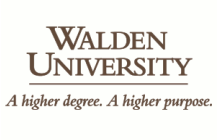

2015

Raising Texas State Biology Exam Achievement Scores for Students with Disabilities

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This is to certify that the doctoral study by

Nancy Larkin

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2015

Abstract

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MA, The George Washington University, 2000

BS, Lamar University, 1982

Doctoral Study Submitted in Partial Fulfillment

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Abstract

The No Child Left Behind Act changed the way educators taught students with disabilities (SWD), as this population has now become part of all districts' annual yearly progress. The problem this qualitative study addressed was that many biology teachers in a Texas suburban district were not effectively implementing evidence-based strategies for SWD. The study's conceptual foundation was based on Vygotsky's cognitive development theory that students achieve at higher levels when working in their zone of proximal development with support from peers or adults. The guiding question was intended to determine what strategies biology teachers were using to provide this support at schools with higher passing rates for SWD and how these strategies differed from those used by teachers in schools with lower passing rates. Participants interviewed were 6 biology teachers and 4 administrators from schools with both higher and lower passing rates for SWD to examine differences in strategies used by the two groups. Transcripts were coded and analyzed for common themes. Triangulation, member checking, and a second researcher re-coding selected data samples were used to insure data trustworthiness. Results indicated that SWD who had biology teachers using evidence-based strategies with follow-up activities scored higher on the state biology exam than those who did not and that participants would like to have special education teachers assist in developing effective biology lessons with the follow up activities for SWD. These findings were used to create a staff development project to help biology teachers use more evidence-based strategies and follow up activities. Based on results, SWD may have a greater array of career choices and may be prepared to make more informed biology and health-related decisions, thus promoting social change.

Raising Achievement Scores Among SWD on the Texas State Biology Exam

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Dedication

Thank you to my son, Eric, who was patient with me as I worked through my project study.

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Section 1: The Problem

Introduction

Public education's path to accountability began during the mid-1960s with Title I legislation to ensure that all children, including those with disabilities, would have fair and equal opportunity for a high-quality education in an attempt to close the achievement gap for several groups of students, including students with disabilities, or SWD (US Department of Education, 2004). Through the years, the federal government has passed several legislative acts to guide local education authorities in helping students reach proficiency levels in state assessments. Texas Education Agency (TEA) developed a series of objectives to establish a common set of standards for all districts to follow. The first of these were called essential elements (EEs), which were introduced in the mid-1980s and were revised in the 1990s to become the Texas Essential Knowledge and Skills (TEKS). TEKS provided the basis for the State of Texas Assessment of Academic Readiness (STAAR) exam currently taken by all Texas students. Scores for SWD were not included in state assessments until after the No Child Left Behind (NCLB) legislation (the Reauthorization of the Elementary and Secondary Act of 2001), which dealt with closing the achievement gap among various demographic groups, including SWD. SWD were then expected to achieve the same proficiency levels as their nondisabled peers, unless provisions were made in the individual education plans (IEPs) of the SWD.

To meet NCLB requirements, all districts must meet adequate yearly progress (AYP). Districts must ensure that all students are taught using proven evidence-based

teaching strategies taught by highly qualified staff. Further, 95% of the students in each subgroup and in the school as whole must take the state tests (Editorial Projects in Education Research Center, 2011). Adding scores for SWD to state assessments was one of the most prevalent issues of concern for district administrators because most SWD were not successful on the state assessments, which affected the district's AYP status. Therefore, district administrators began concentrating on ways to assist general education teachers in raising the achievement scores for SWD.

Determining strategies to help teachers assist SWD raise their achievement scores on the STAAR biology exam was one way to assist districts in meeting AYP. After reviewing the scores for the target districts' STAAR biology exam and talking with several biology teachers, I decided to examine why most biology teachers are not effectively implementing evidence-based strategies for SWD to pass the STAAR biology exam.

The target district serves more than 17,000 high school students (TEA, 2014) with eight high schools, one of which serves as an evening school for at-risk students. The district is located in a metropolitan area in northern Texas. Approximately 6.7% of the students in the district have been identified as SWD (TEA, 2015).

Definition of the Problem

The introduction of NCLB legislation changed the way administrators and teachers have approached teaching SWD. Kaufman and Blewett (2012) summarized the effect of NCLB as bringing an assessment-based model that has schools:

> . . . paying more attention to the creation of each and every Individual Education Plan (IEP) for their SWD to ensure not only that the students are receiving a Free Appropriate Public Education (FAPE), but also that they are able to learn and grow in a manner that will lead to meaningful results both on the IEP and in the disaggregated test scores. (p. 13)

As SWD are now being factored into a district's AYP, the need to implement programs and strategies to close the achievement gap between SWD and students without disabilities has come to the forefront.

Equal opportunities for all students, including those with disabilities, are an important part of NCLB. To graduate from a Texas high school, students must achieve passing scores on exit tests encompassing language arts, social studies, math, and science. As observed by several science facilitators, some school's biology teachers have not been effectively implementing evidence-based strategies for SWD to pass the STAAR biology exam (personal communication, 2013). This problem has caused SWD to score below the satisfactory level on the STAAR biology exam. Using the 2013 released STAAR data from the TEA website, the report cards for individual schools in the target district reported SWD passing rates ranging from 51% to 86% (TEA, 2013). During a 2013 professional development session, data were presented showing how all subpopulations performed on the Spring 2013 STAAR biology exam. The scores of SWD on the STAAR biology exam lagged far behind the scores of students without disabilities. The same trend, but to a much lesser degree, was shown on the STAAR physics test, which the state

no longer requires. Biology teachers at the session questioned several physics teachers as to what they were doing to close the gap between SWD and their peers without disabilities (personal communication, 2013). After viewing the scores from throughout the district, it has become apparent that the gap between the passing rates of SWD and students without disabilities on the STAAR biology exam is not confined to only one building, but is a concern throughout the district.

At a meeting of science facilitators for the target district, the facilitators reported that although they have observed biology teachers using some evidence-based strategies in their classrooms, these strategies are not used regularly among all schools, and at particular schools, they are not used effectively. The facilitators noticed that at schools with higher passing rates, evidence-based strategies seem to be used more often. However, they have not yet been able to identify specifically what makes some schools more effective in raising the passing rates of SWD on the STAAR biology exam. The research problem I plan to study is that many of the district biology teachers do not know how to effectively implement these strategies to enable SWD to learn the biology content so that SWD can pass the STAAR biology exam.

The district has seven high schools with regular, advance placement (AP), pre-AP, and international baccalaureate (IB) science programs. Students can enroll in a variety of courses including biology, chemistry, physics, introduction to physics and chemistry, environmental science, earth space science, astronomy, anatomy and physiology, forensics, and aquatic science. Students are required to take the STAAR

biology exam at the end of ninth grade. In 2013, the Texas legislature changed the exit requirements for all Texas students. The prior graduation requirement had three diploma options: (a) the minimum plan that required three units of English, mathematics, and social studies as well as two units of science; (b) the recommended plan that included three units of mathematics and science and four units of English and social studies; and (c) the distinguished plan that required four units of English, mathematics, science, and social studies.

The new exit requirements have only two options: (a) the foundations plan, which requires four units of English and social studies and three units of mathematics and science; and (b) the distinguished plan, which did not change from the previous plan, because four units of English, mathematics, science, and social studies are still required. The revised exit requirements also included a change in the number of exit level tests required. The prior requirements had students taking a series of end of course exams in 15 courses. Students were required to average an 80% passing rate within each discipline. The new requirements include passing end-of-course exams in biology, English I and II, algebra I, and U.S. history. The test items are based on the Texas Essential Knowledge and Skills (TEKS) objectives. These objectives were written by the members of Texas Education Agency's (TEA) subject matter experts, with input from participating teachers throughout the state.

Even though Texas is implementing a new testing system, an analysis of the data prior to 2011indicates that the same issue existed with benchmark exams designed by the

target district as a gauge for student achievement. Ninth-grade students did not take a science achievement test before 2011; they took reading and mathematics tests. The district's benchmark exams were developed based on the TEKS and were written in the style of eighth and tenth grade state assessments (known as Texas Assessment of Knowledge and Skills, or TAKS test). Data from these tests showed the same trend as current STAAR data; SWD had a passing rate of 11% and 39% on the STAAR test for the two years prior to the introduction of STAAR compared with students without disabilities having passing rates of 47% and 75%, respectively. Data from the target districts 2012 STAAR biology exam indicated that 55% of SWD scored at satisfactory (level 2) rating of the State's end of course Biology exam compared to 90% of students without disabilities (Texas Education Agency, 2013). Comparing this information to statewide results, the target district is doing quite well. TEA in 2011 reported the statewide results for all students taking the biology end-of-course exam was an 87% passing rate, compared with a passing rate for SWD of 57%. Although the passing rate for students without disabilities for the target district is above the state passing rate, the rates for SWD for the target district is below the state data. This trend, as well as concerns expressed by teachers regarding their ability to teach science to SWD, effectively supports the need for the proposed project study.

Determining the best way to close the achievement gap for SWD on these tests is a priority for Texas educators. Within the focus district, the biology departments have four to six teachers at each campus, for a total of approximately 32 biology teachers at

this time. Most of these teachers do not have specific degrees in biology but rather have a composite science teaching certificate. Currently, these teachers range from having no experience teaching biology to having 20 or more years of experience. With this wide range of expertise and experience, it is imperative that an optimal method for reaching all students be found and shared amongst all the biology departments.

Across the United States, 36 states have mandated exit level exams in science (Usher, 2011). After reviewing individual states' data, it is apparent that SWD score at least 20 points lower on their respective science exit exams (Usher, 2011). Even though each state's criteria for passing are different, the published results show an alarming trend; districts are not adequately preparing SWD for passing science exit exams. Data from states providing information on modifications and accommodations given on exit level tests (Texas is one such state) still show SWD lagging behind their counterparts without disabilities (TEA, 2013). A student's IEP could include accommodations such as extra time, large print, use of calculators, or having the exam read (many more exist, but these are common science accommodations) (Kettler, Dickenson, Bennett, Morgan, Gilmore, Beddow, Swaffield, Turner, Herrera, Turner, & Palmer, 2012). Even with modifications and accommodations, SWD taking the STAAR biology exam in Texas have scores lagging behind those of students without disabilities. In the target district, STAAR biology scores for SWD are 35% below those of students without disabilities (TEA, 2013). One of the goals of this study is to examine what makes certain schools more successful with the passing rates of student with disabilities on the STAAR biology

exam. Another goal of this study is to determine how the target district can aid its biology teachers in incorporating the strategies into the science curriculum.

Rationale

The rationale for studying the problem that many of the district's biology teachers do not seem to effectively implement evidence-based strategies to enable SWD to learn the biology content so that they can pass the STAAR biology exam is threefold. First, there is large gap between the passing rates for SWD and nondisabled peers on the STAAR biology exam. Second, passing rates for SWD on this test are low across the district, there are some schools in the district that have been successful with SWD and have much higher passing rates for this group of students. And third, the achievement gap in science is not just a local problem, but also exists at the national level. Addressing the problem of low passing rates for SED is essential so that SWD will be more successful in passing the STAAR biology exam and to assist the district in meeting the requirements for adequate yearly progress (AYP).

Evidence of the Problem at the Local Level

In addition to the requirements of NCLB, the Individuals with Disabilities Education Act (IDEA) of 1997 stated that all SWD must have access to the general curriculum and must be included in state and district large-scale assessments (Browder et al., 2012). The 2004 re-authorization of the IDEA (IDEA, 2004) required that SWD receive instruction in the Least Restrictive Environment (LRE) (Individuals with Disabilities Education Act, 2004), which for most students is the general education

classroom. This requirement has led to teachers providing evidence-based strategies designed to aid SWD in their studies.

Table 1 shows a comparison of district-wide overall passing rates and the passing rates of SWD from 2011 to 2013 (TEA, 2013).

Table 1

State of Texas Assessment of Academic Readiness

Year	Passing percentages for all students	Passing percentages for SWD	Gap between all students and SWD
2011	59	39	20
2012	90	55	35
2013	84	63	21

Note. Data taken from TEA website, 2013. SWD–SWD.

A review of the science test data from 3 consecutive years indicated that the focus district has been able to improve the passing rates of SWD, but the passing rates of these students continues to lag behind those of their nondisabled peers. The table clearly shows that while the district has made great strides with the passing rates of all students, the gap between the passing percentages for all students and the passing percentages for SWD has not decreased.

Though clearly higher than state and national results, the district's passing rates for SWD are not on a steady incline and are lagging behind the overall passing rate by an average of 30%. Current information shows that this gap is increasing; the gap changed from 20 points in 2011, 35 points in 2012 and 21 points in 2013 (TEA, 2013). The

analysis of these data show that there must be changes made in the strategies used with SWD to close the achievement gap that currently exists. Based on the latest data from the TEA website, several high schools are more successful with the passing rates of SWD on the STAAR biology exam than other schools. Table 2 shows the passing rates for SWD in the seven high schools versus the overall biology student passing rate.

Table 2

STAAR Biology Data by School for SWD Passing Rates vs. Passing Rates for All Students

School	Passing percentage for all students	Passing percentage for SWD
A	81	51
B	95	86
C	85	61
D	92	66
E	91	52
F	93	70
G	87	53

Note. Information gathered from the TEA website. SWD-SWD.

From the data found in the above table, all schools were able to meet the 80% passing rate for all students. Several schools, however, were able to meet the 80% passing rate with the SWD subpopulation. Discovering which evidence-based instructional strategies teachers in the two more successful schools are implementing may help all schools in the district raise the passing rates for SWD.

Released public data from TEA indicated that SWD had a state-wide passing rate of 58% compared with an 87% passing rates for all students on the 2012 STAAR biology exam (TEA, 2013). As Texas moves toward EOC exams, known as the STAAR tests, the

district will need to concentrate on instructional methods designed to increase the achievement rate for SWD to continue to meet AYP as dictated by the State of Texas.

