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Co-Teaching and Inclusion in Upper Level Secondary Science Classrooms

by

Megan Weeks

B.Sc., University of British Columbia (Okanagan), 2016

B.Ed., Simon Fraser University, 2017

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William McGann, Thesis Faculty Supervisor   Date:
Faculty of Education,
Vancouver Island University

Dr. David Paterson, Dean, Faculty of Education   Date:
Vancouver Island University

Abstract

Although inclusion is becoming more widespread in Canada, little progress has been made in making upper level science courses accessible to all students in secondary schools. All students require and deserve access to science courses to help them understand the world around them. Collaborative action research was conducted in an effort to investigate the research question: how can co-teaching support inclusion in upper level science classrooms? The researcher, a special education and trained science teacher, partnered with a classroom teacher to co-teach a diverse physics 11 classroom. Numerous co-teaching methods were explored such as the one teach one support, parallel, teaming, and station models. Data was collected through pre- and post-interviews, audio and video recordings of weekly collaborative planning meetings, and a researcher journal. Five themes were evident throughout the data: time, assessment, support for teacher, co-teacher dynamics, and classroom management. The completed collaborative action research had positive results in improving teacher capacity and confidence in creating inclusive classrooms and making upper level science accessible to all students. Suggestions for practice and future research are provided based on the co-teaching experience and interpretation of the data.

Keywords: co-teaching, special education, inclusion, upper level science, secondary science, collaborative action.

Acknowledgements

TABLE OF CONTENTS

Chapter 1

Introduction

Science is an essential element of the curriculum throughout grade school for all mainstream students. When students enter their final years of secondary school, they are given numerous options for upper level science courses to select. For example, physics, chemistry, biology and earth sciences are commonly offered. Not only do students require either a grade 11 or 12 science course to graduate with a Dogwood Diploma (British Columbia Ministry of Education, 2019), but also post secondary schools list many of these courses as requirements for admission. Students with exceptionalities are too often not included in upper level science courses, resulting in a loss of opportunity and experience that could have a lasting impact on reaching their full potential.

Transitioning to Inclusive Education

Education systems within North America have made great progress towards inclusive education; however, there is an assumption that when new policies are instituted, teachers and students will automatically adjust (Lupart & Webber, 2012). Changes to systems as large as education require time and effort from numerous parties. Lupart and Webber (2012) argue that successful reform requires collaboration between all members of the education community and that inclusive classrooms cannot be created within an education system that has not yet undergone reform.

Traditionally, special education has provided extra, separate services to individuals with diverse needs (Cook & Schirmer, 2003); on the contrary, inclusive classrooms are generally viewed to involve all students regardless of their particular needs. Learning assistance or student services teachers have the responsibility of organizing the implementation of services to support

classroom teachers and students based on needs, not categories or subject areas (British Columbia Ministry of Education, 2016). Brantlinger (2004) explains that our ideologies help us to imagine inclusive classrooms, but it is important to note that ideologies might vary between individuals. For example, Katz (2013b) argues that there is a difference between social inclusion and academic inclusion; educators need to be aware of this distinction. Some frameworks, such as Universal Design for Learning (UDL), have been developed and widely accepted. UDL is "a promising call to action" (Katz, 2012, p. 15) where teachers plan from the outset for learning to be accessible to all students. Research and practices that assist the transition to inclusive education continue to expand.

Inclusion in Upper Level Science

Although progress has been made towards inclusive education, numerous areas of education are still at the beginning of their reform. For example, upper level sciences in secondary school, defined as grade 11 and grade 12 studies of specific science topics, are perceived as exclusive. In other words, there is a common belief that students with diverse needs do not have a place within upper level science classrooms. Essex (2018) explains that science "appears to have retained its identity as a subject for the most academically able pupils" (p. 67). Moreover, McGrath and Hughes (2018) argue that students are not inspired to continue their studies within science. The common theme of academically inclined students being the only type of individual enrolled in upper level science classes could contribute to the lack of research regarding students with disabilities in these particular classrooms. More specifically, much of the research involves younger students, such as elementary or middle school age, or other subject areas like mathematics (Kaur et al., 2017; McGrath & Hughes, 2018). Younger students may demonstrate smaller gaps socially and academically, in turn allowing for fewer challenges and

increased opportunities for inclusive practices. The majority of subjects are taught within the same classroom in elementary grades, while all subjects require enrolment in a separate classroom at the secondary level. As a result, creating an inclusive space at lower grade levels can provide access to a student for an entire school year, but an inclusive space at a secondary school is only a fraction of the student's day in class for part of the year. The inclusion of students with disabilities in upper level science courses is an area that needs to be further investigated because just like every other student, the knowledge and skills learned in science classrooms help students understand the world around them (McGrath, & Hughes, 2018; Slemrod et al., 2018; Taylor et al., 2018). For example, a big idea in the physics 11 curriculum in British Columbia states: "An object's motion can be predicated, analyzed, and described" (British Columbia Ministry of Education, 2018, p. 1). A student can explore the idea of uniform motion compared to acceleration, or a consistent movement versus an object speeding up or slowing down. This big idea can be applied to a topic of interest to a student, or even be connected to learning life skills such as community safety by discussing movement of public transportation.

Inclusion in upper level science classrooms largely relies on the classroom teacher. Consequently, it is essential to look at the improvement of teacher training and efficacy in order to advance the quality of education and opportunities for all students. The lack of teacher training and resources to support inclusion of students with disabilities are a commonly agreed upon issue (Irving et al., 2007). To add to this issue, it is noted that special education teaching has become an entry-level position in many cases (Brantlinger, 2004). For example, Irving et al. (2007) surveyed 120 teachers in Washington, D.C., USA and although over 40 percent had a bachelors degree and over 30 percent earned a masters degree, not a single educator had special education

training. Moreover, over 30 percent had less than 4 years of teaching experience and 20 percent had between five and ten years experience.

Fears and assumptions compound quickly when teacher efficacy is low. First, there is the assumption that inclusive classrooms are more demanding because they add more responsibilities for the classroom teacher (Irving et al., 2007). Teachers might worry how inclusion affects instructional time and achievement standards. More specifically, educators may worry that some students may require personalized instruction, taking time away from general education students and potentially lowering their personal success in the course. Cooc (2019) argues "changes in instructional time in classrooms with students with disabilities are likely contingent on the skills of teachers and not necessarily on having more students with disabilities" (p. 274). Similarly, Rizzo and Taylor (2016) explain that explicit instruction and increased support likely leads to greater success in inclusive science classrooms. Unfortunately, "there is less research on how inclusion may affect teachers, specifically their use of instructional time" (Cooc, 2019, p. 274). Therefore, there is a need to invest in teacher training and the allocation of resources to support inclusion in upper level science classrooms.

Special Education and Upper Level Science

Special education and upper level secondary science courses do not traditionally overlap often, but the time has come to blend inclusion with these general classrooms. There are some barriers to inclusion in upper level science courses. First, students do not always receive the accommodations that are recommended and required for them (Slemrod et al., 2018). A lack of support can result in behavioural issues (Slemrod et al., 2018), which classroom teachers may view as intimidating or disruptive. Slemrod et al. (2018) encourage collaboration between science and special education teachers in an effort to effectively support all students. A lack of

collaboration "limits the implementation of effective practices to isolated teachers who are extraordinarily skilled, dedicated, or both" (Cook & Schirmer, 2003, p. 203). However, the use of researched interventions, supports, and instructional strategies are available to all teachers and are a reasonable place to start.

As previously mentioned, using a UDL approach to teaching and learning asks teacher to "ensure that course materials, notes, and other information resources are engaging, flexible, and accessible for all students" (Katz, 2012, p. 15). The use of UDL is not restricted to classrooms including students with disabilities; "Techniques that are effective for students with disabilities are generally effective for all students" (Cook & Schirmer, 2003, p. 202). In other words, students can access the curriculum when it is represented in multiple ways, which in turn recognizes the fact that each individual learns differently (Tyler, 2011). Although some students will be successful regardless of instructional style, those with disabilities are disadvantaged and are not likely to succeed without them (Cook & Schirmer, 2003). As technology becomes more readily available, educators have the means to represent information in a variety of ways (Rose & Gravel, 2012). Again, this variety is going to reach more students than only those who are designated. Cook and Schirmer (2003) reviewed literature and discovered that there are a significant amount of interventions and practices that are designed for students with all types of disabilities. These practices and interventions are effective for all students in any educational context, including upper level sciences.

Importance for Students

The importance of students with disabilities being included in upper level secondary science classes must be emphasized. These students consistently show educators that they can outperform expectations when supported effectively. Widespread, genuine inclusion is required

to give students the opportunity to excel. For students with or without disabilities, inclusion in any classroom brings opportunities to connect with peers and learn from one another. All students can benefit from science by expanding their understanding of the world around them. In addition, the completion of upper level science credits can be necessary for future opportunities such as post secondary education programs. British Columbia's redesigned curriculum works on competencies, which are multidisciplinary and work to give students lifelong skills and knowledge they require for opportunities such as post secondary education. For example, a student who is interested in computers might connect with the energy unit in physics 11 where they can explore simple machines and electric circuits (British Columbia Ministry of Education, 2018). This student can showcase their strengths, possibly through inquiry and participating in a hands-on assignment. Exposure and appropriate access to the ideas, skills and knowledge in physics 11 courses can spark curiosity and encourage this student to pursue their passion of computers. Moreover, the credit earned would likely be required for admission to a computer-based program in post secondary school. To start, all students need to be explicitly told that they are welcome and will be supported in upper level science classrooms (Essex, 2018), giving them the access they need to gain competencies and skills in science classes that benefit them in daily life.

Importance for Teachers

Cook and Schirmer (2003) state: "special education, like any other service or profession, is admittedly imperfect" (p. 200). Teachers are also admittedly not perfect; however, with their commitment to life long learning comes the responsibility to reflect and adjust to the needs of their students. Cook and Schirmer (2003) predict that there will always exist students with exceptional needs, so it is important to continually invest in ways to support all learners. Many

students struggle in science classrooms, but effective teaching is not consistently implemented at this time (Essex, 2018). Successful reform in education requires both short- and long-term planning (Lupart & Webber, 2012). With that said, teachers are in need of support and most are open to receiving help. For example, in the survey by Irving et al. cited earlier, all 120 participants responded confirming that they wanted help in the form of strategies, resources and materials. Lupart and Webber (2012) note that due to the lack of teacher training, it should not be assumed that teachers have the skills and knowledge they require to be at the forefront of educational reform in the form of inclusion. Consequently, it is essential that educators be provided the support and skills they require to continue to work towards genuine inclusive classrooms.

