key concepts and the standards of the science class.

Rationale for Research

The purpose of this literature review was to address the needs of equipping all of the educators in the classroom to have the best practices in science education to help all students. Special education teachers and paraprofessionals are often placed into science classrooms and do not feel confident in the science concepts to be helpful or supportive to students. Co-taught classrooms have multiple models and both the co-teacher and science teacher need to be flexible to utilize different models depending on the learning targets and expected outcomes of the lesson. There are best practices already identified in the research review and they must be incorporated as strategies deployed throughout the science course. Creating a professional development that is inclusive to all the educators that will be in a science classroom will nurture collaboration which can be sustained through the course of the year. The collaboration needs to extend through continual reflection and proactive planning through weekly 50 minute meetings between the science teacher, special education teacher, and paraprofessional.

Summary

Mainstream methods of science instruction don't always work for all learners at the high school level does not work for all learners, especially students who are in special education. Students have a measurable gap starting in elementary school and the gap grows throughout the high school career. Many schools choose to address this issue and set up students for success by implementing co-teaching models. This has been shown in the research to be problematic in many classrooms for many different reasons. Many times there is a special education teacher supporting one classroom, the other classroom

is being supported by a paraprofessional. This can lead to disjointed learning and some students not receiving the best form of instruction for their individual educational needs. Secondary science classrooms seem to be a particular challenge for collaboration that is high rigor and utilizes the strengths of the science teacher, special education teacher, and paraprofessional. A solution for this issue is a professional development that connects these educators before a course starts and builds a collaborative working style and introduces highly effective teaching strategies that can work in a science classroom. The success of this collaboration will depend on maintaining a weekly planning meeting that can be reflective in nature while simultaneously being proactive for the following week.

Chapter 3 will present a detailed plan for professional development, which will bring in the voices of all the educators in the science classroom. Educators will know their teaching assignments and will start the process of building a base of success in the classroom. A plan will be implemented and scheduled so that the collaboration will continue with weekly 50 minute meetings that will address student needs and continued success in order to fully answer the question: *What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom?*

CHAPTER THREE

“Behavior precedes belief - that is, most people must engage in behavior before they accept that it is beneficial; then they see the results, and then they believe that it is the right thing to do.... implementation precedes buy-in; it does not follow it.”

— Douglas B. Reeves

Project Overview

The question being explored in this capstone project is: *What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom?* Co-teachers and paraprofessionals come into my class with very little knowledge in the content of science and have struggled with being an equal leader in the classroom.

The capstone goal was to create professional development for all of the adults in the science classroom, including the special education teacher, paraprofessional, and general education teacher. This was especially challenging as there are very few examples in the literature for such training, especially with the focus being on secondary science. Building support from my science department is important, as well as bringing a detailed plan to my administration and curriculum director, whose support is required, to invest in the training during workshop week which already has the challenge of having very limited days before school starts. When I began researching this project, I always went back to, “How will this help student achievement?” and I continued to question if

there was sufficient data to support the recommendations that were being offered in these peer-reviewed papers.

This chapter describes the educational models and values that informed the research and professional development creation. This will help readers have a framework from where the research originated and any possible biases that might have influenced this project.

The professional development is for adults so I had to consider strategies that were time effective, collaborative, and included strategies that educators could use on day one as well as a plan that could be used through the course of the school year. Finally, I planned for multiple opportunities for the initial group to meet back together for continual reflection in order for this professional development time to be adapted and modified as needed throughout the first year and beyond.

Project Description

My project's goal is to create a collaborative and reflective professional development that starts before school starts and is ongoing throughout the year. The content of the workshop presented on Google Slides includes multiple opportunities for small group collaboration, the introduction of best practices to help students with individual education plans in general science classrooms and specific interventions that can be implemented immediately, and time to develop norms and plans in the individual classrooms. A framework is put into place to build from the initial professional development with weekly meetings to reflect on student achievement and to be proactive

and plan for the upcoming week including modifications and accommodations to meet the needs of all learners.