Five of the seven high schools within the target district did not meet AYP in 2012, due either to mathematics scores or graduation rates. If a district or campus does not meet AYP for 2 consecutive years, the district will be subject to certain requirements such as offering supplemental education services, offering school choice, and/or taking corrective actions. With the passing of House Bill 3 (HB3) through the 81st Texas Legislature session, ending in May 2013, science became part of the indicators within a school's AYP (TEA, 2013). With the biology STAAR indicator added to AYP, evidence exists that teachers are not effectively incorporating evidence-based strategies to assist SWD and the low passing rates for this subgroup may result in more schools not passing AYP.

Evidence of the Problem From the Professional Literature

A similar gap in science achievement rates between SWD and their nondisabled counterparts can be seen at the national level. According to the National Assessment of Educational Progress (NAEP), SWD scored lower on science achievement tests than their nondisabled counterparts within the same grade level (National Assessment of Education Progress, 2012). The Nation's Report Card, a communication tool of the NAEP, had science achievement score information at the eighth-grade level, but Mervis (2012) projected that the scores could be transposed to the high school level. The information gathered from the Nation's Report Card showed SWD with a 34% passing rate compared with a 69% overall passing rate. All students, including those with disabilities, must be

instructed using methods that will maximize their learning potential to graduate from high school and have the same expanded options for employment and/or higher education as their nondisabled peers.

With increasing expectations of stronger science achievement for SWD (Gartland & Strosnider, 2011), there is a push to find the most effective teaching strategies for this subpopulations of students. More states are reporting the data from achievement tests of SWD to the national database with 42 states currently reporting such data. Gaps in the achievement rates of SWD are evident, even with accommodations (VanGetson & Thurlow, 2007). VanGetson and Thurlow (2007) conducted a study of SWD's proficiency on state achievement tests from 2004–2005. They were able to access the information through the Department of Education's website. The researchers were able to identify 97 different state-wide assessments and 107 in total. After reviewing 7 years' worth of data the researchers found sizable and various gaps in the scores between SWD and nondisabled students. SWD that used an alternate assessment (accommodated or modified test) had higher scores than those that did not use an alternate assessment, but a gap was still prevalent. A similar study conducted by Wagner, Newman, Cameto, and Levine (2006) reported that SWD take fewer science courses (2.3 credits versus 3.0 credits for nondisabled students). According to the National Longitudinal Transition Study-2 covering 2002 and 2004, one of four SWD scored very low on the Woodcock-Johnson III subtests. In science, seven of 50 SWD scored below 70% on the subtest (Wagner et al., 2006). With Texas now expecting SWD to earn at least three science

credits for graduation (TEA, 2013), finding strategies that will improve their proficiency scores on achievement tests required for graduation is essential.

The achievement gap problem for SWD has been observed to be widespread across the state of Texas as well as throughout the entire country. Research has shown that the performance of SWD reveals several limitations in cognitive strategies (Dermitzaki, Stavroussi, Bandi, & Nisiotou, 2008). Dermitzaki et al. (2008) have also determined that the criterion for choosing the appropriate teaching methods is a major issue for teachers. Most science teachers also noted that their teaching experience and training played a vital role regarding their decisions on what and how to teach science in inclusive classes (Browder et al., 2012).

Definitions

There are many specialized terms when dealing with SWD. The list below is a compilation of the terminology used in this paper, along with their definitions and sources for the definitions.

Accommodations: A testing change intended to facilitate student's access to test content while preserving test validity (Dickenson, Gilmore, Price, & Bennett, 2011).

Activities: An educational tool that imparts the knowledge or skill (Wordnet 3.0 Princeton University).

Benchmark: a measurement standard for comparison. Used within an organization with the aim to improve its performance (Burquel, 2014).

Evidence-based strategies: using instructional strategies grounded in strong empirical foundations to improve the educational outcomes of students in both general and special educations (Kutash & Duchnowski, 2006).

Highly qualified- teachers: hold a bachelor's degree and who have demonstrated subject matter knowledge by passing a credentials exam (Mills, 2008).

Inclusive classrooms: classrooms containing both SWD and those without disabilities (TEA, 2013).

Instructional Strategy: approach used to present information in a manner that achieves learning. Approaches include tutorial, gaming, simulation, etc. Aspects of instructional strategies include the order of presentation, level of interaction, feedback, remediation, testing strategies, and the medium used to present the information (Clark, 2008).

Modifications: the content of an item has changed and evidence that the original construct has been preserved is lacking (Dickenson et al., 2011).

Response to Intervention (RTI): a program where students are provided with instruction from classroom teachers with their progress monitored. If students do not respond to their initial instruction they will receive additional instruction again with progress monitoring. Those who still do not respond could qualify for assistance as a student with disabilities (Fuchs, Mock, Morgan, & Young, 2003).

State of Texas Academic Achievement and Readiness Test (STAAR): measures student mastery of state mandated curriculum for individual core classes (TEA, 2013).

SWD: students receiving special education services (not including students with 504 plans) (TEA, 2013).

Texas Assessment of Knowledge and Skills Test (TAKS): measures student mastery of state mandated curriculum over the course of a student's educational career (TEA, 2013).

Texas Education Agency (TEA): governing body designed to provide leadership, guidance and resources to help schools meet the educational needs of all students (TEA, 2013).

Texas Essential Knowledge and Skills (TEKS): sets of objectives for all grade levels and subject areas under the Texas Administrative Code for district implementation in all curricula (TEA, 2013).

Significance

This study is significant for three reasons. First, SWD may not graduate if they do not pass the STAAR biology exam. Second, adequate science knowledge is important to the future of SWD. And finally, the district may not meet AYP if the passing rates of SWD on the STAAR biology exam do not improve. If SWD do not pass the STAAR biology exam, one of two options will have to be selected. Either the student will not graduate, but has the opportunity to take the STAAR biology exam over again an

unlimited amount of times until they pass or an emergency admission, review, dismissal (ARD) meeting may take place to see if the student is eligible to have the STAAR biology exam requirement taken off of their graduation plan. No matter which option is chosen, SWD need to have a solid understanding of the biological sciences in order to make better career and health –related decisions outside of the academic realm.

Science education is important for several reasons. To begin, science education teaches problem-solving skills that students can apply to everyday life and career experiences. Determining how to define a problem, formulating a plan for solving the problem, and having the ability to explain the problem and solution to others are basic skills learned in science classes that can be transferred to any number of careers (Lindstrom, Doren, & Miesch, 2011). As SWD are able to raise their achievement scores, they will have a wider job market to enter. The latest job market projections show that science based jobs will increase 20% or more for the next 10 years (Sommers & Franklin, 2012). Preparing SWD with the necessary science skills will increase their marketability. As SWD embark upon life after graduation, they will need an adequate background in the sciences to make informed decisions on health, environmental, and career decisions. If students are not adequately prepared for making these important decisions, economic disparities may grow. If, however, teaching methods can be employed to raise the achievement scores of SWD in the sciences, they will have a better knowledge base from which to improve their quality of life.

Another possible result of SWD not passing STAAR is that the district may not meet AYP as required in NCLB legislation which could affect funding as well as the district's report card. With these factors in mind, this project study will attempt to aid teachers by identifying the most effective teaching methods for SWD in biology classes. The results of the study will be used to develop a project to help biology teachers increase the passing rate for SWD on the STAAR test by implementing accommodations using evidence-based strategies.

The target district has established a database that holds the district's curricula for all disciplines from elementary though the high school levels. The curriculum has the TEKS which is Texas' list of objectives that need to be covered during a course. The TEKS have been aligned with activities and time frames in order to aid teachers in developing lessons for their classes. Within the district's science community, the online curriculum has been moving toward more discovery and cooperative learning activities, both of which have been noted to be beneficial for SWD (Browder, et al., 2012). The district online curriculum for biology is still lacking in activities specifically targeting SWD, and teachers are still faced with finding teaching methods that will work within the confines of the classroom and that will assist SWD in passing the STAAR biology exam.

Guiding/Research Question

The district in this study needs to reduce the gap between the passing rate for all students on the STAAR biology exam and the passing rate for SWD. The guiding

question for this study was as follows: What makes certain schools more successful with the passing rates of student with disabilities on the STAAR biology exam?

Research Questions:

Research Question 1: What evidence-based instructional strategies do biology teachers report using at schools with higher passing rates for SWD on the STAAR biology exam?

Research Question 2: What evidence-based instructional strategies do biology teachers report using at schools with lower passing rates for SWD on the STAAR biology?

Research Question 3: What are biology teachers' perceptions regarding what the district could provide to help them be more effective in increasing the passing rate of SWD on the STAAR biology exam?

Research Question 4: What are administrators' perceptions concerning the performance of SWD on the STAAR biology exam?

Review of the Literature

Conceptual Framework

Educational institutions in Texas, such as the target district, operate with the guiding belief that all students, no matter their race, socioeconomic background, or disability have the capability to learn as required by the TEKS. The target district also

holds to the core value that it is the responsibility of all the adults in the district to ensure that all of the children succeed academically. Equitable and excellent classroom learning is the primary focus of district operations (District Improvement Plan, 2012). Incorporating this idea that all students can learn and achieve at high levels, it is imperative that SWD are provided instruction using strategies proven to increase their achievement scores. Teachers must also be given the training and tools necessary to provide SWD those needed skills.

The conceptual framework supporting the district's idea that all students have the capability to learn is based on Vygotsky's (1978) cognitive development theory. This is also the theoretical framework upon which this research study is built. Cognitive development theory describes how skills and knowledge are learned coupled with the learner's readiness to achieve mastery of the concept (Vygotsky, 1998). Vygotsky (1978) described zones of proximal development as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 2011). Vygotsky's theory is applicable to this research study as I will be examining what evidence-based strategies can be used with SWD to help them bridge the gap between where they are currently functioning and where they can potentially function with appropriate guidance and support.

Doolittle (1995) applied Vygotsky's cognitive development theory toward cooperative learning under the premise that anyone's potential for cognitive growth is determined by what can be learned on his or her own and what can be learned with peers, tutoring, or a teacher. This framework provides the support for implementing instructional strategies such as cooperative learning, peer tutoring, and coteaching as classroom strategies for SWD as these instructional methods allow SWD to have interactions with others, enabling them to learn from others while being able to express their own opinions. Thus, they are able to learn more than they would have been able to learn on their own. Gredler (2012) also has integrated Vygotsky's cognitive development theory to develop implications for educational practices. In this project study, Gredler and Vygotsky's theory are applied as the foundation for determining why SWD are not successful on the STAAR biology exam.

The introduction of a tutor, either in the form of a peer or adult (teacher) is thought to involve a scaffolding process to allow the learner to solve problems beyond what he or she could do alone (Wood, Bruner, & Ross, 1976). The use of a dialogue that develops between the learner and others increases the learner's realm of knowledge and allows the learner to increase his or her cognitive thinking skills. This concept was echoed with Vygotsky's zone of proximal development whereby a child's potential for cognitive growth is bounded by what can be accomplished alone versus what can be accomplished with others (Vygotsky, 1978). The use of tools such as graphic organizers

and mnemonic devices can be applied as a form of scaffolding for SWD to record what they have learned and recall it at a later time.

Vygotsky's cognitive development theory has been applied in various ways to show that SWD can achieve at higher levels when strategies designed to allow for interactions are introduced. These models work well in enabling strategies designed to aid SWD to increase achievement and prepare them for higher education (Korbel, McGuire, Banerjee, & Saunders, 2011) or careers beyond high school. However, teachers must have the training in order to effectively implement evidence-based strategies into the curriculum in order to achieve higher scores than they could on their own (Colbert, 2010). As biology teachers learn how to effectively implement strategies such as graphic organizers, guided notes, cooperative learning, peer tutoring, and coteaching, SWD will be able to achieve higher scores on the biology STAAR, as Vygotsky's theory implies.

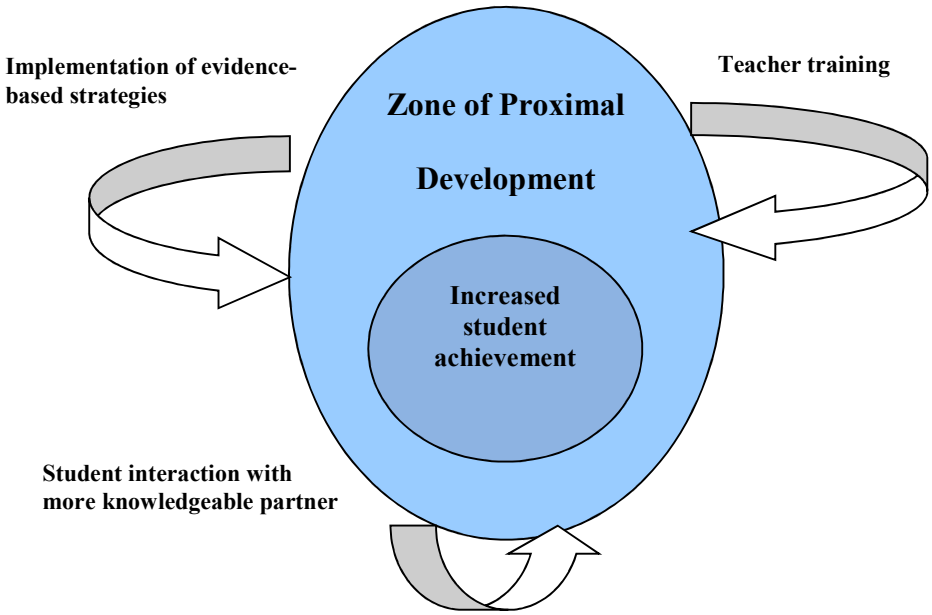

Figure 1.

Strategies for SWD success. This figure illustrates how Vygotsky's cognitive development theory can aid in the success of SWD.