Inclusion in the Transition to Post Secondary

Inclusion in science is required at the secondary level to ensure all students have the opportunity to enrol in post secondary programs of their choice. Universities are looking to expand their science and engineering programs to include students with disabilities as the demand within these industries increases (Lawler et al., 2018). The number of students with disabilities attending post-secondary school in Canada has dramatically increased over the past few decades (National Educational Association of Disabled Students [NEADS], 2018); however, NEADS notes that this coincides with the fact that there have been significant increases in students with diagnoses. British Columbia is considering disability legislation, which could impact documentation that ensures accessibility and accommodations for students with disabilities in post-secondary schools (NEADS, 2018).

Personal Background

As a student, peer, tutor, volunteer, colleague and teacher, I have always expressed a passion for education; I wanted to become a teacher for as long as I could remember. As a young adult I became interested in sciences and mathematics, which led me to pursue a Bachelor of Science in Physics. I was hired as a counsellor for BC Easter Seals summer camps soon after graduation. That summer the campers who motivated me to step outside my comfort zone and learn how to support them inspired me daily. As I transitioned into my teacher education program, I began to consider the school experiences of these children and developed a concern regarding how they are supported in classrooms and what opportunities are made available for them. After numerous student services positions and two international experiences, I settled in a skill development and student services role at a secondary school.

I have always enjoyed opportunities to work and play with individuals with disabilities; however, due to the undeniable disconnect between individuals with exceptionalities and the study of sciences, I had little opportunity to connect with peers with disabilities. During my later years in secondary school and my undergraduate classes I participated in science classrooms where students with disabilities were rarely included. Consequently, I was not able to make connections to peers with disabilities for many years of my education. Now that I am in a student services teaching role, I am role modeling and mentoring colleagues in supporting students on my case load in their classrooms. Conversations and collaborations are ongoing, which have resulted in increased openness from colleagues and improvements in their inclusion practices. There is still a significant journey ahead until inclusion in upper level science classrooms becomes status quo. My focus on the issue of inclusion in upper level secondary science classrooms stems from wanting the best for my students and ensuring that they are given all possible opportunities to flourish as learners.

Overview of Study

This study will involve a multi-stage collaborative action research inquiry with a focus on implementing strategies and processes that will lead to individual teacher practice and school change. The research question for this study is: *how can co-teaching support inclusion in upper level science classrooms?* The goal is to create knowledge that will aid in supporting teachers and students in the transition towards inclusive, upper level science classrooms.

The proposed research will use a collaborative action approach. Collaboration will occur between the researcher and a participant, who together will act as co-teachers in an upper level secondary science classroom. The cycles of the action research model will require the co-teachers to meet and collaboratively plan for an inclusive classroom. Formal meetings with data collection will occur weekly, while the researcher keeps a journal throughout the study. The participant will be asked to respond to pre- and post-interviews.

This proposed research will contribute to the reform of education in science (Irving et al., 2007) by working towards the expansion and quality of inclusion in upper level science classrooms. The research and its findings have the potential to have an impact on students and educators. This study will contribute knowledge related to strategies and teacher practices that are effective for supporting students with exceptionalities in upper level science courses. It is hoped that the proposed research will encourage the teacher participant to continue to provide support and opportunities for all students to access upper level science courses. Moreover, the knowledge created and collaborative action research processes could contribute to the transfer to additional school contexts, resulting in an interest in increasing access to and success in upper level science courses for all students. Answers to the research questions could result in better support for students and teachers, in turn improving relationships between staff and building

rapport with students and parents. If students are able to enrol in all courses, scheduling could become more flexible at the school level. In the short-term the research could encourage improvements with the involved school and classrooms. Furthermore, this could spread school- or district-wide, or even impact future teacher education programs. In the long term, there might be a focus on improving the frequency of enrolment and experiences of students with disabilities in upper level secondary science courses

      There are a few known limitations regarding this study to be addressed. First, a small sample size limits the findings to the specific context of the research, causing it to not be generalizable. Second, the participants (co-teacher and researcher) are self-reporting throughout data collection, so the reported findings will inevitably be biased as they are rooted in personal perceptions. Lastly, the current regulations in schools due to the global pandemic will restrict the research in a number of ways: limiting the number of students in classrooms, restricting the sharing of materials, set seating plans, reduced instructional time, and a blended in person and online learning quarter system all limit potential co-teaching methods and activities.

Chapter 2

Literature Review

This literature review was completed based on the investigation of the effects of co-teaching on inclusion in upper level secondary science classrooms. The review is organized by first including a theoretical discussion, which includes some history that has influenced inclusion and will provide background information. Current research supports and explains planning for an inclusive classroom, general attitudes and approaches towards inclusion, and perceptions and strategies for inclusion and co-teaching. Finally, a conclusion summarizes the literature review, which informs the study and explains how it will add knowledge to the field of education.

Transition Towards Inclusive Classrooms

The transition towards inclusive classrooms is an educational reform that has been gaining momentum for decades. Students with disabilities were traditionally institutionalized or segregated, but support for inclusive classrooms started as early as the middle of the 20th century: "During the 1960s nearly everyone associated with education rejected the existing practice of housing and educating students who were different in institutional settings" (Edmunds & Edmunds, 2014, p. 12). The *Canadian Charter of Rights and Freedoms* provision of section 15 came into effect in 1985, which has consistently been recognized as guiding the placement of special needs students in the most appropriate educational setting (Edmunds & Edmunds, 2014; Poirier & Goguen, 1986; Seigel & Ladyman, 2000). However, it is important to note that individual provinces and territories in Canada create and implement their own policies and guidelines regarding education (Edmunds & Edmunds, 2014). Poirier and Goguen (1986) describe British Columbia's education laws as being "permissive," meaning they are "laws which merely permit school boards to provide educational services to students with special

needs" (p. 233). Although this description may be out-dated, it continues to be true that the province of British Columbia gives school boards the autonomy to interpret and decide how best to provide supports for students with special needs. Many school districts have adopted needs-based models for assigning resources, such as support staffs, to individual schools. Students with physical limitations or safety needs take priority when allocating district resources and many other individuals require additional supports. Although the general classroom is the first option to be considered, inclusion does not always result in full days in regular classrooms with same-aged students (Edmunds & Edmunds, 2014). School reforms, isolation and negligible opportunities for collaboration in the late 20th century left teachers with low morale and efficacy, as they were ill equipped to carry out this significant change (Lupart & Webber, 2012). Lupart and Webber (2012) argue that diverse learners need general classroom teachers to be equipped with specialized education techniques in order to support effective change towards inclusion.

Although it is known that all individuals have the right to access education, "rights breaches in education still frequently occur, even in more privileged contexts" (Graham, 2019, p. 81). Rooted in history is the misconception that some youth are educable while others are unable to profit from an education (Graham, 2019). The history of special education continues to influence society's attitudes towards inclusion (Graham, 2019). However, there are growing expectations of inclusive education in North America, which have led to slow yet steady improvements (Grynova & Kalinichenko, 2018). As Graham (2019) explains, this means that students with exceptionalities continue to face barriers to accessing education that uses a universal design approach. In British Columbia, the most recent redesigned curriculum moves away from a focus on content and towards core competencies, which has the potential to break down barriers that limit access for students with exceptionalities. Highlighted in this new

curriculum is the opportunity for "personalized learning" and "flexible learning environments" (British Columbia Ministry of Education, n.d.), meaning the teacher has the autonomy to adjust the learning to meet the needs of all students. With this autonomy comes great responsibility, but educators have the opportunity to continue the trends of improving inclusive education, including in upper level science classrooms.

Planning for Inclusive Classrooms

Each child is on their own unique developmental journey that is influenced by maturation processes and learning (Empson et al., 2004). There are numerous developmental theories that attempt to explain how a child's development may be considered "atypical." For example, Sameroff and Mackenzie (2003) explain the transactional model of development as viewing the child as a product of their interactions and experiences, which will inevitably vary for each individual. Moreover, the ecological theory of development is multidimensional and considers the strengths and vulnerabilities in relation to the individual's specific context (Empson et al., 2004). Understanding some of these theories and developmental processes can help guide our planning for diverse classrooms.

Edmunds and Edmunds (2014) argue that too much emphasis is on the word "special" within special education, and that the term simply means that good teaching is happening to support more diverse learners. When this idea is emphasized, teaching students with special needs becomes a practice that can be expected of teachers. There are many approaches to planning for inclusive classrooms that make the regular classroom a more viable option for students with special needs. First, the inclusive classroom must promote belonging for all students. Optimally the classroom will be a safe space that encourages students to make mistakes, collaborate, be empathetic and understanding, and recognize personal and peers'

strengths (Brownlie & King, 2011). Brownlie and King (2011) explain that when students feel they belong, it "moves students to act in an inclusive way, change behavior, go out of their way for others, and appreciate others for who they are" (p. 19). Katz (2013b) argues that all students experience social and academic benefits from inclusive classrooms. Given that inclusion has undeniable benefits for all students, the focus is on the pedagogy and instructional approaches to facilitate inclusion (Katz, 2013b). Katz (2012) believes that the Universal Design for Learning (UDL) is the inclusive approach to planning for all learners. UDL plans with diverse learners in mind, but what works for these individuals often expands to benefit the class as a whole (Rose et al., 2014). Consequently, the fact that UDL designs options for all students from the beginning planning stages means that the learning is more accessible for everyone throughout the learning stages (Rose et al., 2014). UDL can be intimidating and unfamiliar to some educators, but it is accessible for all through resources such as online self-directed courses, resources and examples (Special Education Technology British Columbia, 2019). Inclusive classrooms require educators to inspire and discover new ways for students to demonstrate their competencies (Levine, 2002).