Research Paradigm

This project is built upon the social constructivist paradigm, where meaning and learning is derived in a social setting, in which learning will come from a community of learners through interactions in which people are sharing experiences and ideas (Lave & Wenger, 2018). This helps facilitate new ideas and new practices that can be supported by all of the educators in the room because they all feel empowered to share their thoughts, and other people can take those ideas and be able to implement them into practice immediately. Learning new methods happens in a social environment. Participants are focused on professional development before the school year starts but then interact daily inside the classroom and through a weekly reflection and planning meeting. This social constructivism changes the learning community for the better in the science classrooms and ultimately brings more exceptional student achievement. This helps pull out educators' thoughts and apply them to the social setting of the classroom.

This professional development will introduce new ideas through conversation and collaboration and the discussion of best practices, which many classrooms have implemented to some degree. Brown & Duguid (2017) support this collaboration through the argument that information (best practices, science principles, etc.) gains value to all educators when discussed and argued in the social context of the initial professional development and through the weekly reflection and planning meetings. Educators will be

equipped to start the year with a strong foundation for setting up a co-teaching science classroom.

Adult Learning Theory

Using Jack Mezirow's theories on adult learning theory has been shown to transform many educators to reflect and learn from their own experience in professional development and professional learning communities (Calleja, 2014). Mezirow's ideas of adults needing to bring in their own experiences and ideas will be key in this professional development structure. Through the year of applying new ideas into the classroom, the educators are responsive and reflective and learn from each other to bring out the best learning environment in a high school science classroom.

Bringing all of the educators together. Traditionally, paraprofessionals do not know their daily schedule until the first day of school. This is in contrast to teachers who received their teaching schedule before the end of the previous school year. The educators come from very diverse backgrounds, with a range of experience. Some have been in the district for over 30 years and some enter this school as a first-year teacher. Many paraprofessionals have had limited post-secondary experience in the field of education but have become very effective by working with diverse students and different classrooms. Special education teachers have a spectrum of experience at our school, with some who have never been in a co-taught classroom and some have been working successfully with teachers for years. In my current district, science teachers have between 4-20 years of teaching experience but have had many negative experiences working with

special education as there was little to no planning on how the best way to work together, plan together, and assess how the course is helping students achieve.

Understanding this range of backgrounds, this professional development would be purposeful in its intent on giving space to share ideas, experiences, and best practices already seen in practice, or read about/discussed in education classes. The goal is that everyone at the table, teachers, paraprofessionals, and special education teachers, agrees on the mission of this professional development, respect each voice at the table, and is open to new ideas. Over time, the structures that are already in place in the science classroom can be improved upon, and all educators know their role to help student achievement.

Setting. This four-hour professional development occurs in a high school setting that is about 45 miles from the twin cities. This school has strong community support and places a strong focus on the arts, academics, and athletics. There are about 50 staff members at the school and 555 students enrolled in 2020 (*Minnesota Report*, n.d.). The Minnesota School Report Card (2020) also reported that 93.3% of the students are white and 14.6% of the students are in Special education.

The professional development occurs in a science classroom during the workshop week, the week before school starts. The Google Slide deck is presented in a secondary science classroom with the science team, special education teachers and paraprofessionals. This is a hectic time for educators as it is when they are setting up their classrooms for the open house and the first day of school, finalizing syllabi, welcoming new staff as well as catching up with old staff, and attending many mandatory training

meetings and other refreshers that are dictated through the state or district office.

Although this is busy, it is important to set up the foundation for a strong start to the school year.

Project Timeline. The final project consists of a Google Slide presentation that is intended to be very reflective in past practices, and a compiled list of “best tools” that the science department currently uses. The Google Slides deck was completed in the summer of 2020 and implemented the week before school starts in September. It introduces new practices that set the foundation of teamwork and collaboration between the science teacher, special education teacher, and paraprofessional. Finally, expectations and guidelines will be in place for 50 minute, weekly reflective and planning sessions which will have to focus exclusively on the individual classrooms.

Summary

What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom? This project is centered around the idea that effective collaboration is key to student success and outcomes. It requires staff members to become collaborators and challenge each other in order to achieve maximum results. This project brings the educators to sit at the same table and give equal time to share experiences in all classes. The ongoing weekly meetings allow this model to be flexible as the teaching schedule changes through the quarters and students get switched into different classes. The result will be maximizing the educator’s effectiveness in reaching all students in the science classroom. Chapter four will conclude the project and synthesize major learnings from this process as well as examine the

limitations of this professional development. Chapter four will continue to offer future exploration for collaborating in a secondary science classroom.