Teacher Training and AYP

Training preservice teachers to become culturally responsive will allow them to create an environment conducive to supporting a diverse student body, including SWD (Colbert, 2010). Preservice teachers must be able to understand how their biases can affect the climate of their classroom. Colbert describes a university providing a series of workshops designed to focus on classroom culture and then describes its impact on teaching and learning. He determined that the workshops provided teachers with the tools to relate to students within culturally diverse populations. This workshop strategy becomes an integral part of the conceptual framework designed to raise achievement scores of SWD on the exit level science test. If teachers are aware of the students'

experiences, they will be better prepared to devise active learning lessons. This type of lesson will facilitate a deeper learning for SWD (Colbert, 2010).

With the advent of the NCLB legislation, which supports setting high standards and establishing measurable goals in order to improve outcomes in education (No Child Left Behind Act, 2001), school districts are searching for ways to meet AYP for all categories of students. Even though there is no national mandate for including science achievement scores into AYP, Texas, along with twenty- five other states have such mandates in their AYP assessments for schools (Judson, 2010). Since 2007, many Texas schools, including the target district, have made strides in closing the achievement gap between SWD and students without disabilities. IDEA now permits the use of an RTI (response to intervention) approach, in which students are not only given standards-based tests to determine eligibility but also continuous monitoring (Gartland, & Strosnider, 2011). As a response to RTI, districts must begin to determine which strategies work best for SWD and then work toward building a curriculum, training their teachers to facilitate an increase in the achievement scores of SWD in science (Swanson, Solis, Ciullo, & McKenna, 2012). This literature review will help determine proven strategies for increasing the achievement scores of SWD as well as determining evidence-based strategies for providing effective training opportunities for teachers.

Evidence-based practices, though put into many curricula, are not guaranteed to work for everyone (Cook & Odom, 2013). Implementation of evidence-based practices must be monitored and partnered with training, support and evaluation of the strategy

(Cook & Odom). Training preservice teachers in providing not only sound science lessons, but incorporating strategies to ensure that SWD will achieve in science courses is essential. A survey of preservice teachers revealed that teacher-centered techniques work best with SWD, while student-centered techniques work best with students without disabilities (Woodcock & Vialle, 2010). Preservice teachers must be trained on methods and instructional strategies to promote learner-centered activities for SWD. This can be done by allowing preservice teachers to spend time planning and observing inclusion classrooms as part of their coursework (Szyjka & Mumba, 2009). Jordan, Glenn, and Richmond (2010) reported that SWD who spent more time in general education classrooms scored higher on achievement tests than those that spent less time in general education classrooms. They also reported that teachers who are effective classroom and time managers were observed spending more time with SWD, which contributes to the success of those students. Preus (2012) reports that the RISER (Research Institute on Secondary Education Reform) study found that SWD that graduated from schools of Authentic and Inclusive Learning showed higher levels of postsecondary completion compared with students without disabilities. Through interviews, Preus (2012) discovered that the district provided teachers with individualized professional development plans.

More students are entering higher education with 11% of enrolled students in 2010 reported having a disability (Korbel et al., 2011). It is imperative that these students are given the skills in order to transition from their high school experiences to their collegiate experience. In order to provide training on effective strategies with both

preservice and other teachers, a determination of effective strategies for SWD must take place.

Special education teachers also need training to aid SWD in raising their achievement scores in science. Generally, special education teachers have little to no exposure to science education or science classes as part of their degree program, and most high school science teachers are not trained to teach SWD or inclusive classrooms (Cawley, 2002). Cawley (2002) suggested that the reasoning behind this situation is that special education teachers generally specialize in reading or mathematics, and that most high school teachers have not taken the opportunity to attend professional development or other courses concentrating on the teaching of science to SWD. There are several implications to this occurrence. First, general education high school teachers do not perceive themselves as having the required skills to modify activities for students with special needs. Special education teachers perceive themselves as not having enough science knowledge to decide how to modify the content for students with special needs. It will take a concerted effort between general education teachers, special education teachers, and administrators to work together to insure that all involved receive the necessary training and skills to provide SWD an equitable education.

NCLB and IDEA legislations have put pressure on schools and universities to implement training programs and workshops to prepare both preservice, general education teachers, and special education teachers on raising the achievement scores of SWD. Now that SWD are part of a district's AYP, there is a need to provide teachers

with ways to implement evidence-based strategies into the curriculum in order to close the achievement gap for SWD on science exams. The success of providing quality science instruction to all students through inclusion in high schools largely depends on several factors: general education high school science teachers' curriculum, instructional and assessment decisions for inclusive classes, and the factors that influence such decisions (Szyjka & Mumba, 2009). Success is also likely to depend on science teachers' knowledge about SWD and their willingness to accommodate them in science lessons (Szyjka & Mumba, 2009). Within the target district, out of the seven high schools, one had a 78% passing rate for SWD on the 2012 STAAR biology exam compared with 55% for the overall district score (TEA, 2013). At another school, the passing rate for SWD was 68%. Biology teachers at those schools with noted success, will also be approached to be part of the study to determine what strategies they are using to increase the passing rate for SWD on the STAAR biology exam.

Accommodations in Testing

NCLB legislation has led to more SWD participating in state level achievement tests. With this comes a need for an increased occurrence of accommodations to ensure SWD have a valid measure of their progress on the tests. Accommodations for testing include, but are not limited to oral administration, computer administration, extended time, use of calculators, and use of a scribe (Thurlow, Quenemoen, & Albus, 2013). Each state can allow different accommodations and SWD can incorporate combinations of accommodations depending on their IEPs. Thurlow's team interviewed special education

leaders in order to determine the effectiveness and validity of accommodated tests from across the United States. The study included data from all core courses (reading, math, science, and social studies) from grades K–12. The researchers found that the use of accommodations had either a small positive effect or no statistically significant effect.

A follow-up study by Cormier, Altman, Shyyan, and Thurlow (2010) concentrated on test accommodation effectiveness from 2007 and 2008. Cormier and his fellow researchers used 40 studies to determine the effect of accommodations on test scores. Both qualitative and quantitative studies were used in this meta-analysis with the majority of the data coming from test scores. For comparative purposes, data from both SWD and peers without disabilities was used. The researcher determined that no matter which type of accommodation was used, SWD showed little to no significant difference in scores versus peers without disabilities (Cormier, Altman, Shyyan, & Thurlow, 2010). Thus, it appears from the research that simply providing accommodations for testing is not going to result in a significant increase in test scores for SWD.

Effective Instructional Strategies

For many SWD, basic reading comprehension must be addressed before dealing with strategies to enhance science content. Students need cognitive strategies and accommodations to aid in cuing students as they acquire knowledge (Cowden, 2010). Many SWD need help monitoring comprehension and clarifying relationships among facts. These students require cognitive strategies designed to help with analyzing and combining activities in order to be successful in the science classroom, as well as in other

courses (Dermitzaki, Andreou, & Paraskera, 2008). SWD can have difficulty translating information from hands-on activities into main ideas for analyzing the data. There are several methods that can aid not only with memory issues, but also enhance the thinking skills of SWD through the use of observation, comparison, and inference. Teacher interviews conducted by Korbel et al. (2011) revealed that strategies including peer teaching and editing as well as flexible grouping (cooperative learning) were implemented with great success for SWD as were graphic organizers to help structure student's thoughts (Korbel et al., 2011). These strategies aided SWD to be successful with higher order thinking skills, deep knowledge questions, and connections to the real world thereby improving their achievement.

Cooperative learning. One successful strategy with SWD is cooperative learning. Cooperative learning is often referred to as methods of instruction designed to allow students to work together on academic tasks (Cowden, 2010). This strategy allows students to listen and to learn from their peers. SWD are able to express their views and opinions as part of a group, allowing them to practice socialization skills as well as mastering information. Implementing a cooperative integrated reading and comprehension strategy within a mixed ability group allows SWD to learn appropriate science techniques with peers (Cowden, 2010). Fuchs and Fuchs (2001) originally researched using a cooperative integrated reading and comprehension strategy approach. Their study used what they termed "reciprocal teaching". Mixed ability groups read passages, developed questions, clarified meanings of words from the reading, and

summarized passages. This was done within small groups on a daily basis over several months. They found that SWD were able to raise their comprehension scores via pretests and posttests (Fuchs & Fuchs, 2001). Cooperative learning can be used within many different types of science activities. Laboratory activities allow SWD to have hands-on experiences along with practice relating facts in a structured environment. The use of inquiry-based strategies has been found to aid students with reading disabilities. Inquiry-based strategies are described as activities through which students develop knowledge and understanding of scientific ideas (National Science Teachers Association, 2004).

SWD must be academically engaged in learning (Jimenez, Browden, Spooner, & Dibiase, 2012). A study by Jimenez, Browden, Spooner, and Dibiase (2012) was designed to research the effects of peer-mediated instruction incorporating time delay on the number of correct responses while using a graphic organizer technique known as a KWHL chart (what you know, what you want to know, how are you going to learn it, and what did you learn) over several science concepts including kinetic and potential energy. The study recruited six 11 year old peer tutors which were trained in the peer-mediated instructional method from a large, urban school district in the Southeast United States. The peer tutors were provided with a checklist so they would remember when to incorporate the strategy into the KWHL chart. One general education teacher as well as one special education teacher participated in the study. Once a baseline was established for the use of a KWHL chart, the study commenced. Observations were done over three units of study or 18 lessons. After the teacher introduced the lesson for the day, the peer-

mediators, the SWD, and other general education students were placed in different mixed-ability cooperative learning groups of four to five students. All of the SWD were found to increase their number of correct responses on the KWHL chart over the course of the study. Even though the researchers realized a limitation of the study was having a small number of participants, they concluded that collaboration with peers allowed SWD to apply problem solving techniques while being actively engaged which leads to higher achievement test scores.

Students working in groups allow SWD to learn from their peers. Marino, Black, Hayes, and Beecher (2010) conducted a study to determine which variables aided in raising student achievement in a science, technology, engineering, and mathematics (STEM) curriculum. The study was conducted in four northeastern United States school districts. Sixteen general education teachers participated in the study. Each school selected had SWD represented making up 9.1% to 14.4% of all students in the study. Students were placed into three reading ability groups based on a previously given Degrees of Reading Power scores. During science classes, students participated in whole class instruction followed by group time with computers (two to five students per group), then back to whole group for closing discussions. SWD in inquiry-based groups showed a higher achievement on posttests (Marino et al., 2010). Through analysis of pretest and posttest data, it is determined that SWD scored at levels equal to their peers without disabilities when instruction occurs using cooperative groups. Teachers must be able to incorporate analysis strategies that will allow SWD to understand how to take what they

have discovered during the hands-on experience and translate that information into demonstrating mastery of the objective. This can be done by incorporating other disciplines, adding graphic organizers, and introducing mnemonic phrases into the analysis section of hands-on activities (Kaldenburg, Therrien, Watt, Gorsh, & Taylor, 2011).

Integrating disciplines. Integrating disciplines through a science context is another strategy that has been supported by several researchers. Cawley and Foley (2002) reviewed several programs that incorporate an interactive problem-solving strategy where students are given a hands-on approach to science education. The approach was used to increase the understanding of physics concepts for SWD while in a mathematics or language-related course which then leads to higher achievement (Cawley & Foley, 2002). Incorporating charts to help SWD visualize, highlight, or color code relationships aids in recognition of patterns that may not otherwise be apparent.

A study of a summer project done by teachers and instructors at a northeastern university by Cawley, Hayden, Cade, and Baker-Kroczynski, (2002) was conducted in order to determine how well teacher cooperation in development of activities for inclusive classrooms affects the achievement rates for SWD. The project was designed to have teachers work together to build and design theme-based; hands-on physics activities that would work best for SWD along with designing a long term project to determine how the activities aided SWD in raising their achievement in science classes. Mentors were used as consultants to aid the groups in the design of the project. During the ensuing

school year, the activities were incorporated into the curriculum. After the activities, a posttest was given to determine the achievement for SWD. The posttest scores were double pretest scores for SWD. In the same study, SWD were taught to maintain a portfolio and keep track of their progress. These same students were given a district achievement assessment on which no changes were made in terms of testing items or score and 11 out of 16 passed the exam. The researchers suggested that science teachers that take the time to talk with teachers of other disciplines find that their discussions can be extremely beneficial in creating integrated lessons (Cawley et al., 2002).

Peer tutoring. In order to raise achievement scores for SWD, incorporating vocabulary skills is essential. One way to do this is through peer tutoring. If a student with disabilities is paired with a peer without disabilities so that they alternate roles, this allows SWD to demonstrate positive attitude and learning (McDuffie, Mastropieri, & Scruggs, 2009). A study from a large suburban area in the Eastern United States was done to access the impact of a peer tutoring intervention (p. 496). The study had four general education teachers and two special education teachers participate as well as 203 students with and without disabilities. The peer tutoring intervention was implemented over eight weeks and included both pre and post testing revolving around several biology units. Classes began with whole class instruction and then students moved into peer-tutoring pairs. All students and teachers were trained to use the peer-tutoring materials consisting of a tracking sheet and fact sheets (cards with questions and answers to be matched up). The final data, which included a pretest, five unit tests as well as a

cumulative posttest were analyzed at the individual student level using ANCOVA, supported by intra-class correlations. Analysis of the data showed that SWD in the peer tutoring classes scored significantly higher than SWD in classes without peer tutoring (p. 504).