General Attitudes and Approaches Towards Inclusion

Schools are experiencing increasing pressure to educate students in a way that provides them with a wide assortment of skills which allow our youth to experience success and adapt to various contexts (Erkens et al., 2019). Brownlie & King (2011) argue that youth have basic needs that need to be met before they are ready to develop intellectually; moreover, these children need to feel a sense of belonging within a classroom in order to foster motivation to learn. The inclusive classroom and its accompanying approaches help educators consider that the variation within their students does not warrant identical expectations for learning (Levine, 2002). Furthermore, British Columbia has moved towards a competency-based curriculum,

which means that authentic learning is not rote memorization for the purpose of written output. For example, science students might be evaluated on not just what they know about science, but how they demonstrate that they can think like scientists (Erkens et al., 2019). Inclusion gives everyone the opportunity to learn because each individual benefits from learning knowledge and skills within a specific topic (Levine, 2002). Experts within the field, such as Shelley Moore, offer resources and experiences to support inclusion. For example, her *Place Alignment Planner* (Moore, 2018) supports educators in being purposeful while planning classroom activities with each individual in mind. In addition, *The Baked Potato Planning Pyramid* (Moore, 2019) helps ensure that there is an access point, or a learning goal that is appropriate for *all* students.

There is some research that investigates teachers 'attitudes towards inclusion. Sokal and Sharma (2013) collected information from 99 schools and 131 in-service teachers, who taught grades kindergarten through eight, in Manitoba to identify connections between teacher perceptions and teaching in inclusive classrooms. The in-service teachers responded to questions regarding demographics, attitudes toward inclusion, concerns about inclusion, and teacher efficacy for inclusive practice. An initial correlation analysis was used to determine variables that were correlated to attitude, efficacy and concern scores. This analysis indicated training in special education helped participants have increased positive attitudes about including designated students in general classrooms. Moreover, if respondents felt confident teaching diverse students, they expressed being more open to including designated students in general classrooms and teaching efficacy improved overall. The findings of this study are limited due to the lack of verification regarding participant responses.

Perceptions and Strategies for Inclusion in Science

Inclusion is a topic of interest for many educators, parents and students around the world; however, there is limited research concerning inclusion, specifically in science classrooms. Essex (2018) and Irving et al. (2007) explore teacher perceptions of inclusion in science and ways of supporting diverse learners in science classrooms. Essex (2018) collected voluntary questionnaires from teachers and support staff regarding their perceptions of how students with special needs engage with science outreach. Essex (2018) identified through their research the opportunities and barriers that students with disabilities face when they are included in science learning. Irving et al. (2007) contribute to the focus of science inclusion with their investigation of "Meeting the Needs of the Special Learner in Science." The researchers asked secondary science teachers to respond to a survey regarding teaching strategies, resources, and actions used to support special learners in science classrooms. The results of this study were recommendations for instructional methodologies that teachers should use to better support diverse learners in science. These studies offer perceptions, opportunities, barriers, strategies, and resources that enhance science learning in inclusive classrooms.

Essex (2018) issued questionnaires, which were answered voluntarily, to staff that accompanied their students to four outreach chemistry festivals: three of the events were intended for students with special needs. There were 21 educators who responded to the survey, a small sample size, and only 11 were from the events differentiated for students with disabilities; almost half of the respondents were not explicitly accompanying special needs students to the events. The type of question varied with closed response questions tallied and open response questions clustered. Common themes were identified: the purpose of science for different learners, common notions of what science is, and that educators of students with

special needs felt that their students faced more barriers to science than students in general classrooms. The author uses language such as "appears" and "seems" when describing results, making the reader question their validity. Essex (2018) concludes by stating the important message: "science educators need to revise the hidden messages that they convey about the accessibility of the subject and to signal much more unequivocally that they are teaching 'science for all'" (p. 67). In other words, regardless of the extent to which inclusion is promoted and the commitment of special education staff in supporting each individual, students with exceptionalities continue to face numerous barriers to accessing science and experience humiliation when they participate in science programs.

Irving et al. (2007) asked 120 secondary science teachers to respond to a survey to investigate how teachers without specific training can adjust their methods to meet student needs, what resources can be used to support learning, and what the teacher needs to do in general to effectively teach special learners. The study included a pre- and post-test following training sessions adding to a total of 50 hours, with only six hours dedicated to diverse learners, as well as classroom observations for 76 of the teachers. The researchers summarized their findings as a list of six effective instructional methods, including ideas such as designated learning areas, connecting to prior knowledge, providing structure, consistent formative assessment, use of technology, and learning in small groups using cooperative strategies. It is noted that all students can connect with and be inspired by science when they are able to make connections to their personal life experience. The authors did not acknowledge any limitations for their study. There is some missing information regarding data collection, such as who was doing the in-class observations and how that data was

collected and interpreted. However, this intervention case study was thoughtful and long-term, convincing the reader that further research is worthwhile.

Both studies used a survey format and argued a need to learn what teachers require to better support students with diverse needs in their classrooms. Essex (2018) and Irving et al. (2007) resulted in suggestions of what teachers need in order to facilitate the transition to inclusive classrooms, particularly in science. When considered as a whole, the research reviewed verifies a need for schools and districts to take action in providing professional development, support, and resources to in-service and experienced teachers in order to foster inclusive classrooms, thus providing better learning opportunities for students with diverse needs.

Co-teaching and Inclusion

Co-teaching has been researched in a variety of settings, but its connection to inclusion of students with special needs is only beginning to be addressed, especially in secondary schools (Weiss & Wills Loyd, 2002). Weiss and Wills Loyd (2002) interviewed and observed six educators who were participating in co-teaching to help them describe co-teaching and its varying strategies. Through their research they identified four different roles regarding the special educator in co-teaching: providing support, teaching the same content in separate rooms, providing a segment of instruction to the class, and teaching as a team. Moreover, they identified four factors that influenced these roles: "(a) scheduling pressures, (b) content understanding, (c) acceptance by general educators, and (d) the skills of the special needs students" (p. 65). When compared to special education teachers in separate classrooms, the co-teachers were not as explicit with their supports. More specifically, special education teachers provided explanations,

asked questions, and gave help and feedback that were all more detailed than what the co-teachers delivered.

Shin et al. (2016) explain that co-teaching is an educational method that is used to support students with exceptionalities in inclusive classrooms. They also defend the fact that co-teaching does not reach its full potential of effectiveness in practice; consequently, Shin et al. (2016) reviewed qualitative studies to understand how teacher candidates perceive the co-teaching experiences they are offered during their practicums. The authors chose 11 studies, which met their criteria of inclusion, and coded them to identify common themes. The studies highlighted the need for reciprocal communication and shared planning time. A common theme of lack of training for co-teaching at the university level was evident and resulted in recommendation for these skills to be considered for teacher training programs.

Co-teaching is popular enough that it is investigated worldwide. Murphy and Beggs (2006) investigated the effects of teaching and learning science with co-teaching between student teachers and classroom teachers in primary schools in Northern Ireland. The authors explained co-teaching as a method that is used specifically to prepare science student teachers during their training. The student teachers initially co-taught a total of ten half days as well as during their longer practicum experiences in the following semester. The planning, teaching and evaluations were all completed in collaboration between the student teacher and classroom teacher. The most significant finding came from a survey regarding enjoyment of learning science that was given to students approximately six months after co-teaching concluded. The results of the survey, when compared to peers that did not participate in co-taught classrooms, were that the students "were significantly more positive than other children about their science lessons" (p. 7). The level of student enjoyment was validated by student teachers 'and classroom teachers 'journals. The

authors did not discuss the effectiveness of co-teaching as they did for the level of enjoyment.

Akcamete and Gokbulut (2018) investigated classroom teacher opinions on inclusion and co-

teaching in Turkey. They conducted qualitative research by using a semi-structured interview to

collect data from 18 teachers at the elementary level. The researchers provided an interesting

response from the classroom teachers: they view support from a teacher trained in special

education as "an effective coping strategy" (p. 797). The negative responses to co-teaching

included concerns about the effect on student performance, a reduced performance of both

teachers, that co-teaching may district the students, and that teachers might not be comfortable

working together. On the contrary, the positive responses valued inclusive practices, including

maximizing the amount of time students spend in the general classroom with their peers, having

the opportunity to enrich their own practice, providing more teacher time to all students in the

classroom, and the possibility of a reduced workload. Akcamete and Gokbulut (2018) concluded

that teachers in this region are not ready for co-teaching yet, but recommended that teacher

candidates be exposed to co-teaching experiences and that a proper pilot program applying co-

teaching should be implemented and evaluated.

Multiple studies explore the different forms of "co-teaching" or "team teaching" (Embury,

2010; Weiss & Wills Loyd, 2002) in various educational contexts, including with English

language learners and speech and language pathologists (Conderman et al., 2009). Co-teaching

allows teachers to learn from one another and grow as educators (Murphy & Beggs, 2006),

which can be described as "a built-in teaching development system" (Plank, 2011, p. 7).

However, Plank (2011) warns that the opportunity to co-teach is not always available, nor is it

always the most fitting option. On the contrary, Katz (2013a) argues that although some resource

teachers are hesitant to give co-teaching a try, acknowledging that best practice is including all

students in classrooms often results in the resource teacher being present as well. In order to create a working dynamic between co-teachers, both teachers must teach all the students in an effort to generate equal ownership (Conderman et al., 2009; Katz, 2013a). According to Katz (2013a), co-teaching provides the opportunity to achieve two essential goals: first, to provide social and academic support to each student, and second, to grow the classroom teacher's abilities to support diverse learners in their classrooms. Co-teaching allows for the removal of barriers to accessing classrooms, not the standards of achievement (Wilson, 2016).

Conclusion

Considering historical and theoretical events and perspectives have guided education systems within Canada to view inclusion as a necessity. The evident inclusion practices have encouraged many researchers and specialists to create models and resources, such as UDL, to support the movement towards inclusive education. While there is a lot of support for inclusion, there are feelings that barriers still exist with accessible science for special needs students and their teachers (Sokal & Sharma, 2013). Current research in science inclusion and co-teaching exist, but there is very little research concerning the effects of co-teaching on science inclusion, especially in upper level secondary science. Katz (2012) explains that teachers, although they are seeking knowledge to improve their practice, are only provided with small amounts of information at professional development, leaving them wondering what the big picture looks like. The regular classroom is the first option for placement for all students (Edmunds & Edmunds, 2014), so it is worth investigating if co-teaching can make the general classroom an authentic option. Brownlie and King (2011) argue that students require a connection with adults at school to develop a sense of belongingness; more than one adult in the classroom could increase the probability of a connection. Students who are discouraged from upper level science

courses are reducing future opportunities such as post secondary programs or specific training. Co-teaching could give students and teachers opportunities to work, learn and grow together. Although co-teaching has not always been the perfect solution for every context (Plank, 2011), this cannot be ruled out in upper level secondary science classrooms due to a lack of research in this specific area.