CHAPTER FOUR

Conclusions

Introduction

This project was built on the desire to be a more effective science educator for all the students in my classroom. I am lucky that I often have at least one other adult in the classroom but I have learned the mere presence of a special education teacher or a paraprofessional doesn't automatically mean a better, more functional classroom. Unfortunately, many opportunities for paraprofessionals and special education teachers in the classroom have been missed due to a lack of training around collaborative inclusive classrooms. While there is a lot written about co-teaching classrooms, it is daunting to find and evaluate those best practices in the middle of the school year. I created this professional development to work in collaboration with other educators in the building to find the best practices and implement them in anticipation of the new year. The question I asked was, *What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom?* I have answered this question by developing a four-hour professional development that addresses this and provides work time to begin the implementation of creating a more successful partnership.

In this chapter, I critically examine what I have learned through the process of developing an adult professional development including some unexpected lessons. I revisit the literature in chapter 2 to make connections between this project and what the data supports. I discuss the limitations of a four-hour professional development and am

honest about what can and can not be accomplished in that time, and what the next steps are to continue this process as a science and special education department.

Major Learnings

Through a meta-synthesis of co-taught classrooms, Scruggs et al. (2007) found that the co-taught inclusive classroom is supported by the majority of general education teachers and special education teachers. Almost 7 years later, Conderman & Hedin (2013) still reported that inclusive classroom co-teaching has yet to reach its potential. The major reasons for this failure were the lack of planning time for educators (Wasburn-Moses, 2005) as well as a lack of knowing how to co-plan (Rice et al., 2007). Creating this professional development, I attempted to build training around ways of getting away from one teach, one assist model of co-teaching, introduced methods of collaborating in a professional manner, presented specific resources on how to use planning time intentionally, incorporating strategies to build student skills in science and how to collect data to make informed instructional decisions.

Having a common language around co-teaching models is important and I relied specifically on Brouk's (2007) descriptions as a way to concisely discuss these models. Although this wasn't training specifically designed to teach these strategies, it was important that everyone knew what these models were and had time to evaluate the positives and drawbacks of each model.

I found that Ploessl et al. (2009) had the best specific strategies on how to collaborate in a professional manner. The tools that they presented were described as specific strategies that would improve collaboration between special education and

general education teachers. I adapted the tools that they provided and used them as a catalyst to discuss meaning, teaching philosophies, and job roles in small groups. The improved collaboration was one strategy presented that would benefit all students in co-taught classrooms. They offered questionnaires that I adapted to be a baseline tool for educators to use when starting a co-teaching collaboration. This questionnaire probes individual beliefs and philosophies in areas of instruction, classroom management, communication, and individualized instruction. It serves as a guide to understanding yourself as an educator and a collaborator. Within the professional development this was given as an action task, and participants actually filled it out and compared their responses with those of another educator. It was also encouraged that they keep this document for future start points at the developing stage of a new partnership or class.

It was important to me to offer a specific strategy that could be implemented almost immediately into any science classroom. I found that content vocabulary was identified as a barrier to success in many science classrooms (Dieker et al., 2013). McDuffie et al. (2009) studied peer tutoring, specifically in regards to science vocabulary as a benefit in the classroom. I modeled their methods in the study and presented that as a specific task that could be used in their classroom. I highlighted the area of the students keeping data of their peer tutoring sessions as a segway into the importance of using data to drive instruction in inclusive classrooms. This was modeled for the teachers as both a research-based strategy and a way to collect data in the classroom.

Finally, it was vital that the educators had a framework to continue to collaborate throughout the school year. Dieker et al. (2013) outlined a schedule on how to use 50

minutes of collaboration time a week for a successful partnership in the classroom. I presented this framework and supplemented a collaborative lesson plan to offer a streamlined way to meet regularly and ensure that the classroom is continuing to meet the needs of all of the students in the classroom.

Reflections on the Literature

What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom? The project was built deliberately to be reflective in current practices and attitudes as well as listening to the collective knowledge of educators who have been doing this work for years. The session was centered around improving students' experiences in the classroom, increasing the toolbox educators have to make their classroom even more powerful and to start applying this to the very first week of school.

I used Vygotsky's (1978) social constructivism theory, the idea that learning is a social construct that is built upon through social interactions when I built this as I wanted the participants to be reflective and to co-construct their knowledge and establish norms in this social community that the staff already has. I felt like my job was to create a collaborative problem-solving environment that allows the participants to be active throughout the training. I was intentional about making the facilitator the guide and not a lecturer and that the professional development was centered around the participant's own experiences.