Graphic organizers. Another strategy is the use of graphic organizers. These are visual and spatial displays making relationships between related facts and concepts more apparent (Dexter & Hughes, 2011). Researchers agree that SWD have issues with word-oriented cognitive strategies (Conley, 2011). Graphic organizers allow SWD to connect new material to prior knowledge, thereby increasing their problem solving skills. There are several types of graphic organizers designed to aid in teaching abstract concepts to SWD. The first is a cognitive map which supports and develops organizational skills and is also helpful in building vocabulary. A second graphic organizer is a semantic map (web) which allows SWD to actively create a visual representation to demonstrate a relationship between concepts. SWD tend to require assistance in making predictions; a semantic map lends itself to helping SWD achieve success with prediction-making (Dexter & Hughes, 2011). Dexter and Hughes (2011) performed a meta-analysis of graphic organizers to increase achievement scores in science for SWD from grades 4 – 12. The meta-analysis allowed the researchers to avoid limitations of small sample sizes. They only used studies that reported on factual comprehension measures for their meta-analysis and only included studies that applied experimental or quasi-experimental designs. This approach allowed the researchers to address the overall effects of graphic

organizers. The researchers computed effect size and inverse variance weight along with a z-test from 29 studies. Their analysis found there was no significant difference between the type of graphic organizer and posttest effects. The researchers also concluded that graphic organizers are effective in increasing both basic and higher level thinking skills.

Visual displays are a third type of graphic organizer that allows concepts to be created spatially. In the study discussed earlier by Dexter and Hughes (2011), visual displays allowed SWD to apply knowledge to situations not directly covered in text or lecture. The same study reported that semantic maps are appropriate choices for immediate fact recall and visual displays are better for maintenance and transfer of knowledge for SWD.

An e-chart is a fourth type of graphic organizer that can be incorporated by SWD. The e-chart allows students to correlate information with the main idea or concept. All types of graphic organizers allow SWD to reduce the amount of information given during a unit. This tool allows students to apply short phrases, words, or pictures to facilitate their learning. Students will associate the words, phrase, or picture with the information thereby reducing the amount of information they must write.

Graphic organizers such as KWHL (what you know, what you want to know, how you are going to find out, and what you learned) charts have been determined to be able to link prior knowledge with new learning (Smith, Spooner, Jimenez, & Browder, 2013). A study by Smith, Spooner, Jimenez, and Browder (2013) was designed to look at the effectiveness of an adapted early science curriculum on three elementary aged students

with several disabilities in a southeastern state (p. 5). The science lessons were delivered as a whole class then the assessment was performed on a one-on-one basis. The assessment used a response board set up as a KWHL chart as the students' visual component. Lessons were repeated three times before the students were given the assessment. It was determined that this type of organizer allowed SWD to develop science vocabulary skills. In the course of a study led by Smith, the researchers determined that the used of evidence-based strategies such as graphic organizers aided SWD, including those with severe disabilities to increase their average scores on science assessments (Smith et al., 2013). The visual cues that graphic organizers provide give SWD an understanding of a concept using key words (Kaldenberg et al., 2011).

Concept maps help SWD in connecting the main ideas of a unit with the specific information found within individual lessons (Kaldenburg et al., 2011). Concept maps, like all graphic organizers, incorporate shapes and lines with words and phrases designed to link concepts and relationships between main ideas (Novak & Canas, 2008). All graphic organizers incorporate a hierarchical basis. This allows SWD to build their learning, starting with a simple scaffold that transforms into a more complex structure. Concept maps aid SWD to develop a memory system, allowing them to construct links between different learning situations and apply them to new learning situations. The graphical clues stimulate the working memory of SWD thus allowing them to have a deeper understanding of the lesson’s objectives (Novak & Canas, 2008).

Teachers must devise focus questions or enduring understandings upon which the concept map will be devised. SWD need simpler designs first (Novak & Canas, 2008). Constructing maps that are already partially filled in and allowing the SWD to complete them allows them to acquire the confidence to implement this style of learning organization. As the school year progresses, students can become more independent at creating the maps, thereby becoming more independent learners.

Graphic organizers are designed to allow SWD to make connections between new learning and prior knowledge (Dexter, Park, & Hughes, 2011). Dexter, Park and Hughes (2011) performed a meta-analysis of experimental or quasi-experimental designs on the effectiveness of graphic organizers for SWD. Quantitative data from eleven published articles underwent weighted mean effect size, *z* test, and Q-statistical analysis to determine effectiveness of the various types of graphic organizers. All studies had the experimental group work with graphic organizers for several class periods over several weeks before assessments and evaluations were conducted. The researchers determined that the use of graphic organizers provided a large standardized effect on science posttests for SWD. There was also an overall positive effect when a maintenance performance test was performed (Dexter, et al., 2011). As with other studies, the type of graphic organizer used did not cause a significant change in effectiveness.

Graphic organizers allow teachers to assess student learning at many stages during a unit of study. Graphic organizers can be used before learning begins in order to see what knowledge a student with disabilities already possess. Graphic organizers can be

applied during the learning process to aid students, giving them tools to understand new vocabulary and concepts as well as dispel misconceptions; or they can be used after learning, to assess whether or not students are able to discern main concepts (Gallavan & Kottler, 2012).

Guided notes. As more SWD enter general education science classes, they must master more difficult content. Incorporating problem solving skills and higher order thinking skills is essential for laboratory activities (Boyle, 2012). Further, when SWD enter secondary classroom settings, their teachers expect them to become more independent learners. SWD at the secondary level are also expected to meet the passing standards for science achievement tests (Boyle, 2012). SWD must learn to take notes and incorporate those notes on activities, quizzes, and tests. Teaching SWD effective note taking strategies will increase their understanding of science related vocabulary as well as understanding the main concepts contained within lectures. As SWD become actively engaged in the note taking process, their achievement scores increase (Boyle, 2012).

Konrad, Joseph and Eveleigh (2009) conducted a meta-analysis of thirteen studies to determine how the use of guided notes affected achievement among SWD on post intervention quizzes and tests. The researchers found that when students were given training on how to implement guided notes, tests and quiz scores improved over those populations where guided notes were not used (Konrad et al., 2009). Guided notes are designed to increase SWD skills such as listening, participation, and thinking (Haydon, Mancil, Kroeger, McLeskey, & Lin, 2011). In a meta-analysis of 13 studies, Haydon and

his fellow researchers determined that when guided notes were used with SWD, higher scores were achieved in all the studies. Student satisfaction indicators determined that SWD preferred guided notes to traditional notes in three of the four studies that addressed student satisfaction (Haydon et al., 2011).

Taking notes from lectures has been observed in helping SWD with their understanding of the content leading to a better retention of information (Boyle & Rivera, 2012). An issue with SWD ability to take notes is their problem distinguishing between important and non-important information as well as writing quickly enough to keep up with the lecture.

Boyle and Rivera (2012) reviewed articles published between 1980 and 2010 in order to determine which note-taking intervention for SWD increases students' achievement. Five of the nine studies used in the review incorporated guided notes which are teacher prepared outlines of the lecture with places for students to record information during the lecture (Haydon et al., 2011). Two studies employed a strategic note taking strategy where students are given prompts and cues to write certain information or summarize material at different times during the lecture (Boyle & Rivera, 2012). The remaining studies used a direct note taking strategy where students are taught to incorporate a split-page method, where one column is meant for recording main concepts while the other column is for definitions, details and examples that relate to the main concepts (Boyle & Rivera, 2012). This method required teachers to stress concepts at first, then slowly allow students to take more responsibility for completing the notes. The

teachers also took up the notes and gave students feedback on how to improve their note-taking strategies. The review of the studies determined that SWD that were taught note-taking techniques scored higher on post quizzes and tests than other guided notes strategies, even though all three types of interventions had positive results (Boyle & Rivera, 2012).

Mnemonic phrases. Another strategy for aiding SWD to learn important facts is through mnemonic phrases. Mnemonics is a strategy that can be used in general education classrooms to help SWD learn how to learn effectively (Wolgemuth, Cobb, & Allwell, 2008). A meta-analysis by Wolgemuth, et al. (2008) was performed in secondary schools. The study was designed to determine the extent mnemonic strategies were able to improve academic outcomes for SWD. Twenty studies with a quantitative design incorporating keyword mnemonic strategies were found, and a weighted mean effect size, z-test, and t-tests were performed on the data. The researchers concluded that SWD, when given the keyword/keyword-pegword strategies have a better recall across core courses, including science (Wolgemuth et al., 2008).

Mnemonics allow either the use of key words with pictures or key words with letters to stimulate the recall of vocabulary or concepts (Kaldenburg et al., 2011). Mnemonic phrases can be teacher or student generated. A common mnemonic phrase used in biology to remember the classification hierarchy in order is King Phillip came over for good spinach. Each first letter is the same as the classification scheme (kingdom, phylum, class, order, family, genus, and species). Another example of a mnemonic used

in astronomy helps students to remember the stellar classes in order. The phrase is Oh; be a fine guy, kiss me. This represents O, B, A, F, G, K, and M stellar classes in order according to temperature. Mnemonics allow students to recognize science words in order to make connections. As SWD incorporate these strategies into their learning, SWD comprehension of science deepens and their ability to attain higher scores on achievement tests can be improved (Kaldenburg et al., 2011). As with all strategies, teachers must be trained in the development and implementation of mnemonics within the science curriculum. Keyword and other techniques have been used in several studies demonstrating an increase in scores for SWD (Brigham, Scruggs, & Mastropieri, 2011).

Coteaching. Coteaching can be defined as two teachers cooperatively co-planning, co-instructing, and co-assessing heterogeneous groups of students (Conderman & Hedin, 2012). How the teachers divide the responsibilities of the components is determined by the dynamics of the partnership. Coteaching allows for SWD to receive all necessary accommodations according to their IEP in an inclusion classroom. Inclusion classes are general education classrooms where SWD are fully incorporated into the classroom alongside students without disabilities. Teachers of inclusion classes are provided with a list of accommodations and modifications determined by a student with disability's IEP. Special education teachers provide support for students with strategies for success as well as one-on-one assistance in completing tests and activities. Incorporating the general educator's science knowledge along with the special education teacher's expertise at determining strategies to aid SWD in achieving higher proficiency

rates is a good combination and can improve student achievement (Conderman & Hedin, 2012). Coteaching also allows for individualized grading and progress toward achievement, especially when coteachers work together to write assessments that will reflect what SWD have learned (Conderman & Hedin, 2012).

McDuffie, Mastropieri, and Scruggs (2009) purposefully chose four co-taught and four non-co-taught inclusive middle school classes to determine the effects of coteaching on the achievement of SWD on several biology objectives. Within the coteaching pairs, the general education teacher provided the majority of the instruction with the special education teacher providing additional support for SWD. On days where there were to be lab activities, one teacher explained the activity while the other teacher set up the lab and related materials (McDuffie et al., 2009). After several observations over an 8 week period, the researchers asked participating teachers to answer a 25 question survey on their perceptions of coteaching. Teachers perceived coteaching as positive for SWD. Pretests and posttests were also given to the students in both the coteaching and non-coteaching classrooms. SWD in the co-taught classrooms outperformed SWD in non-co-taught classrooms on identification items, but not production items. The results also revealed that students in non-co-taught classes interacted with teachers more often than in non-co-taught classes, even though observations did not corroborate that finding (McDuffie et al., 2009). The researchers agreed that even with mixed results, coteaching could be a positive strategy for raising the achievement of SWD in science courses.

Summary

Therrien, Taylor, Hosp, Kaldenberg, and Gorsh (2011) conducted a meta-analysis of articles to determine what classroom-based instructional methods are effective at increasing science achievement of SWD (Therrien et al., 2011). The meta-analysis included articles on structured inquiry, supplemental mnemonic instruction as well as supplemental non-mnemonic instruction. Structured inquiry includes hands-on activities where small groups follow a specific set of steps to test a concept. Supplemental mnemonic instruction incorporates keyword and pegword strategies. After determining effect size and running ANCOVA on the data, the researchers determined that both structured inquiry and supplemental mnemonic instruction are effective at increasing SWD retention of science facts (Therrien et al., 2011).

There are numerous strategies to be found in the literature to aid in raising the achievement scores for SWD in science. Cooperative learning, integrated disciplines, and peer tutoring allow SWD to work with peers to acquire information. Graphic organizers, guided notes and mnemonic phases use words and pictures to represent information. The literature has indicated that graphic organizers, guided notes and mnemonic phrases allow SWD to make connections in order to recall science facts and vocabulary needed to raise achievement scores. Coteaching is another strategy that has been shown in the literature to allow more interactions with teachers (either general education or special education) in order to assist SWD to acquire a better understanding of science knowledge. Determining which of these strategies will increase the achievement scores for SWD on the STAAR biology exams is one of the goals of this study.

Research Sources

Many search terms were used to determine relevant resources to address the problem of increasing the scores of SWD scores on exit level science tests. The list below is by no means complete, but offers an insight to finding related literature. A Boolean search was conducted through several databases including ERIC, Educational Research Complete, and Google Scholar. The following list shows the descriptor combinations used to find the sources for this study.

- SWD and achievement scores.
- Exit-level test scores and SWD and issues.
- SWD and learning strategies.
- Strategies that work with SWD.
- Learning strategies and raising SWD achievement test scores.

I was also able to use the reference lists from the researched articles to find additional sources, and the references also were able to provide ideas for other combinations of terms for searches.

Implications

By researching the problem that most biology teachers are not effectively implementing evidence-based strategies for SWD to pass the STAAR biology exam, I was able to find the commonalities in terms of what is effective and what strategies schools with higher passing rates for SWD are using that schools with lower passing rates are not implementing using public data from the TEA website. There were several

directions the project based on this study could have taken. One possible direction was to determine what would be most helpful to teachers so they could be more successful in implementing strategies to raise the achievement scores of SWD on the STAAR biology exam. The project resulting from this study could entail creating professional development opportunities for teachers on designing lessons specifically for SWD. Another possible project could have been developing a training opportunity where special education teachers are partnered with biology teachers in designing activities using evidence-based strategies for SWD. Making a series of videos that could be uploaded to the district's online database demonstrating how strategies for raising the achievement scores of SWD in science can be implemented in the classroom was a third possible direction for the study to take. Adding the video(s) to this database would allow all teachers access to the information, not just those that attend a professional development session. The results of the study could be generalized and applied to other disciplines at the district and state level, thereby allowing all teachers of SWD the chance to increase their scores on achievement tests.