Chapter 3

Methodology and Methods

Students with disabilities experience low levels of inclusion in upper-level secondary science classrooms. Moreover, there is a lack of staff that is able to support students in this high level of academics. McNiff (2016) explains that students who refuse what is being taught are often seen as disobedient, when in reality the students are trying to express their own logic and difficulties they are having with the learning. Educational reform is required to implement authentic inclusion where classrooms are "learning environments where diverse learners can be socially and academically included and teachers can grow and develop alongside them" (Katz, 2015, p. 17-18). Consequently, the research question posed is: *How can co-teaching support inclusion in upper level science classrooms?* The research will be approached as collaborative action research. The following sections describe the proposed research methods.

Research Process

Action research is a collaborative, commonly used method for research (Cohen et al., 2018). Overall, action research asks the researcher to evaluate their personal practice and explore ways to make improvements (McNiff, 2016). This research proposes to examine the issue of inclusion in upper level secondary science classrooms; therefore, the researcher is looking to develop their practice in ways that address the research question and advocate for improvements to be made within the context of their school (Cohen et al., 2018). More specifically, McNiff (2016) explains that the goal is to demonstrate courses of learning at the personal and collaborative levels, which hold potential to further educate the researcher and those within their wider context. Although educational practice does not need to be flawed to improve (McNiff, 2016), as life long learners, teachers involved in action research seek to make progressions in

their practice (Cohen et al., 2018). Action research provides an opportunity to ensure that we take appropriate action to work towards a vision of an improved future (McNiff, 2016). This approach allows educators to pose problems and attempt to solve those problems using methods that are flexible and respond to the situational context (Cohen et al., 2018).

Action research is a cyclical process where a researcher and their participants identify questions or issues and take action, then reflect and revise to make further improvements. Cohen et al. (2018) outline an eight-step process to conducting action research: first, identify the problem; second, discuss and negotiate with involved peoples and draft a proposal; third, review the literature; fourth, reevaluate and modify the initial problem; fifth, select research methods; sixth, choose evaluation for data; seventh, implement the intervention; and eighth, interpret the data. Action research requires participation from interested parties; therefore, in order to encourage others to be critical of their own practice, the researcher must demonstrate their ability to engage in dialogue and self-critique (McNiff, 2016). Not only are participants aiming to improve their teaching, but also they are developing a heightened level of self-awareness (Cohen et al., 2018). The researcher is not responsible for the learning of participants, but has the responsibility to encourage participants to reflect on their own behaviours, make changes, and share their learning (McNiff, 2016).

Action research is collaborative in nature; therefore, participants create knowledge of their practice throughout the experience (McNiff, 2016). In other words, the conducted research offers valid explanations for how one can continue to make improvements to their teaching (McNiff, 2016). Individuals will have personal knowledge from experience and values; consequently, they can decide whether or not they will be influenced by the knowledge presented (McNiff, 2016). One's epistemological values may vary between individuals, so the researcher

must be diligent and thorough in the discovery and presentation of knowledge created. The validity of knowledge claims in action research must demonstrate consideration of the values of others and show how these negotiated values influenced the direction of the research (McNiff, 2016). McNiff (2016) explains that through action research, the researcher has the capacity to influence change in their context through development of their own and others learning.

Participants

Participants who are willing to collaborate are an essential component to action research. Cohen et al. (2018) note that action research often increases the workload of the participants, so the researcher has the responsibility to ensure that the research involves reasonable requests and follows ethical procedures. McNiff (2016) suggests that the participants are invited to also do action research of their own and that researchers clarify that they are studying themselves, not the participants.

The researcher begins by applying to the Research Ethics Board (REB) at Vancouver Island University to gain approval for the proposed research. After the REB approves the research, a colleague will be informed of the research through a formal letter (see Appendix A). If the colleague has expressed interest, they will be asked to participate in the collaborative action research and will be presented with a research ethics consent form (see Appendix B), which will be signed and copied. Students will be clustered in classes for co-teaching; however, this is the norm for scheduling in order for the students to receive necessary additional support. There are ethical risks involved in the research. The participant has the right to the confidentiality of their identity (McNiff, 2016). A colleague on staff being able to identify the participant is an issue. Some responses to questions may be answered in a way that is critical of the school or district and their policies, or even the participant's practice, which could result in

loss of status, reputation, or embarrassment. The participant will not be directly identified unless they want to be and permission is given in writing. Any identifying information and comments will be edited or removed from transcripts and will not be included in the research findings. Moreover, the school and district will not be named. Involvement in the research will be completely voluntary and the participant will always be in control of their contributions. This means that the participant will be given opportunities to review any transcripts from data collected with the option to withdraw comments. The participant can request revisions of the data collected at any point throughout the research. Data will be stored digitally in password-protected folders on the researcher's device. The participant will be asked for informed consent at the beginning of the research and will be continually informed throughout the action research process.

Data Collection

Action research requires collecting data in a way that is flexible and can adapt as plans and actions evolve throughout the research. The data collected must demonstrate the learning of the researcher and participants and how the learning influenced the progression of actions taken (McNiff, 2016). There are multiple forms of data collection to be used in this research: video and audio recordings of digital meetings and interviews, and a researcher journal. The researcher journal will be in a digital format, and all data will be stored on the researcher's computer.

The participant will be asked for an interview in a digital format preceding and following the research (see Appendix C). McNiff (2016) argues that interviews are an important means of data collection for action research; moreover, interviews allow the researcher to probe to provide specific, rich data. The purpose of the pre-research interview is to identify the participant's existing views and understandings of inclusion in upper level secondary science courses. The

post-interview will ask the participant to identify any changes in their practice, what they learned about inclusion, and what they anticipate for the future.

The co-teachers in this research will meet formally, but digitally using Microsoft Teams, approximately once per week for collaborative planning meetings. Data will be collected at these meetings as the co-teachers identify goals, list strategies they are considering, and discuss the actions they have planned (see Appendix D). The subsequent meetings will focus on the effectiveness of the actions taken, identifying new goals, and planning new actions.

A researcher journal will be kept throughout the course of the research (see Appendix E). The purpose of the journal is to consistently reflect in order to identify how my thoughts and actions have developed, demonstrating how my learning has advanced. More specifically, I would be looking to "identify significant moments of change in thinking and practice" (McNiff, 2016, p. 156). These changes require the researcher to be critical of their own thoughts and actions; consequently, the researcher journal acts as a record that will influence the next cycle of action within collaborative action research (McNiff, 2016).

Collaborative action research will require common planning time for the researcher and participant, or the co-teachers. The ideas and plans that emerge from this collaborative planning are an essential element of the cycle of action research; therefore, data will be collected from the planning sessions. This data will be in the form of audio and video recordings of digital meetings as well as photographs of any larger brainstorming. Although discussions will naturally vary, the co-teachers will structure their meetings by using the following questions as prompts: How have we been co-teaching? Which styles of co-teaching have we used? What are the benefits or shortcomings of each? What was our previous goal? Did we meet this goal? Why or why not? How was the planning for instruction and assessment different for this lesson than for your

regular/previous practice? What is our new goal(s)? How are we going to achieve these goals? What is the new plan of action?

Data Interpretation

Rumrill et al. (2011) notes "data analysis occurs through induction rather than deduction" (p. 155); this means that the researcher should not be designing a study that only has the potential to confirm their hypothesis. McNiff (2016) supports the same idea by advising the researcher to consistently recall their research questions, but to keep an open mind about what they are looking to find. The data collected throughout this research will need to be analyzed with an open mind and interpreted in order to give meaning to the findings.

Content analysis involves choosing important pieces of data to report (McNiff, 2016); data is analyzed using coding and categorization techniques. All forms of data collection must be considered in appropriate ways to identify key themes that address the research question. The interpretation of a researcher journal has multiple possible uses. McNiff (2016) explains that a journal can serve as a timeline, help identify general ideas, keep track of progress, and show critical self-reflections. Audio recordings from collaborative planning meetings will be reviewed by the researcher (and the participant if they wish) and selectively transcribed to focus on key points such as the co-teachers 'goals. The pre-and post-interviews will be compared to identify meaningful learning that arises from the research and make connections to the research question. The action research findings will be explained chronologically, telling the story of growth and challenges in each cycle and collecting themes to present in a conclusion.

Application of Understandings

The proposed research has numerous potential applications for the understandings that are uncovered. Students have the potential for increased opportunities to show their learning

in a variety of ways while participating in multi-sensory experiences. The research will cause

teachers to reflect on and improve their practices through cycles of action. Consequently, their

developed understanding of inclusive classrooms could build capacity in these teachers to

support a wider range of learners in upper level secondary science classrooms. Improved

capacity could increase opportunities for and frequency of positive interactions between

special needs and general education students. The understandings could be applied to create a

shift in instructional design, meaning a reduction in one-to-one support as a requirement for

inclusion in science classrooms. Classroom teachers are interacting more frequently and

confidently with designated students and do not need relief from an education assistant or

special education teacher.

Significance and Limitations

The significance of the proposed research is easily conceivable. Katz (2015) notes that

when instructional practices are adjusted they reduce teacher worries in areas such as planning

for diverse learners; consequently, the working environment is more enjoyable and increases

job satisfaction. Improvements in teachers' self-efficacy and job satisfaction could help push

back against the resistance for inclusion in upper level secondary science courses. There is

great value in establishing a collaborative relationship with colleagues for on-going student

support. Although they are not generalizable, the findings might suggest possible effective

teaching methods and strategies specifically for upper level science courses. If the research is

successful in contributing to improved inclusion, administration and department heads could

be encouraged to provide more co-teaching opportunities for their staff. In addition,

successful completion of the courses could increase post-secondary opportunities for students

who may not have previously been included. Inclusion has the potential to improve school

climate (Katz, 2015). Lastly, the proposed research can showcase the need for further, broader research on the topic.

There are limitations associated with the proposed research. The findings will be limited by the small sample size. Moreover, the findings will be based on participant perceptions and therefore are not generalizable. Although the choice of data included has to address the research question, "the researcher's choice of which data and events to include is almost inevitably personal" (Cohen et al., 2018, p. 648). The action research will be limited by the amount of common preparation or collaboration time that is available outside of class time for the researcher and participants.