I found many resources that found recommendations in general classrooms but very little in science classrooms and even less on the best strategies for paraprofessionals

in science classrooms. I was surprised at how little evidence is out there on best practices in high school science classrooms regarding students in special education. This created the need to broaden my search and focus on research-based strategies that could be applied to a science classroom but haven't been directly studied.

Limitations

It became clear that a four-hour professional development would never be able to cover the amount of work that it takes to build a truly inclusive classroom. This project aimed at educators who have previous co-teaching experience and introduced them to a couple of high impact research-based practices that could be incorporated into their practice. The time limitation was because the teacher workshop week is already packed with many mandatory training sessions and the additional stress of getting classrooms ready.

Another limitation is that this truly meant to be collaborative. Many paraprofessionals and teachers have been in co-teaching classrooms for years and have many great things that they are already doing. It is difficult to script a conversation into professional development about creating teacher-specific content on collaboration conversations. This project's vision is that this time in the training will allow all the participants to share their own best practices and examples in their classrooms and experiences. This is essential to a well-developed project, but it was difficult for me to predict what and how this conversation will look. I want to make sure that this project honors that and that all participants feel heard and learn from each other. Some educators already know this content, but how it is implemented by two teachers who are both equal

leaders in the classroom will create an environment that will help students be more successful. That process is hard to build into a presentation with specific timelines for adults.

Future Exploration

The district has a day built in every quarter for professional development throughout the year. I think an exciting opportunity would be to create a reflection meeting during the first professional development day where educators could come together and share what was working and not working in this model. My experience has been that I am super organized at the beginning of the course, and then I fall back into my habits of leading a classroom and could use a “refresh” mid-way through the course. Meaningful conversations around how to collect and use data to drive instruction, the best interventions for specific disabilities, and tips and tricks that other teachers have found and can be shared with the group are essential to explore.

Building more collaborative time around using data in the classroom to drive instruction that met individual learning goals also was a topic that should be explored through further collaboration with this team. McDuffie et al. (2009) cited that even in co-taught classrooms, there wasn't enough individualized instruction. Exploring databases for individualized instruction as well as creating learning targets for specific disabilities would be an area that would benefit more students in the classroom and require collaboration time between the science team and the special education team.

Summary

To answer the question: *What are the best practices to partner with and utilize special education teachers and paraprofessionals in a high school science classroom?*, the answer begins to emerge when the team of science educators, special education teachers and paraprofessionals are a part of a four-hour collaborative professional development that will build upon the foundation of sound co-teaching principles, be reflective about practices that have worked and have not worked in the past and create a framework for following through with this collaboration throughout the entire school year. It is crucial for educators to share their successes and to have an open dialogue when challenges arise. This collaboration needs to be centered around the success of students.

This project was started with a personal struggle to fully partner with and utilize the other educators in my classroom. Diving into the research, I found that I am not alone and although co-teaching is a great idea, if it isn't implemented with intention, it can quickly become ineffective for students. As I move forward, I will continue to find ways to make science accessible to all students in my classroom and expand to other classes and my school.

References

- Allen-Malley, M., & Bishop, P. (2000). The power of partners: two-teacher teams. *Schools in the Middle*, 9(8), 26–30. EBSCOhost.
- Brouck, E. (2007). Co-Teaching ... not just a textbook term: Implications for practice. *Preventing School Failure*, 51(2), 46-51. <https://doi.org/10.3200/PSFL.51.2.46-51>
- Brown, J. S., & Duguid, P. (2017). *The social life of information* (Updated, with a new preface ed.). Harvard Business School Press.
- Brusca-Vega, R., Alexander, J., & Kamin, C. (2014). In support of access and inclusion: Joint professional development for science and special educators. *Global Education Review*, 1(4), 37-52. Retrieved from ProQuest database. (Accession No. 1697485773)
- Calleja, C. (2014). Jack Mezirow's conceptualization of adult transformative learning: A review. *Journal of Adult and Continuing Education*, 20(1), 117-136. <https://doi-org/.ezproxy.hamline.edu/10.7227/JACE.20.1.8>
- Capizzi, A. M., & Da Fonte, M. A. (2012). Supporting paraeducators through a collaborative classroom support plan. *Focus on Exceptional Children*, 44(6), 1-16. Retrieved from EBSCOhost database. (Accession No. 72159112)
- Conderman, G., & Hedin, L. R. (2013). Co-Teaching with strategy instruction. *Intervention in School and Clinic*, 49(3), 156–163. <https://doi.org/10.1177/1053451213496158>
- Cook, L., & Friend, M. (1995). Co-Teaching: Guidelines for creating effective practices. *Focus on Exceptional Children*, 28(3). <https://doi.org/10.17161/foec.v28i3.6852>