As SWD attain the knowledge and skills to achieve higher scores on tests, they will gain the confidence to extend those skills beyond their high school career. As more SWD enter post-secondary education or the workforce, the knowledge SWD acquire to develop vocabulary, main ideas or concepts, and organizational skills will aid them in their further endeavors.

Summary

SWD need evidence-based strategies in order to raise their achievement scores on exit level science tests in a large suburban district in Texas. Data acquired from the Texas Education Agency reveal that SWD have scored at least 27% lower on the state exit exam than their peers without disabilities over the past five years. Research has shown that strategies including peer tutoring, graphic organizers, mnemonic phrases, cooperative learning, and integrated disciplines can be used to aid SWD to raise achievement scores. Incorporating evidence-based strategies along with effective teacher training and continuing professional development, facilitated improving the passing rate of SWD on the STAAR biology exam as well. In order to determine what biology teachers and administrators perceived about the STAAR biology exam, face-to-face interviews were conducted. Information was recorded, transcribed and coded. The methodology for this study was qualitative and discussed in more detail in the next section.

Section 2: The Methodology

Introduction

The research design for this study was qualitative. I used purposeful sampling to obtain a cross-section of the current population of teachers within the district. This was a more appropriate method to provide a variety in age, experience, and gender, whereas using a random sample would not ensure this variety of participants. Interviews are one of the most common forms of data collection used in qualitative research (Frels & Onwuegbuzie, 2013) and also allow gathering in-depth information for a subject (Roulston, 2011). Combining interview questions with a survey used to gather preliminary information for possible participants allowed for a legitimation or validity of interpretation of the qualitative data (Frels & Onwuegbuzie, 2013) and thereby increased the understanding of collected data.

After obtaining an IRB approval number (02-20-14-01977560), interviews were conducted to determine what strategies teachers at schools with higher passing and lower passing rates were using. Interviews also focused on perceptions among biology teachers regarding what the district could provide to aid in implementing strategies to increase the passing rates among SWD on the STAAR biology exam. Administrators were also interviewed to obtain their perceptions of evidence-based strategy implementation in the biology classrooms. Being able to analyze both teachers' and administrators' perspectives on classroom strategies used with SWD provided insight on how to aid SWD in passing the STAAR biology exam. This analysis was necessary to determine the best method for

closing the achievement gap between SWD and their peers without disabilities regarding the passing rates on the STAAR biology exam in the target district.

I also considered quantitative and mixed method designs, which I rejected. A quantitative methodology, which deals mainly with collecting numerical data that are analyzed using mathematically based methods (Creswell, 2009), would not provide a space for teacher's perspectives and in-depth descriptions needed for this study. Further, although the mixed methodology has a qualitative segment, the quantitative segment would be lacking because no data were taken regarding a change in test scores.

Participants

Sample

I obtained participants for this study from two sets of populations: biology teachers and administrators. I obtained a purposeful quota sampling of six biology teachers via e-mail and Facebook messenger to invite participants. I used a quota sample to deliberately set the proportions of levels or strata within the sample to ensure the inclusion of particular segments of a population (Schatz, 2012). I sent an e-mail containing a question of willingness to participate to assist in selecting interviewees. I implemented purposeful quota sampling because it fit the purpose of the study, the resources available, the questions asked, and the constraints faced (Schatz, 2012). Implementing this type of sampling (a) kept the sample small because the entire pool of possible participants contained fewer than 35, (b) kept the questions focused only on strategies and perceptions of teachers and administrators, and (c) limited the participants

to those who fit the needed criteria for the study. Even though purposeful sampling was determined to be the best choice, other types of sampling techniques were considered.

I also considered convenience sampling, which occurs when a researcher cannot gather a sufficiently random sample to accurately represent a population (Merriam, 2009). I chose not to use convenience sampling because enough participants were included to create a sample representative of the biology teacher population. The sample contained a range of biology teaching experience to receive a well-rounded cross-section of perceptions. To take part in the sampling, the biology teachers needed to teach biology classes at the regular level and have classes containing SWD. Teachers from schools with higher passing rates for SWD and teachers from schools with lower passing rates for SWD were determined by viewing public data from the TEA website. Teachers from both groups, (a) those who were from more successful schools and (b) those who were from less successful schools in helping SWD pass the STAAR test, were sampled without knowing which teachers were more successful with SWD and which teachers were less successful prior to the interviews. The interviewed sample of teachers consisted of three females and three males. Years of experience ranged from 2 to 22 years, with an average experience of11.5 years. Three of the biology teachers interviewed were from schools that were more successful with SWD on the STAAR biology exam and three were from schools that were less successful with SWD on the STAAR biology exam. Table 4 depicts the entire breakdown of the interviewed biology teacher demographics. For the administrators interviewed, two were female and two were male. Experience in the

classroom ranged from 6 to 14 years, with an average of 10 years. Two of the administrators had 3 years of experience as an administrator, whereas the other two each had 7 years of experience. Two of the administrators were from schools that were more successful with SWD on the STAAR biology exam and two administrators were from schools that were less successful with SWD on the STAAR biology exam. Table 5 has a complete breakdown of individual administrator's demographics.

Table 3

Biology Teacher Demographics

Participant	Gender	More or less successful school with SWD	Years of experience teaching biology	Years of experience with SWD
T1	F	More	8	8
T2	F	More	18	18
T3	M	Less	2	2
T4	F	Less	22	20
T5	M	More	4	3
T6	M	Less	15	15

Table 4

Administrator Demographics

Participant	Gender	More or less successful school with SWD	Years of experience teaching	Years of experience as administrator
A1	F	Less	14	7
A2	M	More	8	7
A3	F	More	6	3
A4	M	Less	12	3

During the interview, a series of open-ended questions designed to identify strategies perceived to aid in raising the test scores of SWD were asked. After each interview, the notes and audio were transcribed and coded to find common threads. As more information was compiled, themes emerged and were used to guide any additional questions (Creswell, 2009) that were asked to participants not yet interviewed in order to enhance any emerging themes.

Accessing Participants

Once the proposal was officially approved, the researcher provided the institutional review board (IRB) with the needed information to ensure participant protection as well as sound research processes. After all approval processes were met, the biology teachers were contacted via researcher's Walden e-mail to begin the process of acquiring participants for the interviews.

During the summer and fall of 2014, biology teachers within the target district were sent an e-mail via personal e-mails and Facebook messenger introducing the project and inviting those interested in participating to reply to the researcher from which a sample was drawn (Merriam, 2009). Administrators at the more successful and less successful schools, as well as the high school science facilitators, were also invited via Walden e-mail and Facebook messenger to participate in the interview process. The e-mail consisted of a brief explanation of the project study, including the voluntary nature of the study as well as assurances of confidentiality.

Researcher/Participant Relationship

A major part of any interview is to establish a researcher/participant relationship. It was important for me to warmly welcome the participant and thanked them for their time and remind them that the interview would be recorded in order to ensure the accuracy of their responses. They were also reminded that participation was voluntary and they could withdraw at any time. This helped to put the participants at ease and built a rapport between the two. I made eye contact with the participant, acknowledged answers, and gave adequate wait time before asking follow-up questions. Rephrasing answers in order to be sure the participants' thoughts were correctly conveyed was another important step in providing a productive researcher/participant relationship. When writing while the participant was speaking, I looked up and responded appropriately, especially if the participant asked a question or sought clarification (Irvine, 2011).

Merriam (2009) describes the interviewer-respondent interaction as "a complex phenomenon" (p. 109). I was responsible for establishing a researcher-participant working relationship. I recognized and set aside personal biases. I appeared neutral in body language and tone of voice as the interview questions were asked. Furthermore, I used active listening during the interviews to establish rapport, and was able to ask appropriate probing questions as needed (Glesne, 2011; Merriam, 2009).

Ethics and Participant Protection

In conducting good research, protecting participants is of paramount importance. All participants received an informed consent form consisting of a letter detailing what the project study was about and the reasoning behind their needed participation. All participants signed the letter, which included a section on their right to withdraw from the study at any time. In order to protect participants' confidentiality, no schools were identified by name, but rather were identified by a random code which included a school number and teacher or administrator letter (Kaiser, 2009). For example, a teacher at school 1 would be coded Teacher 1-a. This type of coding was duplicated for each participant so that only the researcher would know their identities. All information on the school coding and participants is locked in a filing cabinet in the researcher's home office. Any data maintained on the computer will be kept in a password protected folder on the researcher's home computer (Kaiser, 2009).

Data Collection Strategy

Once a pool of participants was established using teacher e-mails and public data, teachers from schools with higher passing rates for SWD on the STAAR biology exam and teachers from schools with lower passing rates for SWD were asked to participate in the interview phase of the project study. Administrators were asked to participate as well through convenience sampling in which the participants were conveniently located at the place of study. The interviews were conducted during the summer and fall of 2014. The data collected was validated using triangulation of member checking, where each

interviewee reviewed the transcript of the interview to be sure it conveyed each participant's responses accurately (Merriam, 2009); second researcher coding, where a second researcher was asked to listen to a section of interviews and code a random section for the primary researcher to compare with their own coding to ensure accuracy; and adequate engagement in data collection.

As interviewees returned the checked interview, one of the biology teachers wanted to add a comment concerning a student she perceived she had not been successful with and why. Her comments were added and compiled into the other data. The change did not make an impact on the results based on the research questions, but was interesting to read. The second researcher read two interview transcripts from biology teachers and two interview transcripts from administrators. Using the biology teacher interview questions, the second researcher coding was very close to the primary researcher's coding on 12 of the 15 basic questions (see p. 188 for questions), making the percent agreement 80%. When the probing questions were added in, the agreement went up to 21 out of 26 questions overall, making the percent agreement 81%. The differences in coding had to do with how the second researcher grouped related themes versus how the researcher grouped them. An example would be that the primary researcher grouped answers such as cooperative learning activities with lab activities, since as a science teacher, the primary researcher understood that as the biology teachers described the activities, they were related. The second researcher, not being a science teacher, placed those as separate themes (see Appendix H for sample of coding). Adequate engagement in data collection

involved including as many subjects in the interview process until the data and emerging findings felt saturated (Merriam, 2009).

Interview Design

The sample size of teachers for the interview phase was six participants while the sample size of administrators was four. According to Kvale (2007), how many interview subjects required for a study is dependent upon what the researcher needs to know. The most common amount of interview subjects is 15 ± 10 (Kvale, 2007). With the limited number of administrators, and the limited number of biology teachers that teach regular level biology classes and have SWD in the majority of those classes, the sample size was sufficient to attain a cross-section of participants within the target district and to reach data saturation. Saturation was determined as interviews continued and definite themes emerged; the same basic answers to interview questions were being provided.

Determining an appropriate venue for interviews was a priority since choosing a convenient meeting place was a factor in teacher participation (Malak, 2013). The most commonly used place for interviews was a reading room at the public library closest to the participant being interviewed, though for the sake of convenience, some interviews were conducted at participants' homes. The target district, as well as its neighboring cities have several libraries located near the high schools. A neutral site allowed both teachers and researcher to focus on the interview process. If interviews were to take place at the schools, after school hours, the potential for interruptions from the office calling for people or asking for teachers to call the office, would break the train of thought and slow

down the interview process. Interviews were conducted during summer break as well as the beginning of the school year in order to not interfere with teacher's duties. Interviews lasted approximately 30 minutes. This time frame was sufficient for all questions and follow-ups as well as any further comments to be completed. The smaller time frame made it easier to recruit participants (Malak, 2013). Interviews were conducted during summer and during the beginning of the new school year, at a convenient time for the participants. No more than two interviews were conducted on any day. This allowed the researcher to listen to the recorded responses and transcribe the data after the interviews to look for emerging themes.

The interview format for this study was a semi-structured design. Merriam (2009) states a semi-structured interview is centered on a theme or a phenomenon, but is unstructured in the order of the questions or the exact wording of the questions. An interview guide was employed to create a series of pre-determined, open-ended questions in order to allow for a conversational style (Holloway & Wheeler, 2010). The topics were arranged by research question in order to attain a logical sequence (Doody & Noonan, 2012). The semi-structured design allowed for follow-up questions in order for interviewees to provide an in-depth picture of their perceptions. This design also allowed for changing the order of questions, depending on a participant's answers (Smith, Flowers, & Larkin, 2009) (See appendix E for interview protocol). All responses were audio recorded and later transcribed to allow for coding and discovery of emerging themes.

Before each interview, the participants were advised of their rights, including refusal to participate in the interview and the right to stop the interview at any point without penalty. Each participant was informed that all interviews will be protected by confidentiality and no one, except the researcher, will have access to the information. The interview questions were asked using the interview protocol, but the researcher was flexible with the questions and asked follow up questions as appropriate. Each interview ended by thanking participants and explaining they would receive an interview transcript to review for accuracy in order to allow an opportunity to update any information they felt needed clarifying. This step was critical in making sure that information truly reflects the perceptions of the participants and the themes that emerged from their analysis were valid.

A qualitative researcher must make notes and analyze the data for emerging patterns and themes as the data are collected (Galletta, 2013). I took very brief notes during the interview, but did not want to focus too much on taking notes and miss the content of the responses or the body language used. Watching body language allowed me to assess the interviewee's nervousness or understanding of the question (Kinnair, 2011). Being able to assess these reactions allowed me to rephrase questions, reassure participants, and ask follow-up questions. All of these techniques enhanced the quality of the interview and data collected. A journal was used to record my thoughts and impressions from the interviews immediately after each interview (see Appendix H for journal sample). As soon as possible after each interview, I transcribed the interview

from the recording to a Microsoft Word document. To ensure accuracy in the transcriptions, I listened again to each recording and followed along with the transcription, correcting any errors. As the data were analyzed from the interviews, a codebook was developed. Each theme was given a code name, definition or meaning, an example of the code, and any relationship to other codes (Galletta, 2013). Each interview was analyzed using the codes identified in the code book (See Appendix H for the codebook). To ensure accuracy in coding, a second researcher, which was a fellow doctoral student, was asked to code a random sample of responses and determine the percent of agreement in coding (Gwet, 2012). The second researcher's coding closely matched those of the primary researcher.