Chapter 4

Findings and Results

The purpose of this research was to investigate how co-teaching can support inclusion in upper level secondary science classrooms. The findings that are presented resulted from data collected in the form of pre- and post-interviews, collaborative planning meetings, and a researcher journal. In this chapter I first present the specific context of the co-taught classroom and the previous experience of the co-teaching participant. I will then explain the methods of co-teaching that were implemented and our experiences with them. Lastly, central themes identified from the data are explained.

Context

The context of any classroom is altered during a global pandemic, so it is important to understand the specific circumstances in which the research took place. The research was conducted in a physics 11 classroom comprised of 29 students. Two students in the class had designations on file. The class was taught in one of the main science classrooms, which contained most of the physics equipment. The classroom had chalkboards at the front and a projector and screen. Students sat in groups of two at large tables. We were assigned a peer tutor, who was a grade 12 student who had previously completed physics 11. This course was enrolled in a quarter system, where classes ran for 10 weeks instead of an approximately 19-week semester. As a result, the daily instructional time was increased to 2.5 hours per day. For the first 5 weeks the class was not considered a "learning group," so a maximum of 15 students were physically in the classroom at a time while the other half of the class was participating in remote learning. Not being a learning group meant that students attended class in person 2 days per week, and participated remotely (independently) 2 days per week. Moreover, lessons were taught online to the entire class on Wednesdays for the first 5 weeks. For the second 5 weeks of the

course, the class was considered a learning group, so all 29 students attended class in person 5 days per week. All data for this study was collected during the second half of the course. Even when the class was considered a learning group, we did restrict the sharing of materials and limited movement around the classroom. Students were assigned to a seat and were required to return to the same seat every day to enable contract tracing (due to possible coronavirus exposures) if needed.

Co-Teacher

The co-teacher who partook in this research participated in a pre-interview. The purpose of this interview was to understand the co-teacher's background and previous experiences with co-teaching, and to hear their perspective on inclusion and supporting students with special needs in their classroom. The participant was asked the questions listed in Appendix C as they reflected on their prior involvement in co-teaching and their current opinions on inclusion.

The participant described a single co-teaching experience that took place approximately 7 years ago. They were teaching Science 9 in a class of approximately 30 students where 12 of these students had designations on file. Due to the composition of this class, the teacher approached their administration and requested a second teacher to support in the classroom. Although they expressed that they did not expect to be paired with a second teacher, the participant was given a teacher to co-teach this block with for the semester.

There were numerous benefits to co-teaching that the participant identified from their previous experience. First, the participant expressed themselves and their co-teacher as being compatible because they both had outgoing personalities. They enjoyed discussing their ideas with one another and valued having perspective to inform their practice. Moreover, they were able to collaborate continuously instead of only during times such as lunch breaks or professional

development days. Flexibility of the co-teachers was a characteristic that was identified as important for effective teaching. The participant noted that their co-teacher was new to the profession, so their opportunity to co-teach acted as a natural mentorship. Second, the participant felt that having a co-teacher benefitted the students and their learning. It was noted that having the ability to divide students into groups was advantageous. The co-teachers could each teach a different concept and have the students rotate, or one teacher could take a small group who needed additional support with a concept and provide targeted instruction. The co-teachers valued more group activities involving critical thinking and discussions instead of a stand and deliver model of instruction. Students who showed their learning best by verbal expression were allowed to complete interviews with one of the teachers for assessment, which would have been challenging in a single teacher classroom. Lastly, the participant explained that they noticed a decrease in marking, prepping, and classroom management efforts while working with a co-teacher.

The participant also noted a few challenges regarding co-teaching. First, they felt that receiving approval for a co-teacher was the biggest barrier. They noted that assessment was challenging as teachers each have their own values and perspectives, making it time-consuming to agree on assessments that are consistent and fair. The participant and their co-teacher had the same lunch block, which made it possible to collaborate and plan; however, it was noted that if they had not had common prep time, it would have made planning while co-teaching difficult.

As noted in Appendix C, the participant was asked at the end of the pre-interview about their experiences working with students with special needs in their own classroom, concerns they have about inclusion in upper level secondary science, and the support they are provided related to having students with special needs in their classroom. The participant explained that the

majority of students with designations that they have taught were from high-incidence categories (see Appendix F for categories in British Columbia). However, they did work with some students in low-incidence categories in a course called Science and Technology 11. The concerns about inclusion in upper level science courses included the students' mathematical skills and the pacing of these academic courses. This teacher was concerned that support staff, such as education assistants and many student services teachers, do not have any science background. This fact as well as an increased teaching load due to unbalanced schedules in the newly developed pandemic-driven quarter system, led to concerns that students with exceptionalities may not be able to access supports for science that they require. The participant felt that they were well supported for students with low-incidence designations, but that for students in high-incidence categories, there is no support for the classroom teacher who is planning for and assessing the students. More specifically, individuals with low-incidence designations often have support staff accompany them in classrooms and the participant felt as though the student services teacher (also their case manager) played an active role in organizing their supports. Students in high-incidence categories have case managers (student services teachers) who have larger caseloads of students and fewer resources to designate.

Methods of Co-Teaching

The participant and I were able to attempt four different methods of co-teaching throughout the course of this research. The following sections define the co-teaching method, describe our experience in implementing the approach, and summarize our reflections from the pre- and post-interviews, collaborative planning meetings, and the researcher journal.

One Teach One Support

The one teach one support method was the default approach to co-teaching. Wilson

(2016) defines the one teach one support routine:

> This model of co-teaching, wherein one teacher is primarily responsible for the planning and execution of the lessons while the other co-teacher offers roaming support to students, occasionally interjecting points and assessing student learning, requires very little, if any, co-planning (p. 4).

At the beginning of the school year, I found myself multi-tasking while my co-teaching partner taught the lesson. Unfortunately I was periodically pulled out of the science classroom to deal with student-related issues, which resulted in me often missing the lesson and returning to support the students during work time. More specifically, I would support with classroom management, help students with designations get started on their assignment and circulate the room. Fortunately, I am familiar enough with the course material that I was still able to assist students even when I missed the instructions. There was also no time to collaborate and co-plan with the co-teacher prior to the beginning of the course due to the school's transition to a quarter system. The challenges of altered schedules and restrictions due to the pandemic led to the one teach one support model being used for longer than anticipated.

There were not many positive thoughts to report regarding the one teach one support approach to co-teaching. The co-teacher reported in the first collaborative planning meeting that this method allowed us to reach more students faster and spend the necessary time with them; however, I think this is a general benefit of co-teaching that is not specific to this approach. The co-teacher explained that they felt that the students might view our dynamic as co-teachers as having a power differentiation, which might result in some confusion. For example, some students may not respond to instruction from me as willingly as from my teaching partner because they are not viewing me as an instructor, but more as a support for struggling students.

Wilson (2016) argues that the one teach one support model of co-teaching is the least effective and may lead to unequal roles and workloads. The participant noted that the one teach one support model is "easy to implement" and reflected on how it may become the default method of co-teaching.

> Now if I were a control freak teacher, I think the [one] teach [one] support model works very well too, [but] you know I'm very open for people coming in, talking, asking questions. Other teachers, you know that's their domain and they're not willing to budge as much.

My co-teaching participant was open and willing to reflect and redirect to trying new, more effective methods of co-teaching.

Parallel

Co-teaching using a parallel method was an approach we had considered implementing from the beginning of our collaborative planning meetings. Parallel co-teaching is defined as: "the splitting of the class into two heterogeneous groups with each co-teacher delivering instruction to a group" (Wilson, 2016, p. 7). Teaching in a quarter system means that a single block in the timetable is over double the length of time that a block is in a semester system. Consequently, multiple lessons are taught during each instructional period in effort to present the full curriculum. The intention of parallel teaching was for me to take a group of students to a neighbouring classroom and teach the same lesson, but at a slower rate because the course had been moving so quickly.

My co-teacher announced to the class that I would be teaching the same lesson at a slower pace and any students that would like to join me were welcome. Upon reflection, the co-teacher said: "I was very happy with how many left and were willing to go;" moreover, I noted

in my researcher journal that I was "surprised" to learn that approximately half of the class wanted to join me. We both taught the lesson to groups of approximately 15 students, and I finished my lesson just over 5 minutes later than my co-teaching partner.

Numerous positives were noted from our parallel co-teaching experience. My co-teaching partner was happy that students were willing to join me in the neighbouring classroom; the teacher felt that it did not isolate designated students or identify anyone as being different than their peers. In general, they felt that "it was just quieter and more controlled" when we split the class into parallel groups. In addition, they expressed that when there are fewer students in the classroom, there are fewer distractions and individuals are more focused. The participating co-teacher thought we would be able to answer students' questions faster while parallel teaching; however, I did reflect on the fact that a question asked by a student in one half of the class would not be heard by the other half of the class, potentially resulting in a loss of a learning opportunity. We also considered the fact that a smaller group might encourage students to ask questions and feel less pressure or nervousness than speaking up in front of an entire class. On the other hand, a more intimate group may put pressure on students who do not want to share their ideas simply because there are fewer students to answer questions posed by the teacher or peers. We noted as a co-teaching partnership that this method required little planning as we were simply teaching the same lesson at a different pace. On the other hand, it is a similar amount of effort and time required of each teacher instead of just one. A benefit of teaching smaller groups is having improved proximity to the students, making it easier for the teacher to interpret how engaged their students are and reduce needs for classroom management.

Although parallel teaching had many positive aspects, there were limitations to this method. Both the co-teacher and myself recognized that having an available additional classroom

space nearby is not typical, and that we were fortunate to have access to this space during this experience. We both expressed concerns about how difficult it would be to execute parallel co-teaching if we were forced to work in the same classroom. Lastly, parallel teaching requires sufficient planning time in order to chunk the lesson in a meaningful way.

Teaming

The participating co-teacher and I had the opportunity to attempt the teaming model of co-teaching. In this model, the teachers take turns leading the instruction while the other teacher is supporting students (Wilson, 2016). Although the lead teacher is guiding the lesson, their co-teacher offers comments and additional details to add to the conversation. My co-teaching partner naturally moved towards the teaming approach even when we were using the one teach one support model; they did this by asking me to share my opinion and experiences with the class throughout their lessons. Our instructional time was 2.5 hours each day, so it was natural to chunk the material into smaller lessons, which we then split between the two teachers.