- Cook, S. C., & McDuffie-Landrum, K. (2019). Integrating effective practices into co-teaching: Increasing outcomes for students with disabilities. *Intervention in School and Clinic, 55*(4), 105345121985573. Sage.
<https://doi.org/10.1177/1053451219855739>
- Devlin, P. (2008). Create effective teacher-paraprofessional teams. *Intervention in School and Clinic, 44*(1), 41-44. <https://doi.org/10.1177/1053451208318874>
- Dieker, L., Finnegan, L., Grillo, K., & Garland, D. (2013, December). Special education in the science classroom. *Science Scope, 37*(4), 18-22.
https://doi.org/10.2505/4/ss13_037_04_18
- Dieker, L. A., & Murawski, W. W. (2003). Co-Teaching at the secondary level: Unique issues, current trends, and suggestions for success. *The High School Journal, 86*(4), 1-13. Retrieved from JSTOR database.
- Dugan, K., & Letterman, M. (2008). Student Appraisals of Collaborative Teaching. *College Teaching, 56*(1), 11–15. <https://doi.org/10.3200/ctch.56.1.11-16>
- Education for All Handicapped Children Act, S. S.6, 94th Cong., 1st Sess. § 773 (Nov. 29, 1975).
- Ekli, E., Karadon, H. D., & Sahin, N. (2009). High school students attitudes and opinions regarding biology course and biological sciences. *Procedia - Social and Behavioral Sciences, 1*(1), 1137–1140.
<https://doi.org/10.1016/j.sbspro.2009.01.204>
- Giangreco, M. F., Yuan, S., & McKenzie, B. (2005). "Be careful what you wish for..." five reasons to be concerned about the assignment of individual paraprofessionals.

Teaching Exceptional Children, 37(5), 28-34.

<https://doi-org/ezproxy.hamline.edu/10.1177/004005990503700504>

Graziano, K., & Navarrete, L. (2012). Co-Teaching in a Teacher Education Classroom: Collaboration, Compromise, and Creativity. *Issues in Teacher Education*, 21(1), 109–126. ERIC. <https://eric.ed.gov/?id=EJ986819>

Hamilton-Jones, B., & Moore, A. (2013). Ensuring high-quality inclusive practices: What co-teachers can do. *Kappa Delta Pi Record*, 49(4), 156-161.

<https://doi-org/ezproxy.hamline.edu/10.1080/00228958.2013.845503>

Harris, S., Lowery-Moore, H., & Farrow, V. (2008). Extending Transfer of Learning Theory to Transformative Learning Theory: A Model for Promoting Teacher Leadership. *Theory Into Practice*, 47(4), 318–326.

<https://doi.org/10.1080/00405840802329318>

History twenty-five years of progress in educating children with disabilities through

IDEA. (2007, July 19). Retrieved April 28, 2020, from

<https://www2.ed.gov/policy/speced/leg/idea/history.html>

Individuals With Disabilities Education Act, 1400 U.S.C.C.A.N. Retrieved from

<https://sites.ed.gov/idea/statuteregulations/>

Keefe, E. B., & Moore, V. (2004). The challenge of co-teaching in inclusive classrooms at the high school level: What the teachers told us. *American Secondary*

Education, 32(3), 77-88. Retrieved from EBSCOhost database. (Accession No.

507922155)

Lave, J., & Wenger, E. (2018). *Situated learning: Legitimate peripheral participation* (29th ed.). Cambridge: Cambridge University Press.