As the data were coded, the differences in the reported use of various strategies and interventions between the teachers in schools with higher passing rates for SWD on the STAAR biology exam and those in schools with lower passing percentages were examined. Emerging themes here helped identify what strategies were currently being used that were most effective and perhaps account for the differences in passing rates. Another prospective goal for the qualitative design was to determine teacher perspectives of possible professional development workshops or other supports that the district could provide to aid teachers in preparing lessons to raise achievement scores of SWD.

The interview questions were designed as an extension of the research questions. The open-ended questions and follow-up questions were based on the literature review and followed examples found in past dissertations focusing on similar issues. Several

teachers not involved in the interview process were asked to evaluate the questions and provide feedback on question design and clarification. The teachers that read through the interview questions for the biology teachers gave several suggestions on how to reword questions, or gave suggestions on how to add probing questions to aid in getting more focused answers. For example, one of the questions was "What assistance would you like to see established in order to aid SWD in passing the STAAR biology exam?" A probing question was added to clarify the types of assistance that could be a possibility. The added probing question ended up as: "Probing: I will ask follow up questions to elicit information regarding changes to the online curriculum, staff development, etc." This proved to be beneficial as some of the less experienced teachers were not sure of the types of assistance that would be appropriate. I could then make sure the wording of the questions reflected what the researcher intended to ask and that the questions could be easily understood. The clarified questions allowed the interview process to proceed smoothly and helped to assure that the participants understood the questions and answered accordingly. I took this opportunity to practice good interview techniques to further put participants at ease.

Explanation of Data Analysis Procedure

Individual teacher interviews were used to collect data for all three research questions. The interviews were recorded and then transcribed. Then the data were entered into HyperRESEARCH for coding (Dupuis, 2002) which was chosen since it allowed the researcher to organize data in many ways and allowed Microsoft Word as an input tool

(Dupuis, 2002). Unfortunately, the HyperRESEARCH program had communication issues with my computer, so could not be used. I ended up listening to the audio and transcribing the interviews into a Microsoft Word document (See Appendix F for interview transcription example).

To ensure the best possible accuracy and credibility for the findings, member checking was employed. After the interviews were transcribed, a copy was e-mailed to the individual interviewee to read. This was done to be sure that participants' intentions and perceptions were accurate. Corrections and revisions were done if participants choose to clarify any of their statements. A peer debriefing was conducted after the final analysis was done in order to allow participants to understand how their interviews were used and how the valuable information they were able to provide would help SWD (Barusch, Gringeri, and George, 2011). The peer debriefing was done via FaceTime which is a program on the district's iPads that allows teachers to teleconference. The debriefing was done this way in order to allow everyone to hear the information and give feedback at once. As I was able to go over the main findings, both the biology teachers and the administrators commented that it was "so true" that vocabulary is a major road block for SWD, and that time is another obstacle for planning and creating activities. For any discrepant event, where a participant's answers were clearly divergent from the themes that were emerging a second interview was conducted to seek clarification on points, if member checking did not resolve the issues. Member checking resolved any discrepant

event issues since interviewees had time to consider their answers to the interview questions.

Role of Researcher

As a current teacher within the target district, I was part of the benchmark writing process for physics, but not for biology. Having been an active member of the curriculum writing team in physics, I was known throughout the district, but had no real direct contact with biology teachers, with the exception of those within the my high school. This allowed me to be familiar with the participants, putting them at ease with the interview process. It also allowed me to be far enough removed from the data being collected that objectivity could be maintained thereby reducing any bias. I taught biology in other districts; and as a result, had an understanding of the issues in working with ninth graders as well as the biology Texas Essential Knowledge and Skills (TEKS); both of which served to aid me in developing a rapport with the participants. The fact that I had taught biology before and had also taught classes consisting mainly of SWD, a preconceived notion as to how teachers should be helping SWD in the classroom existed. To keep this bias from interfering with the interview and analysis process, I had to think in terms of asking the questions without interjecting any connotations into them. By practicing the interview process and questions with colleagues also in doctoral programs, I gained more confidence in alleviating biases during the interview process. It was important that I stayed neutral and kept an objective mind and attitude during the interviews. Keeping to the interview questions as well as follow up questions allowed the

researcher to stay objective during the process and keep any bias to a minimum. I had to be sure to not read in too much or too little as transcription of the data took place and common threads were found. Member checking and a second rater were employed in order to establish reliability in rating helped tremendously in making sure that the biology teacher's perceptions were interpreted correctly (Merriam, 2009).

Interviews were set up at locations convenient for the participant. Letters of consent were reviewed and signed, with one copy going to the participant and another staying with me. Interviews were audio recorded then transcribed by me. Copies of the transcripts were sent to participants for member checking. When the transcripts were approved, data was color coded for common answers and themes emerged. Results of the interviews are discussed in the next section.

Data Analysis Results

After the interviews were completed, the final analysis could begin. The four research questions were used as the areas of focus.

Research question 1. Using the first research question, what evidence-based instructional strategies do biology teachers report using at schools with higher passing rates for SWD on the STAAR biology exam, biology teachers were asked what they perceived as successful strategies with SWD. Three themes emerged from the biology teachers from schools more successful with SWD on the STAAR biology exam. One theme was the use of interactive strategies to help SWD understand the material. Guided notes, graphic organizers, mnemonic phrases, and visual vocabulary (See Appendix F)

were strategies all the biology teachers stated using. One of the biology teachers stated, "We use graphic organizers, or thinking maps, as they (the district) prefers to call them. But we do a lot of those. We use mnemonics when appropriate, like during classification." Two of the three interviewed immediately mentioned that guided notes worked well with SWD since they did not get bogged down with writing and keeping up with the class discussion. One of the biology teachers explained that, "I really prefer guided notes, and based on the AVID training I went to this summer, the school is going to require Cornell and only Cornell. If it were up to me, I would do guided notes because with Cornell, students get too bogged down with what they are writing than paying attention to the discussion, but clearly I'm in the minority." A common comment by all the interviewed biology teachers from higher passing rate schools was best personified with "Anytime I can get my SWD to use vocabulary, it is a plus. Biology is so vocabulary specific that it can be overwhelming for them. If they at least get an understanding of the basic vocabulary, they can begin to understand what the lesson is about. Using guided notes and graphic organizers really help my students with that."

A second theme was the utilization of professional learning communities to share and develop ideas on developing accommodated activities for SWD. They reiterated that team members share accommodations during professional learning communities (PLC) time to ensure all SWD are afforded the same opportunities. One of the biology teachers explained that, "even though our PLC time is limited, we always try to make time to see if anyone has already made accommodations for the activities that we are going to use

during the lesson cycle. If so, we look at it and decide if we need to make any changes; if we don't have an accommodated activity, we try to have someone volunteer to take at least one activity in the unit and make appropriate accommodations. Our thought process is that we can keep building on that every year and have choices for our SWD to use." The third biology teacher from a higher passing rate school also acknowledged that guided notes were a successful strategy when asked which strategy they found most effective with SWD. All of the strategies mentioned during the interviews were discussed in the first literature review as many of the best evidence-based strategies to use with SWD.

The third theme that was pronounced with all three of the biology teachers from higher passing rate schools with SWD, was the use of follow up activities incorporating the initial strategy. A biology teacher that has been teaching for less than five years said:

> I thought I was doing something wrong, I would have my students use evidence-based strategies and would make accommodations for my special education students, but they still were not "getting it" on assessments. One of my colleagues asked me what I was doing after completing the initial strategy. I did not understand until she asked about the follow-up activities where the students use the evidence-based strategy. She gave me several activities to try, and it was like a whole new world for the special education kids…they got it. Now, I always use a lab

or puzzle, or manipulative activity after guided notes, Frayer cards, or graphic organizers.

Allowing students to use the guided notes or graphic organizer to complete a cooperative activity, manipulative activity, or laboratory analysis was perceived as beneficial to SWD overall learning and achievement. The biology teachers at schools with higher passing rates seemed to understand that the more often SWD can demonstrate what they have learned through evidence-based strategies, the higher their scores will be on the STAAR biology exam

Research question 2. Using the second research question, what evidence-based instructional strategies do biology teachers report using at schools with lower passing rates for SWD on the STAAR biology, biology teachers were asked what they perceived to be successful strategies for SWD. Three biology teachers from lower passing rate schools were asked about which strategies they perceived as being successful with SWD.

Two major themes emerged. The first theme was that the biology teachers from less successful schools with SWD incorporate some type of guided notes and graphic organizers. The teachers with more experience (22 years and 15 years) reiterated several of the same strategies that the biology teachers from higher scoring schools mentioned, such as graphic organizers, guided notes, and visual vocabulary. The second year teacher was a big proponent of using Cornell style notes, since the target district has made this an important initiative. The teacher was concerned about how to accommodate SWD with this style of note-taking. The teacher trades the student notes out with teacher notes. The

second year teacher also perceived that cooperative learning is advantageous for SWD. When asked how cooperative learning activities were set up and run in the classroom, the teacher had trouble defining roles for group members and was not sure about appropriate accommodations for SWD when in cooperative groups. As I asked probing questions concerning activities that he used every unit, he added, "We use Frayer cards with the vocabulary. It seems to help the special education kids if they can get that visual image with the word. It also helps with their writing." The same teacher described PLC time as being beneficial in helping with the aspect of accommodations, but worried that there was never enough time to complete all the planning and modifications to the point that he felt comfortable. He commented,

> I am really am glad that our biology team uses PLC time to help with accommodations. Having a science specialist from the special education department has been terrific. She is able to help us determine how to make assignments the appropriate length for our special education students as well as re-wording activities and assessments. I do not know what I would have done without her! Being new to teaching, a lot of things are overwhelming, but knowing I have a go-to person in the special education department has taken away a lot of my anxiety.

This reply led to the second theme, which involved the use of a science specialist from the special education department that worked with the science teachers and attended PLC. Both the second year teacher and more experienced teachers acknowledged that

their school did have a science specialist from the special education department that was a tremendous resource for the biology department. The specialist was able to look at formative assessments as well as student activities and suggest appropriate modifications for SWD. One quote that summed up all their views was, “I don’t know why we didn’t always have someone from the special education department as part of our PLC. We have all learned so much about making accommodations and writing assessments that our special education kids can be successful with.”

Even though it was apparent that teachers from lower performing schools understood and used evidence-based strategies with their SWD, the use of follow-up activities was lacking. When asked about the types of follow-up activities used with SWD, all of the teachers replied that follow-up activities were rare, if used at all. One biology teacher replied, “Sometimes we use the graphic organizers or guided notes to help them complete a puzzle, but the strategies are usually just activities that become part of the whole unit.” This was a decisive separator between more successful and less successful school.

Research question 3. The third research question, what are biology teachers’ perceptions regarding what the district could provide to help them be more effective in increasing the passing rate of SWD on the STAAR biology exam, led to an overwhelmingly similar theme. All participants acknowledged that having a full time specialist from the special education department as part of the biology team would be extremely useful. One of the biology teachers from a higher scoring school gave the

example of the ESL (English as a Second Language) initiative where an ESL teacher attended biology PLC meetings and helped with rewording tests and activities to help those students with language barriers. She said:

> I think that Mrs. E. did a great job with the ESL kiddos. If they could do that with the other kiddos, that would be great. She looked at our gradebook and saw if they had zeros and made them come in during lunch and redid the work; they came in with her for tutorials. The kids were very successful on the exam. So, and sometimes that just comes from the frustration of "I don't know how to do this" and you know sometimes it's just a matter of pulling them in and having them take care of it.

The less successful school has had a science specialist from the special education department working the biology teachers for the past year and a half. One of the more experienced biology teachers from a less successful school summed up all of their perceptions best with the statement:

> I think it (having a science specialist from the special education department) has been a big relief, particularly for biology teachers. I believe that teachers want to do the best job they can. If a teacher says they differentiate 100% of the time, then they are not really differentiating. You would not be able to get any teaching done if you are differentiating all the time. That's why we need the support of the special education teachers. Ours in particular have been so helpful and focused on the

> biology students. She can look at activities and help us make appropriate accommodations while we are in the planning phase.

The latest data has shown that this particular school showed larger gains for SWD than the higher passing rate schools, even though their scores still lag behind the rest of the schools in the target district.

Both teachers from higher and lower passing rate schools with SWD, four out of the six interviewed, expressed an interest in working with a special education specialist as part of a professional development opportunity to keep SWD, as one teacher put it, from falling through the cracks, catching problems quickly so the students can be successful of the STAAR biology exam. One biology teacher put her thoughts in these terms:

> I think it is so easy to let them fall through the cracks, both on my end and from a special education department because you are dealing with so many students…the SPED department doesn't seem to care as long as they are passing. It just becomes easier to just pass them along but I don't want to get into the situation where I'm just passing them along and then they do miserably on the STAAR. Sometimes it is hard to bridge that gap.

When asked what else the district could do to help, comments ranged from having the district purchase a curriculum that incorporates evidence-based strategies for SWD to starting a mentoring program for teachers to coach SWD one on one: "You know what I would like to see? I would like to see a program where we mentor or coach the SPED kids where one teacher gets a SPED kid and look out for them and also effective teaching

strategies. You know, effective teaching strategies when we are doing labs and having behavioral concerns, getting effective strategies for that." Another teacher suggested providing better laboratory facilities so teachers were not scrambling for lab space in order to incorporate more hands-on activities. One biology teacher voiced her concern, "I know what I need; I need a classroom with a lab so that I can actually run labs and do manipulatives and cooperative activities in two separate spaces." While another biology teacher commented on the lack of laboratory space with "Not have to combine classes. Last year we had to run labs with 64 students in order to handle the spaces".