As co-teachers, we anticipated that the teaming model would benefit the students by offering variety in voices, teaching styles, and viewpoints. My co-teacher participant vocalized this thought from our very first planning meeting: "if you could have different voices with different viewpoints and different examples even if they are the same as what I just gave [it's] something fresh, it re-catches students' attention." They also noted that sharing the lessons allowed the teachers to conserve their energy by reducing their talking time. Having both co-teachers take charge of a lesson helped to present us as equals to the class, thus avoiding any differences in authority. The co-teacher expressed that they enjoyed the opportunity to hear how I presented concepts and sometimes had different ways of explaining the same ideas. It was noted that the supporting teacher has to play an active role in contributing to the lesson and

supporting students, otherwise they are not effective.

A common theme was presented when discussing the negative aspects of the teaming model: lack of planning time. The co-teacher participant expressed the need to be cognizant of splitting up the lessons to be equal between the teachers. They explained that there was "no planning time" outside of our weekly collaborative planning meetings for the purpose of the research. We both acknowledged that our lessons could have been more cohesive had we prepared them together.

Station

The station model of co-teaching was the final approach that was explored in this research. Wilson (2016) defines station co-teaching as dividing students "into three or four heterogeneous groupings that rotate throughout the class period" (p. 7). Wilson explains that the individual co-teachers directly lead two of the stations, and it is a requirement that all stations run independently of one another, allowing students to participate in any order. The station method was brought up at our first collaborative planning meeting. It was then that the participating co-teacher noted that they liked the fact that stations would allow students to focus on one idea; moreover, when they rotate they get to see a fresh face and hear a new voice to keep them engaged.

The station method was the last method to be explored because we thought it would work best with challenging concepts or as a way to review before an assessment. Due to current pandemic restrictions, we could not have students intermingling and moving around the classroom; consequently, we decided the best approach was for each teacher to approach small groups. We chose two of the most challenging questions in the electricity unit to review with the students. The students were working independently on a review as our peer tutor circulated the

room to answer questions. My co-teaching partner and I each had a small whiteboard and pen. We started on opposite sides of the room and went through the question with groups of four to six students as they remained in their designated seats. There were approximately six groups in total.

Upon reflection during the post-interview, the co-teacher participant expressed that "the station was one of the more powerful ones," and that if there had been more time to plan, it could have been significantly better. We discussed the idea that speaking to small groups gave us a clearer picture of our students' understandings and where they required support, making it an effective formative assessment. Although it took the most energy for the co-teachers (compared to other co-teaching methods), the co-teacher said this was the method they definitely wanted to continue in the future. In my researcher journal, I noted that the students were attentive and receptive to this approach, but I did feel that it required more energy to repeat myself multiple times. I also found that circulating the room with a small whiteboard was awkward at times, and in normal circumstances I would have the students physically moving to allow for a body break.

Resulting Themes

As I read through transcripts from the pre-interview, collaborative planning meetings, and post-interview as well as my researcher journal, I noticed some common themes. More specifically, I established five main themes that were present among the data: time, assessment, support for teacher, co-teacher dynamics, and classroom management.

Time

It was not surprising to me that time was a common theme throughout my data collection. I personally found that navigating pandemic protocols and transitioning from a semester system to a quarter system demanded additional time from educators. As my co-teaching partner noted

in the post-interview, we taught the physics 11 course in 42 classes as opposed to the approximately 80 classes we normally have in a semester. Although the total hours of instructional time was similar, the course being taught in 10 weeks instead of a 5-month semester resulted in it being taught at a much faster pace.

My co-teaching participant noted that they had a common lunch block with their previous co-teaching partner in their prior experience. Unfortunately we did not have any common planning time during the research, resulting in our weekly collaborative planning meetings over Microsoft Teams after school being our only opportunity to plan. The participant also noted that without common prep time, sometimes we were unprepared, causing the execution of our lessons and activities to become more time consuming than anticipated. The participant expressed concerns about my workload being increased while co-teaching due to the fact that I was guiding the teacher as well as being involved in the instruction of the class. I conducted this research knowing that my goal was to co-teach in a way that built capacity in the classroom teacher resulting in them creating inclusive classrooms more independently in the future. Consequently, while I appreciated the concern for my welfare, an increase to my workload was a characteristic of the research study, not a problem with any particular co-teaching method.

The action of co-teaching benefitted the students by having increased teacher time available for students to access support. The participating co-teacher expressed in each collaborative planning meeting that being able to spend additional time with individual students and answer questions quickly was a benefit.

Assessment

Assessment was another key theme throughout the data. In the pre-interview, the participant noted, "assessing probably was the hardest part" in their past co-teaching experience.

They reflected that the most successful assessment experience in the past was having their co-teacher interview individual students as an alternative to a written test. On the other hand, they found that coming to an agreement with their co-teaching partner on exactly what they were assessing and how they planned to assess was challenging.

I noticed from the beginning of the collaborative action research that I needed to support my co-teacher with adapting or modifying assessments; the participant admitted that they had never been taught how to alter tests according to a student's IEP and that they felt this was one of their biggest barriers to supporting students in their classroom. Co-teaching gave us the opportunity to work together to adapt and modify assessments to meet our students' needs. However, I noted in my researcher journal that I felt as though making changes to assessments for students was always rushed. We often reflected on the changes that were made after the student had completed the assessment instead of thoroughly discussing the changes before. Feeling as though we did not have sufficient time to discuss changes to assessments could have been due to the pacing of the course as well as the lack of common prep time, but it was a challenge nonetheless. Working as co-teachers allowed one of us to find an alternate space and personally work with students who required a reader or a scribe for assessments while allowing the other co-teacher supervised the class. Without a co-teacher available, students who require additional supports might work in a resource room with staff that are unfamiliar with the science content, making it more challenging to support the students.

Support for Teacher

The topic of support for a classroom teacher regarding teaching students with exceptionalities and creating inclusive classrooms was scattered throughout the data. In the pre-interview, the participant was directly asked if they feel well supported in their classroom when

teaching students with special needs (see Appendix C). The participant felt that they were well supported when they have taught low-incidence designated students who are working on replacement (modified) curriculums. On the contrary, when teaching students on a supplementary (adapted) curriculum, they felt that the student services teachers have supported the students, not the teacher. It was also noted, "the support staff has no science background." The participant explained during a collaborative planning meeting that peer tutors, or students who are assigned to be a peer support in a specific classroom to earn credits, were helpful.

In the post-interview, the participant was asked if they feel as though they have the resources and supports they require to independently manage an inclusive classroom (see Appendix C). Their immediate response was: "it wouldn't have been an enjoyable experience by myself." They continued to explain that an education assistant would not have been sufficient and that they do not always receive peer tutors to support their class. In summary, they decided that: "without a [properly] trained teacher, I don't know how successful it would be."

At the end of the post-interview, the participant was asked how they envision student services teachers supporting in their classroom in the future. The participant had multiple suggestions of how to move forward in supporting them in creating inclusive classrooms. It was recommended that I provide substantial, daily push-in support in the classroom to start, and then slowly reduce the time I spend in the classroom as the classroom teacher becomes more comfortable. That is, I could transition from being in the classroom every day to once or twice per week. This would give me the opportunity to support an additional teacher and build their capacity for building inclusive classrooms, too. The participant noted that accessing a student services teacher on a weekly or bi-weekly basis would be effective in ensuring their students are being supported appropriately. During this weekly or bi-weekly meeting the classroom teacher

could provide updates on how the students are progressing and have the opportunity to ask for suggestions and support. They expanded this idea by suggesting that we "build teams within the departments or within the school" to support one another with creating inclusive classrooms. The participant hoped that developing a community of educators who speak of inclusion in a positive light would result in improvements to the inclusive culture in the school.

Co-teacher Dynamics

The importance of the dynamics between the co-teachers was evident throughout my review of the transcripts. The participating co-teacher reflected in the post-interview on the importance of "getting two people who are compatible to work together and are willing to work together" and that finding a good match can be challenging. They explained that the length of the teachers' careers and their personalities are factors to consider when seeking a co-teacher. More specifically, the participant thought that the combination of two new teachers could either be successful or detrimental. On the other hand, I noted that some experienced teachers may not want to mentor a younger teacher, or could be inflexible in considering changing their practice. The participant noted their openness to my support in the classroom, which I agreed with; however, they did note that other teachers are not comfortable with or open to other educators joining them in their classroom.

Classroom Management

Classroom management is the last of the common themes that was presented in the data. Classroom management is not a concern that I had anticipated would consistently be brought up in our conversations. The participant explained their belief that students in an upper level science classroom are expected to regulate their use of technology or other potential distractions independently. They quickly realized that self-regulation is a challenge for some individuals with

exceptionalities and expressed a concern that when a student is watching a video or playing a game on a device, other students might become distracted. I noted in my researcher journal that I felt the responsibility of reminding particular students to put away devices as needed because of my role as the special education teacher. Also included within the topic of self-regulation, because students with designations sometimes need breaks more frequently than non-designated students, the participant was concerned about designated students missing class time when a quick walk or getting a drink of water is necessary. We had discussions about how incorporating breaks, establishing rules, and structuring the class does not simply accommodate students with special needs, but it benefits all students within the class. The participant worked towards dividing lessons into smaller parts, giving students breaks, and reminding particular students of the rules with devices; however, they did note that these actions would take time to become habitual.

Conclusion

Collaborative action research was conducted to investigate the effects of co-teaching on inclusion in upper level secondary science classrooms. This has been an exceptional year, and as the participating co-teacher noted, "if this were a regular school year, the challenges would be less". Nonetheless, the research was completed while transitioning from a semester to a quarterly system and by adhering to all health and safety protocols. A total of four methods of co-teaching were attempted: one teach one support, parallel, teaming, and station. Data was collected from transcripts from weekly collaborative planning meetings, pre- and post-interviews, and a researcher journal. From this data, five common themes were derived: time, assessment, support for teacher, co-teacher dynamics, and classroom management. The data highlighted areas of strength as well as the need for support and resources to create inclusive classrooms that make

science accessible to all students. Although the resulting themes are not generalizable, they are

potential barriers to successful inclusive practices through co-teaching. Both the researcher and

co-teacher participant were able to reflect on their practice, learn from one another, effectively

support their students, and plan to make positive changes in the future.