Ledbetter, J. P. (2016). *Beyond "supervising" paraeducators: A community of practice about team leadership in special education*. Retrieved from ProQuest Dissertations and Theses database. (Accession No. 10107714)

McDuffie, K. A., Mastropieri, M. A., & Scruggs, T. E. (2009). Differential Effects of Peer Tutoring in Co-Taught and Non-Co-Taught Classes: Results for Content Learning and Student-Teacher Interactions. *Exceptional Children*, 75(4), 493–510. <https://doi.org/10.1177/001440290907500406>

McKenna, J. W., Muething, C., Flower, A., Bryant, D. P., & Bryant, B. (2015). Use and relationships among effective practices in co-taught inclusive high school classrooms. *International Journal of Inclusive Education*, 19(1), 53-70. <https://doi-org.ezproxy.hamline.edu/10.1080/13603116.2014.906665>

Mezirow, J. D. (2006). *Learning as transformation: Critical perspectives on a theory in progress*. San Francisco: Jossey-Bass a Wiley Company.

Minnesota education statistics summary [Fact sheet]. (2020, April 27). Retrieved April 27, 2020, from <https://public.education.mn.gov/MDEAnalytics/Summary.jsp>

Minnesota report card [Fact sheet]. (n.d.). Retrieved May 12, 2020, from <https://rc.education.mn.gov/#demographics/org>

Misulis, K. (2011). A place for content literacy. *Science Teacher*, 78(1), 47–50. EBSCOhost.

- Murawski, W. W., & Dieker, L. A. (2004). Tips and Strategies for Co-Teaching at the Secondary Level. *TEACHING Exceptional Children*, 36(5), 52–58.
<https://doi.org/10.1177/004005990403600507>
- Murawski, W. W., & Hughes, C. (2009). Response to intervention, collaboration, and co-teaching: A logical combination for successful systemic change. *Preventing School Failure*, 53(4), 267-277.
<https://doi-org/ezproxy.hamline.edu/10.3200/PSFL.53.4.267-277>
- Phelan, M. P. (2018). *General education science and special education teachers' experiences with inclusive middle school science classrooms* (Doctoral dissertation). Retrieved from ProQuest 5000 database. (Accession No. 10816481)
- Ploessl, D. M., Rock, M. L., Schoenfeld, N., & Blanks, B. (2009). On the Same Page. *Intervention in School and Clinic*, 45(3), 158–168.
<https://doi.org/10.1177/1053451209349529>
- Rice, N., Drame, E., Owens, L., & Frattura, E. M. (2007). Co-Instructing at the secondary level. *TEACHING Exceptional Children*, 39(6), 12–18.
<https://doi.org/10.1177/004005990703900602>
- Rodrigues, A. B. (2014). *Perceptions of co-teaching by content area and special education teachers with and without experience* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (Publication No. 3617811)
- Rytivaara, A., Pulkkinen, J., & de Bruin, C. L. (2019). Committing, engaging and negotiating: Teachers' stories about creating shared spaces for co-teaching.

Teaching and Teacher Education, 83, 225–235.

<https://doi.org/10.1016/j.tate.2019.04.013>

Scruggs, T. E., Mastropieri, M. A., & McDuffie, K. A. (2007). Co-Teaching in inclusive classrooms: A metasynthesis of qualitative research. *Journal of Research in Science Teaching*, 73(4), 392-416.

<https://doi-org.ezproxy.hamline.edu/10.1177/001440290707300401>

Staples, K. A. (2013). Paraeducators transition from silent partners to collaborators with science teachers in urban middle schools. *Journal of Science Education for Students With Disabilities*, 17(1), 1-11. <https://doi.org/10.14448/jesed.06.0002>

Strieker, T., Gillis, B., & Zong, G. (2013). Improving pre-service middle school teachers' confidence, competence, and commitment to co-teaching in inclusive classrooms. *Teacher Education Quarterly*, 40(4), 159. Retrieved from Gale OneFile: Educator's Reference Complete database.

Thorton, A., McKissick, B. R., Spooner, F., Lo, Y.-Y., & Anderson, A. L. (2015). Effects of collaborative preteaching on science performance of high school students with specific learning disabilities. *Education & Treatment of Children*, 38(3).

Retrieved from Gale Academic OneFile Select database. (Accession No. GALE|A438130118)

Vygotsky, L. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Wasburn-Moses, L. (2005). Roles and responsibilities of secondary special education teachers in an age of reform. *Remedial and Special Education*, 26(3), 151–158.

<https://doi.org/10.1177/07419325050260030301>