Research question 4. The fourth research question, what are administrators' perceptions of SWD on the STAAR biology exam, was addressed with four administrators. Each of the administrators had different perceptions regarding what to look for in terms of activities they wanted to observe when in a classroom with SWD, but three main themes emerged.

One common perception was that SWD need some type of hands-on activity. One of the administrators stated: "I think the most effective strategy in any classroom is cooperative work, but not just group work, but using manipulatives to work together to solve a problem."

The second theme that all administrators agreed on was that time was a major prohibitive factor for the success of SWD on the STAAR biology exam. One administrator from a more successful school summed up all the responses as: "Time is probably the biggest [obstacle], which is sad. We make time for what we think is the

most important, but we sometimes give up planning time to allow other duties; making it hard to apply the strategies that SWD need." The third theme dealt with professional development. Implementing professional development opportunities for teachers to work together as well as with special educations teachers to devise appropriate activities and strategies for SWD that will integrate seamlessly into the biology curriculum was a major theme that resonated through all the administrator interviews (see Appendix G for details). One administrator put their perceptions in these terms: "I think anytime you can add a specialist that deals with a specific population working with teachers is a fabulous idea. When it comes to writing instructional plans, I think those specialists need to be and should be included in the PLC process and curriculum development and lesson planning before students come into the classroom without taking in consideration all students." Another administrator had the same perception, but commented in terms of looking through the student lens;

> I find it interesting when you try to have the student lens – that's what the special education teacher can provide – they are going to have the lens to say there is not enough white space; the font is off - the phrasing is odd – the student is not going to understand what you are meaning on this question. Having a system where being able to mesh teacher expectations with students' abilities via the special education teacher can only lead to better success for the student.

The administrator's responses were, while varied, focused on student-centered strategies and time constraints. The following data table charts the administrator responses.

Table 5

Administrator Responses to Interview Questions

Interview question	A1 answer	A2 answer	A3 answer	A4 answer
What types of activities do you look for?	What the team has agreed on – look at the lesson plans	Cooperative learning activities	Students creating products – students in charge of their own learning	Students learning from each other; in small groups
What teacher behaviors do you look for in classrooms with SWD?	Going by students and giving instructional help or giving a different type of assignment	Clarifying questions – providing resources	Using kinesthetic, visuals and auditory aspects within the lesson	Moving near those students and using questions or strategies to insure their understanding
Which activities are perceived as effective with SWD?	Use of technology	Cooperative learning; visuals	Use of extra time; teacher notes; content mastery; hands-on activities	Cooperative learning with hands-on aspects
What types of strategies should be used with SWD?	Formative assessments to keep SWD from getting off tract	Cooperative learning; formative assessments – both teacher made and self-checks	Use of manipulatives; use of differentiation of products	Frequent checking for understanding
What are perceived obstacles for SWD success on STAAR biology exam?	Amount of reading; question stem understanding - vocabulary	Teachers not being open to the fact that all students can learn	Vocabulary and the amount of white space used on the test	Unique vocabulary used with biology

(Table continues)

Interview question	A1 answer	A2 answer	A3 answer	A4 answer
What assistance needs to be established to aid teachers in preparing SWD for STAAR biology exam?	Training for use of formative assessments and incorporating special education department into biology PLC's	Giving teachers needed information on allowed accommodations early in the school year; helping teachers appropriately weave accommodations into curriculum	Smaller classes; common planning times	Time for planning lessons and sharing information with teachers in same courses
What are some possible professional development opportunities for teachers with SWD?	Establish protocols for PLC's to incorporate special education teachers for accommodations; time to look at student work and assess needed accommodations	Integrate special education specialists into the PLC process and curriculum development to integrate accommodations seamlessly into classroom	Time for teachers to work on the craft of teaching	Time set aside to develop lessons and strategies for special needs students, maybe include sped staff in that time

Evidence of Quality

Several pieces of evidence have been used to ensure the body of work is of the highest quality possible. Member checking was used to ensure accuracy of the participants' perceptions. After each interview, the transcripts were sent to each participant for them to read and make any corrections or clarification they chose. The transcript was e-mailed to each participant and they were instructed to use the comment feature to update their perceptions. This was very useful on several transcripts where the audio was not clear or the participant decided on a better way to word his or her comments. A peer review of a set of transcripts was also employed. A colleague that had completed her doctorate and was now employed as an educational researcher read and

coded the transcripts. Her coding and themes were compared to those of the primary researcher and found to be a close match. Triangulation between data found in the teacher interviews, administrator interviews, and the two literature reviews completed for this project allowed for an assurance of the quality of the information uncovered during the project.

Conclusions

While interviewing the biology teachers from the more successful schools with SWD, one major theme was the use of follow up activities, such as cooperative activities or graphic organizers to aid SWD with their vocabulary acquisition. The use of follow up activities seemed to be lacking at the less successful schools. The less successful schools' major themes included the use of some type of visual vocabulary as well as the utilization of a specialist from the special education department, providing input on making appropriate accommodations for SWD. Three major themes emerged from the analysis of the biology teacher and administrator data gathered during the interview phase of the project study. The first theme is that participants agreed that vocabulary was a barrier for SWD success on the STAAR biology exam. The second overall theme was a strong need for biology PLC's to include special education teachers on a regular basis in order to provide appropriate accommodations for SWD and that this will aid SWD in becoming more successful on the STAAR biology exam. The third overall theme is that professional development opportunities designed to enable biology teachers from across the district to come together and share successful activities as well as devise activities

with appropriate accommodations to fit into the biology curriculum using the input from special education teachers, would be beneficial for the biology teachers, special education teachers, and SWD. The professional development opportunity planned as the culminating activity for my project study will attempt to mesh the three major themes. The professional development will have biology teachers and special education teachers working cooperatively in order to improve and/or create activities using evidence-based strategies in the current curriculum to accommodate SWD. This approach will best put together the major themes which emerged from the interview phase of the project study.

Summary

I used a qualitative design in this study to determine what evidence-based instructional strategies biology teachers at both schools with higher passing rates and lower passing rates for SWD on the STAAR biology exam report using, what biology teachers' perceptions are regarding what the district could provide to help them be more effective in increasing the passing rate of SWD on the STAAR biology exam, and what administrators' perceptions are concerning the performance of SWD on the STAAR biology exam. The data from the interviews were analyzed and I determined that biology teachers understand what evidence-based strategies are, but schools that are less successful with SWD on the STAAR biology exam are not implementing follow up activities that will aid SWD in the vocabulary and knowledge acquisition needed to pass the STAAR biology exam. A professional development workshop is being developed as a direct result of the data gathered from the interviews in order to give biology teachers an

opportunity to work with special education teachers to develop activities for SWD that use evidence-based strategies. The professional development workshop will be described in detail at the end of the next section.

Section 3: The Project

Introduction

The proposed project for this study is a professional development workshop employing a self-directed learning approach. Based on the information gathered during the interview process, four of the six biology teachers interviewed indicated that they would be willing to attend a professional development opportunity where they can collaborate with other biology teachers as well as special education teachers in developing teaching strategies and activities to aid SWD score higher on the STAAR biology exam. I decided to develop a workshop for all of the district's biology teachers, along with the special education teachers, to provide a gateway for teachers who were more successful with SWD to share activities and strategies with other less-successful biology and special education teachers. This opportunity will allow teachers from less-successful schools with SWD to acquire new materials and skills that the teachers from more successful schools currently use. As teachers begin to collaborate on what is and is not successful for SWD, the biology teachers from less-successful schools will become more comfortable with including follow-up activities, which, based on my research, would help their SWD become more successful on the STAAR biology exam.

The workshop will be planned for three days with an introductory and collaboration day, another collaboration day, and a summary and evaluation day in which all activities will be shared and uploaded to the district's online database. During the collaboration times, after I have shared my findings from the research, biology teachers

and special education teachers from throughout the district will discuss the topics with which SWD have had difficulty on the STAAR biology exam. The discussion will be grounded on current STAAR data. Teachers will be able to share strategies and activities that they have used with success for the identified areas of need. Topics identified that do not have successful strategies and activities will become the focus for the biology and special education teachers to collaborate to develop strategies and activities to be shared with all biology teachers in the district. During the analysis of the biology teacher interviews, it was determined that although all the teachers understood that SWD need help acquiring the vocabulary skills, only the teachers from more successful schools had developed activities supporting that acquisition skill. Allowing teachers to share activities and strategies that have been successful among SWD in the biology classroom can lead to higher achievement scores on the STAAR biology exam.

Description and Goals

The goal of the project is to allow biology teachers and special education teachers time to discuss strategies and develop activities designed to aid SWD in raising their achievement scores on the STAAR biology exam. The problem addressed in the study was that some biology teachers are not effectively implementing evidence-based strategies to enable SWD to pass the STAAR biology exam. For professional development efforts to be effective for teachers at different stages in their careers, the professional development must be relevant to each teacher's needs as well as a direct application to the subject they teach (Masuda, Ebersole, & Barrett, 2013). This project

will allow teachers to contemplate their students' needs and develop strategies and activities that will be tailored to their classroom and its environments. Teachers will also be encouraged to share any products of the project with each other to create a series of activities that can be added into the district's online biology curriculum. As the district's biology teachers and special education teachers meet throughout the year, it will be possible for them to reflect on the activities used and develop new activities and strategies throughout the school year.

The project will consist of a 3-day workshop in which effective evidence-based strategies used for SWD will be thoroughly examined. Teachers will use a district application called Edmodo to form an online community where they can ask questions and share ideas as well as activities. Groups consisting of biology teachers and special education teachers will develop activities and provide accommodations for existing activities for the district's online curriculum database. By the end of the workshop, biology teachers will have several activities that are ready to be implemented among SWD in their classrooms, and special education teachers have a better understanding of biology.

Rationale

The rationale behind using a series of professional development workshops delivered in a self-directed learning format is important for several reasons. First, this approach allows teachers to evaluate their own needs as well as their student's needs and proceed accordingly. More experienced teachers will have different needs and may be

able to proceed at a different pace than less experienced teachers. Second, this approach will provide time to develop the activities and strategies needed to add into the curriculum. In a study by Browder, Trela, Courtade, Jimenez, Knight, and Flowers (2010), all of the teachers involved in the study commented that having the time to plan and practice the lessons was beneficial in adapting the activities for SWD. Third, a professional development workshop completed over multiple days will allow for reflection and feedback, which are also important components identified by the teachers in the Browder et al. study. During the interviews, all biology teachers interviewed indicated that they were willing to attend professional development opportunities that would allow them to enhance their curriculum for SWD. Both the interviewed biology teachers and administrators stated that collaborating with special education teachers would be a beneficial exercise in aiding SWD to increase their biology STAAR scores. The collaborative nature of the professional development workshop will not only foster a spirit of cooperation between the biology teachers and special education teachers, but also build a collaborative environment between biology teachers. This will be done as biology teachers from more successful schools with SWD share their techniques and activities with other teachers.

As teachers add more strategies and activities into the biology curriculum as well as have the opportunity to share what they have learned through the process, SWD will have more opportunities to raise their achievement scores on the STAAR test. Teachers will also have gained more knowledge on how to effectively implement evidence-based

strategies into the biology curriculum, again allowing SWD the opportunity to raise their achievement levels. Having these lessons and activities on the district's online curriculum will also allow the activities to be available to future teachers and possibly impact student scores in the future. The project will lend itself to impacting SWD' scores as teachers begin to share effective teaching strategies and activities, all students will benefit. The biology teachers interviewed all indicated a willingness to share all activities and strategies they found beneficial for SWD.

Review of the Literature

Theoretical Basis

Professional development in education is an essential way for teachers to learn new skills and fine-tune previously acquired skills and knowledge. Piaget's cognitive development theory laid the ground work for adult learning theory with Stage Theory, where he dealt with children moving from one stage to another as they mature (Piaget, 1972). Piaget's formal operational stage, which starts at age 11, is the basis for adult learning theory. Knowles incorporated adult learning theory with his theory of andragogy, which is based on adult learners and their specific needs. Knowles' andragogical model came about in response to the traditional pedagogical model where learners are dependent on the teacher (Knowles, 1980). The andragogical model is a series of assumptions designed to move learners into taking responsibility for their own learning. Knowles did not discount the pedagogical model, but surmised that it was the

trainer's responsibility to see which model best fit the learning situation (Knowles, 1980). Knowles' assumptions are based on an adult learner's:

- Need to move from a dependent to independent learner.
- Need for knowledge to better cope with their situation.
- Need to be task centered (have a specific life-centered goal).
- Need to develop a series of life experiences in order to realize what they must learn.
- Need for self-fulfillment in personal and professional situations.

Knowles envisioned life-long learning to be a series of steps where learners mature and move from being directed to self-directed learners (Knowles, 1980). Knowles has been quoted as calling the adult learner a "neglected species". In his book of the same name, he states that adults need to understand why skills they are learning are important and how that learning relates to their current situation (Knowles, 1990).

Knowles (1990) also introduces the concept for adults to be self-directed learners in order to meet their specific needs. Providers of professional development opportunities must keep in mind that adults learn differently than students. Learning has been defined as a place where learners are able to acquire knowledge (Young, 2012). Adult learners have a different set of needs than young learners. Adults have a more varied and deeper experience pool on which to draw than younger learners as well as they are more intrinsically motivated to acquire knowledge or skills needed for them to adapt to their environment, either social or in the workplace (Young, 2012). Younger learners are more

dependent on their teachers for knowledge acquisition whereas, adult learners are more self-directed (Cornelius, Gordon, & Ackland, 2011). The project designed for the target district's biology teachers incorporated the individual needs of the teachers as well as the needs of their students. The strategies and activities developed were extensions of information gathered during the interview phase where biology teachers indicated that being able to work with special education teachers to facilitate effective accommodations for SWD were valuable. Administrators interviewed also indicated that allowing biology teachers' time for working with special education teachers would be beneficial for SWD. The following review of the literature describes different types of effective professional development opportunities and how they relate to adult learning theory.