Chapter 5

Conclusion

The experience of co-teaching, the specific methods implemented, and the themes that resulted from the data were presented in the previous chapter. In this chapter the significance and value of the research is discussed. The limitations of the study will be presented transparently. Finally, recommendations for practice and recommendations for future research will be suggested based on the completed research.

Significance/Value

The learning earned through the research has significant value to the education community. The potential impact for co-teaching on inclusion in upper level secondary science classrooms is invaluable. Working to build teacher capacity to create increased access to upper level secondary science courses for students with disabilities contributes to numerous positive changes in inclusive education.

Change has to begin with the classroom teacher, for if they are not equipped with the strategies, knowledge, and resources they require, creating authentic inclusive science classrooms at the secondary level is a great challenge. Co-teaching helps to build a sense of community and mentorship amongst teachers, including potential opportunities to guide and learn from new teachers. Co-teaching can encourage educators to reflect on their practice and engage in new styles of teaching. The participant in this study expressed that the opportunity to collaborate "helps me justify what I'm doing and also gives me new perspectives on new things I could be trying." Taking a collaborative action approach to teaching has the potential to engage and motivate students in ways the teacher and children have not previously experienced. It allows student services teachers to have access to and support classrooms that they would

normally not be welcome in. That is, if a classroom includes students with designations, the student services teachers and case managers should have access to the classroom. In addition, when student services teachers are isolated in resource rooms that only include students with individual education plans (IEPs), it is challenging to support students who are enrolled in mainstream classrooms and might also benefit from support. Access to the classroom allows student services teachers to make valuable connections with students who require additional supports but have not been specifically identified. The established connections could encourage students to seek support as needed. Lastly, the participant expressed that co-teaching made "it more enjoyable to teach again" suggesting that co-teaching has the potential to improve job satisfaction.

Increasing access to upper level secondary science courses has the potential to have a significant impact on the lives of students with exceptionalities. Co-teaching causes the teachers to be purposeful in their planning, being thoughtful and proactive instead of reactive to students' needs. Teachers learn that what is necessary for a student with special needs benefits all students in a classroom. When we do not assume that students cannot be successful in science and give them equal opportunity and access to these courses, we are giving them the opportunity to better understand the world around them. When students have the opportunity to show their learning in appropriate ways, work with their peers, and potentially earn course credits, they experience growth in personal competencies and are given the opportunity to pursue their dreams. An authentic inclusive classroom is the learning environment that every student deserves.

Limitations

The limitations in this research are related to the current teaching context and the methods used. Current restrictions due to the pandemic have limited some activities in the classroom.

First, for the beginning half of the quarter we only had approximately half of the class physically in the classroom at a time. The data was collected during the time that the class was considered a "learning group" meaning the whole class met in person; however, we had to be cautious that students were located at a desk according to a seating plan, thus limiting most group work and opportunities for students to move throughout the classroom. We made a conscious effort to limit the sharing of materials and instructional time was put aside to sanitize hands and work areas. The amount of time allotted to collect data was significantly shorter than planned as I waited for approval to collect data and the school transitioned to a quarter system. Consequently, many of the co-teaching methods reported were only attempted once or twice, limiting our experience with implementation. In addition, this was the first time the co-teacher participant and I had taught a course scheduled in a quarter system, which demanded more scheduling and planning than if we had continued teaching as a semester. The method of interviews and collaborative planning meetings as data collection are undoubtedly biased due to the fact that I as the researcher took an active role and the results are presented through the perspectives of myself and the co-teacher participant. No data was collected from students themselves, so we were unable to report the effects of co-teaching on students' perspectives of inclusion in upper level sciences.

Recommendation for Practice

The aim of this research was to investigate the effects of co-teaching on inclusion in upper level secondary science classrooms. Overall, the collaborative action research was a positive experience and resulted in reflections that will inform the co-teaching practice moving forward. It is recommended that attention be paid to the themes that emerged from the data: time, assessment, support for teacher, co-teacher dynamics, and classroom management.

Advocating for and receiving a co-teaching partner can be a challenge. Conderman et al. (2009) lists a variety of reasons that co-teaching might take place; for example, they could be asked by administration, the teachers believe their students would benefit, their school and district encourages co-teaching as an inclusive practice, or they want to develop as a professional by working with a co-worker. Colleagues may be paired together who have not previously worked together or might not believe they are compatible as co-teachers. Conderman et al. (2009) believe that there are stages to co-teaching, which take time to navigate: "The relationship develops as co-teachers get to know each other, build their trust and common repertoire, and work toward the final goal of collaboration" (p. 7). Respect, common goals, and equal ownership of the classroom are requirements for a successful co-teaching partnership (Conderman et al., 2009). Teachers are encouraged to consider colleagues that they are compatible to co-teach or collaborate with, as working together is motivating and can result in positive changes to practice.

The research highlighted the need for common prep time for teachers to connect regardless of whether they are co-teaching or simply working together to support their students. The data presented numerous situations where the researcher and participant felt that if they had increased time to collaborate, the result would have been improvements to their practice. The requirement of common prep time outside of the classroom is supported by the literature (Conderman et al., 2009; Wilson, 2016). Sufficient prep time is required for a successful co-teaching partnership.

Creating authentic inclusive classrooms, especially in an upper level academic course, can be challenging. Educators must recognize the impacts of their efforts, but also that it requires patience and time for classrooms and teaching practices to evolve. The co-teaching participant in this research reflected on their progress during the post-interview:

If you were to ask me to do this by myself, I'd be like yeah no, I don't have time for that.

But now that I've done it once, I think I probably could do it again with less support…

still, I'm not 100% comfortable.

Co-teachers are not expected to become experts at supporting students with exceptionalities in a short period of time. The progress they make and their openness to collaborate and learn from others will have a large impact on their students in the long-term. Collaboration through co-teaching is a powerful tool to help educators grow for the betterment of the students, but it requires time and dedication for its impact to reach full potential. Building capacity for inclusive teaching practices, specifically at the secondary level, will require funding that allows for collaborative time. However, the inherent shortage of funding demonstrates a lack of understanding regarding the true financial cost of inclusive education.

Students in secondary schools attend up to eight different classrooms in a school year, so it is important to build an inclusive culture that is not limited to a few classrooms, but is school-wide. Staffs as a collective need to commit to creating inclusive classrooms that continue to evolve over time and are sustainable. One way to address a school's commitment to inclusive education is to explicitly state it in an Action Plan for Learning (APL), which is a statement of what the school wants to focus on and the rationale behind the goal. It is recommended that schools are explicit about their intent to be inclusive of all students.

Recommendation for Future Research

The completed research solidifies the need for future research regarding the topic of co-teaching and its effects on inclusion in upper level secondary science classrooms. It was evident that there is a need for supporting classroom teachers in creating inclusive classrooms, particularly in upper level science courses. The research would be more effective if the models of

co-teaching were implemented for a longer period of time and within a wider variety of subject areas. The research could be expanded to consider the impacts of specific instructional methods within co-teaching approaches. It is recommended that teacher's perceptions of their specific roles in supporting students with special needs be followed during this longer time period. If possible, it would be important and interesting to include student perspectives on the impact of co-teaching and their perceptions of inclusion. Moreover, it would be valuable to understand how different learner profiles benefit from specific co-teaching instructional methods. Future research could consider the resulting themes addressed in the completed action research and investigate their positive or negative impacts on the effectiveness of inclusive practices achieved through co-teaching. Lastly, the research could be expanded to include more professionals in the education community such as counsellors, administration, education assistants, and specialized district staff. These additional professionals could be supports for classroom teachers as well as potential connections to students and their families to communicate that all courses are options for any student regardless of their needs.

Conclusion

Creating an authentic inclusive upper level secondary science classroom is not easy, but it is essential for the overall well being of the students. Inclusion in senior science classrooms is not a common topic of conversation and deserves more attention and action. Co-teaching is a collaborative method, which provides an opportunity to build capacity in general classroom teachers for supporting all students regardless of their needs. One cannot assume that a classroom teacher has been specifically trained to support low-incidence designated students in their classroom; consequently, the teacher needs to be supported in order for successful inclusion to occur. When referring to including students with exceptionalities in their physics 11

classroom, the participating co-teacher expressed that "it's…almost impossible to do without a co-teacher."

In this study, the co-teaching methods of one teach one support, parallel, teaming, and station were implemented and resulted in common themes of time, assessment, support for teacher, co-teacher dynamics, and classroom management being extracted from the data. The resulting themes are potential barriers to effective co-teaching, and in turn, inclusion. The information collected from the experience will be used to inform future practice in my school district and hopefully will lead to further research. As a result, students will have improved access to inclusive upper level secondary science courses, leading to more opportunities to understand the world around them and expand their future opportunities in life.

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Appendix A

Research Information to Participants

FACULTY OF EDUCATION
Vancouver Island University
900 Fifth Street, Nanaimo
British Columbia, Canada, V9R 5S5
Tel (250) 740-6221 Fax (250) 740-6463

Dear Colleague,

My name is Megan Weeks and I am currently a graduate student at Vancouver Island University working towards a Master of Education in Special Education. I am also in a Skill Development teaching role. I am conducting a study on how co-teaching can support inclusion in upper level secondary science classrooms using a collaborative action research approach.
I am inviting you to participate in this study as a co-teacher with myself as the researcher. Your participation will allow for co-teaching with monthly collaborative planning sessions to occur. Your input in a pre- and post-interview will help provide information regarding the progress throughout the collaborative action research.

If you would like to participate, you will be asked in the pre-interview to recall your past experiences with co-teaching and inclusion. In the post-interview, you will be asked to reflect on your experiences throughout the course of the research and their connections to inclusive practices. The interviews should take approximately 30-45 minutes each. Your identity and all the information you share would be considered confidential. I would make an appointment to interview you at your convenience. The interview would be audio recorded and you may request the transcription of the interviews to review and revise. Moreover, you will have the opportunity to review my analysis of each interview to ensure my reports are accurate.

The collaborative action research of co-teaching will result in you being asked to participate in monthly collaborative planning meetings (45-60 minutes each) for one semester of co-teaching. During these meetings we will reflect on previous actions and use these reflections to inform future plans for action. These meetings would be audio recorded and you may request to review or revise and transcriptions used from the meetings. Moreover, you will have the opportunity to review my analysis of each interview to ensure my reports are accurate.

This is a personal request and I would genuinely appreciate your participation. It is hoped that your involvement in both interviews, the co-teaching process, and collaborative planning meetings will help to answer my research question, "How can co-teaching support inclusion in upper level secondary science classrooms?" Please note that refusal to participate will not result in any changes of support for students in your classroom. Moreover, declining to participating or withdrawing from the study will not prevent me from completing my Masters thesis. If you would like to participate please contact me for further details about the study. Given the current circumstances with social distancing, if you inquire about participating, a consent form may be sent to you digitally via email instead of in person.

For more information, you can contact myself or my university supervisor, William (Bill) McGann (XXX@XXX).

Thank you for your consideration,

Megan Weeks (XXX@XXX)

Appendix B: Consent Form

VANCOUVER ISLAND
U N I V E R S I T Y

Co-Teaching and Inclusion in Upper Level Secondary Science Classrooms

<table>
<tr><td>Principal Investigator</td><td>Student Supervisor</td></tr>
<tr><td>Megan Weeks, Student</td><td>William McGann</td></tr>
<tr><td>Master of Education</td><td>Department of Education</td></tr>
<tr><td>Vancouver Island University</td><td>Vancouver Island University</td></tr>
<tr><td>xxx@xxx</td><td>xxx@xxx</td></tr>
</table>

Purpose:

      I am a student in the Master of Education in Special Education program at Vancouver Island University (VIU). My research, entitled "*Co-Teaching and Inclusion in Upper Level Secondary Science,*" aims to use co-teaching as a method to investigate inclusion in upper level secondary science classrooms. My hope is that my research will contribute to the improved access of science courses for all students, thus providing increased opportunities for success for all students and enhanced teacher knowledge and implementation of inclusive teaching strategies.

Description:

      Research participants are asked to complete a research interview using Microsoft Teams at the beginning and at the end of the research. If you agree, you would be asked questions concerning your past experiences with co-teaching as well as your concerns, experiences, and attitudes towards inclusion in upper level secondary science classrooms. Each interview would require approximately 30-45 minutes of your time. With your permission, the interview would be audio and video recorded. In addition, the research participant will be asked to participate in weekly collaborative planning sessions during a preparation block of approximately 30-45 minutes. These planning sessions will include conversations that reflect on previous actions, and planning to inform future actions. With your permission, the planning sessions would be audio and video recorded and photos would be taken of any visual brainstorming, such as plans on a whiteboard. You have the option of participating confidentially and being identified wit a pseudonym.

Risk of harm to participants:

      The information collected during the interview and planning sessions is likely to be uncontroversial, and thus the research poses only a very small risk of harm to participants. Sharing your experiences and feelings could feel awkward or uncomfortable to some individuals; this inquiry may be a source of embarrassment to the participant. There is a risk of loss of status, reputation or embarrassment as some responses to questions/prompts may be critical of a school, district, or policy. You may feel pressured to participate if you have a relationship with the researcher. Please be assured that our collegial relationship or student support in your classroom will not be impacted in any way by your decision regarding participation. Your decision to

decline to participate or withdraw during the study will not prevent me from completing my Masters thesis. You may withdraw at any time during the study and will be given ample, frequent opportunities to do so. You can choose not to answer specific questions during any collaborative planning session or interview. You may request and will be given opportunities to review interview transcripts and withdraw any comments. There is a possibility that the information you share might identify you, resulting in a risk of loss of privacy. Unless you choose to be identified directly, a pseudonym will be used to identify you. Please note that even if you choose the use of a pseudonym, there is a risk of being indirectly identified. Precautions will be taken to maintain confidentiality: the school and district will not be named, identifying information and comments will be edited or removed from transcripts and will not be included in the research findings.

Management of Research Information/Data:

 If you choose to participate, all records or your participation would be confidential. Only my supervisor and I will have access to information in which you are identified. With your permission, the interview and collaborative planning sessions would be audio and video recorded in Microsoft Teams and later transcribed into writing. Microsoft Team's servers are located in Canada. Please refer to Microsoft Services Agreement (https://www.microsoft.com/en-ca/servicesagreement/). You will be provided a copy of the transcript and invited to make changes to the transcript as you wish (e.g. if you would like withdraw a particular statement you made during an interview).

 Electronic data will be stored on a password-protected computer. Signed consent forms and paper copies of interview transcripts will be stored in a locked file cabinet in my home. Data will be deleted and shredded three years after completion of the project, approximately May 31st, 2024.

Use of Research Information:

 The results of this study will be published in my Master's thesis, and may also be used for conference publications, presentations, and published in peer-reviewed journals. The participant will be provided with a copy of the research findings in the completed thesis.

Participation and withdrawal:

 Your participation is completely voluntary. You may withdraw from the study at any time where practicable, for any reason, and without explanation. If you would like to review and potentially make changes to the transcript of the interview, you may withdraw up to two weeks from the time of being provided a copy of the final interview transcript. If you decline to review the transcript, you may withdraw up to two weeks from the date that the final transcript is provided to you. If you choose to withdraw from the study, all information you provided during the interviews and planning sessions would be withdrawn from the study and destroyed. Once the deadline to withdraw has passed and I begin to analyze the interview, it will not longer be practical for you to withdraw. However, you can request to review my analysis of interview and collaborative planning audio or video data to make clarifications and ensure accuracy of my reports.

 Please note that when considering the current circumstances, the interviews and collaborative planning sessions will have to take place digitally.

Consent and Conditions of Consent: I have read and understand the information provided above, and hereby consent to participate in this research under the following conditions:

I consent to the interview and planning sessions being audio/video recorded.	☐ *Yes*	☐ *No*
I consent to being quoted in the products of the research.	☐ *Yes*	☐ *No*
I consent to photographs of lesson planning being taken by the researcher.	☐ *Yes*	☐ *No*

Please indicate your preference for identification:

☐   *I prefer to be identified with a pseudonym.*

☐   *I prefer to be identified directly by name.*

Participant Name _____ Participant Signature _____

Commitment of Principal Investigator: I, Megan Weeks, promise to adhere to the procedures described in this consent form.

Principal Investigator Signature _____ Date _____

Concerns about your treatment in the research: If you have any concerns about your treatment as a research participant in this study, please contact the VIU Research Ethics Board by telephone at 250-740-6631 or by email at reb@viu.ca.

Appendix C

General Interview Guide

General Interview Guide: Pre-Interview

*Remember participation in this interview is voluntary. You may review transcripts and withdraw comments within terms outlined in the consent form.
Please take a few minutes to reflect on past co-teaching experiences and your thoughts on inclusion.

1. Do you have any previous experiences with co-teaching? If so, what led you to your co-teaching experience(s)?
2. Can you please describe your previous experiences with co-teaching? For example, what was the grade, subject, and style of co-teaching?
3. What personal experiences with co-teaching stand out for you?
4. What experiences were most successful during co-planning, instructing and evaluating in your previous experiences?
5. What experiences were challenging during co-planning, teaching or assessing?
6. How has your experience with co-teaching affected you? Describe any changes you associate with your co-teaching experiences.
7. In your role as a general classroom teacher, have you worked directly with students who have special needs? That is, what have your experiences been with teaching designated students in your classroom?
8. What are your primary concerns when including students with special needs in upper level science classrooms?
9. Do you feel well supported in your classroom when working with students with special needs?

General Interview Guide: Post-Interview

*Remember participation in this interview is voluntary. You may review transcripts and withdraw comments within terms outlined in the consent form.
Please take a few minutes to reflect on your co-teaching experience and the effects on inclusion throughout the course of this study.

1. In your opinion, what was the most successful arrangement or style of co-teaching?
2. What strategies will you continue to use in your planning?
3. What were the challenges of co-teaching?
4. Did your mindset or thoughts about co-teaching or inclusion change throughout the course of this study? If so, how?
5. In what ways do you think your planning, teaching, and assessment is becoming more inclusive? What barriers might still exist?
6. Do you feel that you have the resources and supports you require to independently manage an inclusive classroom?
7. How do you envision student services teachers supporting in your classroom moving forward?

Appendix D

Collaborative Planning Meeting Prompts

The researcher and participant will meet weekly for 4 weeks for a formal collaborative planning meeting. The meeting with be audio and video recorded. Although discussions will vary, the following prompts will guide our planning sessions.

1. How have we been co-teaching? Which styles of co-teaching have we used? What are the benefits or shortcomings of each?
2. What was our previous goal? Did we meet this goal? Why or why not?
3. How was the planning for instruction and assessment different for this lesson than for your regular/previous practice?
4. What is our new goal(s)?
5. How are we going to achieve these goals? What is the new plan of action?

Appendix E

Researcher Journal Prompts

The researcher will keep a journal throughout the course of the study. Entries will be written approximately once per week, but more can be written if necessary. Journal entries will be a source of data to identify timelines, common themes, and changes in thoughts or actions.

The following prompts will be used to guide my thinking and reflection related to my experiences as a co-teacher in collaborative action research. As the researcher, I will not record any information that can be used to identify students.

1. What was my schedule this week? How often was I in the classroom?
2. What style(s) of co-teaching was used?
3. What were our goals?
4. How did I support inclusion through our lessons, activities, and supports?
5. In what ways did the included strategies align with BC curriculum's core competencies and curricular competencies for (this science course)? What competencies were not addressed?
6. What are some ideas for next time? What strategies would I continue to use?
7. General thoughts and/or feelings?

Appendix F

Designation Categories in British Columbia

The British Columbia Ministry of Education (2009) defines the categories of disability

designations for students in the province. These categories can be grouped into low-incidence

and high-incidence. The category determines the funding allocated to the school district, where

level 1 is the largest dollar amount.

Low-Incidence Categories (additional funding allocated)

A: Physically Dependent – Multiple Needs (level 1 funding allocation)

B: Deafblind (level 1 funding allocation)

C: Moderate to Profound Intellectual Disabilities (level 2 funding allocation)

D: Physical Disability / Chronic Health Impairment (level 2 funding allocation)

E: Visual Impairment (level 2 funding allocation)

F: Deaf or Hard of Hearing (level 2 funding allocation)

G: Autism Spectrum Disorder (level 2 funding allocation)

High-Incidence Categories (no additional funding allocated)

H: Students Requiring Intensive Behaviour Intervention or Students with Serious Mental Illness

(level 3 funding allocation)

K: Mild Intellectual Disabilities (student base funding allocation)

P: Gifted (student base funding allocation)

Q: Learning Disabilities (student base funding allocation)

R: Students Requiring Behaviour Support or Students with Mental Illness (student base funding

allocation)