Importance of Professional Development

Professional development is an excellent opportunity for districts to invest in their teachers. In order to make changes within the educational system, teachers must be viewed as agents of change (Ellili-Cherif & Romanowski, 2013). To become these agents of change, teacher must have the knowledge, training, and tools to ensure that students are successful in an ever-increasingly competitive global society. In their study, Ellili-Cherif and Romanowski polled 121 teachers, six principals, and 142 parents regarding their perceptions of an education reform initiative started in their cohort (12 districts). Comments included that the initiative of teacher training "opened new horizons into their teaching" and "should result in better teaching practices." Professional development

activities that introduced new technologies allowed teachers to perceive their students as becoming more self-reliant (Ellili-Cherif & Romanowski, 2013).

Embedding professional development into schools as an ongoing processes is another way to invest in a district's teachers. Using the ongoing process aids teachers in becoming the key to improving success (Prusaczyk & Baker, 2011). The researchers sought to provide on-site experts over a three year professional development opportunity to help math teachers raise the achievement levels of southern Illinois students. The teachers were provided with strategies and support to develop lessons designed to raise achievement scores in math. Teachers were able to consult with experts on an ongoing basis, which allowed them the opportunity to try new techniques with their students. The researchers of the study determined that as teachers had more collaborative professional development opportunities, they were able to gain more math knowledge and could transfer that knowledge to their students, raising achievement scores (Prusaczyk & Baker, 2011).

Another reason for districts to invest in their teachers through effective professional development is to prepare teachers for various types of students in their classroom including acquiring knowledge and skills to teach students whose disabilities require different approaches to teaching (Ringler, O'Neal, Rawls, & Cuminskey, 2013). Ringler et.al (2013), provided teachers with a year-long professional development opportunity designed to help teachers acquire the ability to incorporate needed background skills for students with language barriers. After the professional

development, teachers were asked their perceptions of their ability to provide better instruction for their students. Throughout the year, teachers determined that students were retaining more content, and that 57% of the students exceeded state growth expectations. Teachers acknowledged that having ongoing professional development activities and support allowed them to develop lessons that directly impacted student success (Ringler, et.al, 2013). By investing in effective continuing professional development opportunities, districts give teachers the skills to develop new techniques and activities to guide student success.

Effective Professional Development

Continuing professional development has unfortunately become limited to required attendance at a small number of activities (Boud & Hagar, 2012). Continuing professional development is usually delivered in a formal setting where learning is assumed to be taken back and incorporated into the curriculum. In order for professional development opportunities to be effective for teachers at different stages in their careers, the training must have relevance to each teacher's needs as well as have a direct application to the subject they teach (Masuda, Ebersole, & Barrett, 2013). Improving the quality of classroom learning is the responsibility of the district as well as a requirement of the teachers, by finding effective professional development opportunities. Professional development opportunities must move beyond "one-shot workshops" to an environment conducive to moving teachers from where they are to where they want to be (Spelman & Rohlwing, 2013). For teachers to translate new learning or techniques from professional

development opportunities to the classroom, teachers need support and coaching through ongoing work from administration and team members (Spelman & Rohlwing, 2013).

In a study using the top 10 government-based reports on education reform, Burton and Frasier (2012) were able to indirectly correlate the effects that educational reform has had on science teachers. One aspect of the study centered on professional development. Participants completed a Likert-style survey and their responses were analyzed. Teachers surveyed indicated a need for high quality professional development, especially at the local level. There were concerns from teachers over not having access to professional development opportunities in which they were interested in participating. Barriers to this included a lack of time and funding to attend. Teachers also indicated that they had to put forth a great deal of effort to find professional development opportunities that interested them and most often had to pay for the opportunities from their own pockets. Teachers also indicated that they felt powerless to make needed changes in education reform. Long-term professional development opportunities are needed to include teacher input to facilitate lasting effects in the science classroom (Burton & Frasier).

Brown and Inglis (2013) determined through interviews done over a three month time period after an initial professional development that when teacher training was supported several ways, students tended to have a positive educational experience. Teachers interviewed gave three criteria for their perceptions of effective professional development opportunities. First, the training must be supported by the school leadership, allowing teachers the latitude to try new techniques, even if the activities are not

successful. Second, time must be set aside to collaborate with other staff members. And third, time must also be set aside to reflect on the new technique and how it has affected their growth as a teacher (Brown & Inglis). Steinert, Macdonald, Boillat, Elizov, Meterissian, Razack, Ouellet, and McLeod (2010) conducted a study to determine how they could make faculty professional development programs more pertinent to teachers' needs. The researchers interviewed focus groups of people that regularly attended professional sessions to acquire their perceptions of what was effective and not so effective to guide future sessions. Themes that emerged were:

- Allowed faculty members to improve their own methods of teaching.
- Allowed teachers to take risks in a safe environment while learning a new skill.
- Topics were relevant to teachers' needs.
- Allowed for networking with colleagues.

These themes were echoed in a study done by Bayindir (2009). She performed a study consisting of a questionnaire given to 108 teachers ranging in experience from less than 5 years to more than 21 years. Bayindir determined that teachers that have been in the classroom for less than five years and over 21 years had the perception that professional development activities were a loss of time unless they could be directly related to their classroom assignment (Bayindir).

An important component of any type of professional development is time for reflection. Reflection is the process through which teachers evaluate their own experiences and determine the significance of the professional development to their own

teaching practices (Zhao, 2012). Reflection allows teachers to contemplate their own abilities in areas where they have expertise and areas where they need growth. Without this component, any professional development will lose effectiveness. Zhao determined from teacher interviews and observations that reflections, whether technical, practical, or critically based not only empower teachers, but also focus the teachers on behaviors and skills where they need growth. As teachers become more at ease with reflecting on their learning, they will be able to translate what they learn during their reflections to skills designed to increase their student's knowledge and skills (Zhao, 2012).

According to Harvard University Professor Heather Hill, a long term investment in teacher training will be required to produce positive results in the classroom (DeMonte, 2013). A recent study by the American Enterprise Institute determined that in order for professional developments to affect student learning, at least 14 hours of training is needed (Hill & Herlihy, 2011). State and federal agencies report the need for effective teacher training in order to implement the Common Core State Standards, which have been adopted by 45 states (Polikoff, 2013). These standards are designed to provide nationwide academic expectations for student achievement. The search for effective educator professional development has moved to the forefront of education reform (DeMonte, 2013). Demonte's research concluded that high quality teacher professional developments have five characteristics in common: (a) alignment with school, district, and national goals; (b) focus on core content and model teaching strategies; (c) opportunities for active learning for new strategies; (d) teacher collaboration; and (e)

follow-up and feedback opportunities. There are several types of professional development that can lead to effective outcomes using those characteristics.

Types of Effective Professional Development

Continuing professional development is seen by most professionals as being part of the job (Schostak, Davis, Hanson, Schstak, Brown, Driscoll, Starke, & Jenkins, 2010). All respondents to a questionnaire sent out by the researchers acknowledged that continuing professional development was considered to be an essential effective practice when both "when" and "how" were incorporated into the professional development. This literature review will focus on self-directed learning, instructional rounds, peer coaching, and professional learning communities as examples of continuing professional development opportunities that apply DeMonte's characteristics of effective professional development.

Self-directed learning. Self-directed learning, where individuals make decisions about how to advance their own practice (Cornelius, Gordon, & Ackland, 2011), is one of the types of effective professional development. Self-directed learning allows for individual flexibility and activity focused models. Whether designed as an online or in-person experience, self-directed learning should provide a variety of formats to accommodate differing learning styles as well as a collaborative component (Cornelius et.al, 2011). One such program, Learning Lexicon, was evaluated by Cornelius' group. The researchers determined that this virtual learning environment (VLE) is effective for several reasons. First, it can be approached in any order by the learner, allowing for

flexibility. Second, all presentations and collaborative activities provided a variety of input platforms as well as employed a sophisticated search program. These factors allowed participants to delve in-depth into areas of interest and review elements with which they were unfamiliar. A third reason the researchers determined that VLE is effective is due to its collaborative segment. The program allows for participants located far apart to communicate via blogs, inquiry projects, and wikis.

An individual's ability to incorporate self-directed learning stems from cultural and educational background limitations (Frambach, Driessen, Li-Chong, & Van derVleuten, 2012). The researchers conducted interviews with individuals with different backgrounds to determine how those factors influenced an individual's ability to incorporate self-directed learning into problem-based learning situations. The researchers concluded that many subjects are not prepared to apply self-directed learning. Individuals whose educational backgrounds were centered on traditional, teacher-centered curriculum had trouble incorporating self-directed learning into problem-based learning. The researchers also determined that cultural issues, such as apprehension with the ability to interpret instructions and questions with self-directed learning existed. These cultural issues, however, were overcome as individuals learned how to use self-directed learning strategies (Frambach, et.al, 2012). As trainers develop self-directed learning modules for teacher education, care must be taken to incorporate cultural and educational differences in the instructions.

Nonformal educational settings are another opportunity for self-directed learning. This format allows each individual to determine the objectives along with the method of delivery. Grenier (2010), researched the effects of self-directed learning for teachers in a museum environment. Museum-based self-directed learning allows teachers to progress at their own pace as well as determine where time needs to be spent. The researcher concentrated on a summer institute for teachers at the Smithsonian. Participants were actively involved in determining the experiences which included collaboration with peers and time for reflection. Interviews with participants and direct observations led the researcher to conclude that when given choices for self-directed learning opportunities, participant interest as well as direct application to the classroom assignment were important factors to consider. A museum setting allows participants to use several of the characteristics of effective professional development including focusing on content, active learning, including teacher collaboration, and sharing of information, ideas, and strategies.

Instructional rounds. Instructional rounds have been described as a disciplined way for educators to work together to improve instruction (City, 2011). Learning walks, to which instructional rounds are sometimes referred, are a newer concept in education. Instructional rounds are akin to medical rounds where teams investigate the symptoms and develop a strategy for treatment (Guild, 2012). As teams of teachers perform instructional rounds, they focus on what behaviors are observed in the classroom. According to Guild, observers should concentrate on the levels of rigor, relevance to the

content, and the quality of the teacher-student relationship, all within the context of the problem of practice. The problem of practice is an area of focus determined by the school (City, 2011).

The instructional round team was broken up into smaller groups in order to visit a variety of classrooms. As groups made of teachers and administrators entered classrooms to make observations, they wrote descriptions of what was happening in the room with the problem of practice as the filter. The group members scripted descriptions of teacher behaviors, student behaviors, and the classroom itself. Members did not make evaluations of the classroom or the quality of the lesson, only the processes observed. Group members do not talk amongst themselves during or after the observations; discussions occurred later.

After the observation round, the entire team met to discuss the observations and to determine a plan of action. During this debriefing session, team members reflected on their observations. As each member shared his or her observations, other members share their thoughts. This process was designed to help teachers identify instructional practices currently used and how practices could be improved or re-directed to focus on the problem of practice (Marzano, 2011). If done effectively, the school can address problems and put teachers in charge of their own learning (City, 2011). Professional development opportunities can be tailored to teacher's level of expertise in order to make future training highly effective.

Peer coaching. Peer coaching allows people with common goals to collaborate in order to become more successful (McDermott, 2012). Peer coaching also allows individuals to share not only plans, but gage progress while acquiring support to gauge obstacles and problems. According to McDermott, peer coaching is different from mentoring in that peer coaching allows individuals to move between the roles of leader and participant. This approach allows all involved to benefit from each other's expertise while gaining knowledge of skills and techniques. Learning a new skill or technique requires members of a school to work together in order to incorporate the skill into their curricula (Fahey, 2013). Peer coaching allows teachers to work within their disciplines or in cross-curricular teams to provide expertise and needed support to integrate new skills into their day to day teaching practices. Administrators can support a peer coaching effort by providing groups with time to plan, share, and reflect on individual needs and progress (Fahey, 2013).

Professional learning communities. Collaboration and reflection in teacher learning have been indicated as important parts of teacher training by both teachers and principals (Hardy, 2010). Professional learning communities satisfy both of these needs. Most professional learning communities (PLC) consisted of teachers and administrators within a discipline and contained within a school continuously seeking and sharing learning, then acting on what they have learned. The goal of PLC is to enhance teacher effectiveness as professionals so that students benefit (Hardy, 2010). Some districts take the concept of PLC further and provide collaborative and reflective times for all teachers

of the same discipline. Professional development strategies at the district level incorporating PLC strengthen teachers' skills and offer a vehicle for the sharing of a variety of expertise and strategies (Hardy, 2010).

On a smaller scale, teachers within a discipline can meet weekly to plan, share and critique strategies and activities to ensure all students will have the same learning opportunities. The learning needs of students can come to the forefront using PLC rather than administrative needs (Hardy, 2010). During interviews with teachers at schools with PLC, Hardy determined that allowing teachers to share responsibilities relieved teacher stress, letting them concentrate on individual student needs. Creating an environment of collaboration and reflection does not happen overnight. Administrators and others involved in the process of developing and implementing PLC must assess teachers' needs (Abilock, Harada, & Fontichiaro, 2013). Skills and techniques need to be introduced, practiced and critiqued collaboratively among the teachers that work within a discipline I order to give long lasting results. Abilock and fellow researchers interviewed several staff members on their perceptions of a librarian's efforts to infuse technology into the school via a PLC approach. Although most of the teachers admitted having someone with the expertise on campus was helpful, the librarian's approach to meeting with departmental PLC included too much information presented without time for practice and exploration with her present. The principal's solution was to build PLC time into the school's week where teams could meet, plan and practice together with the librarian acting as a

facilitator. This encouraged a climate of collaboration, a cornerstone of PLC (Abilock, et.al, 2013).

Research Sources

Several versions of search terms were used in order to research relevant sources for types of effective professional development. A Boolean search was conducted through several of Walden's educational databases including Educational Research Complete and Academic Research Complete. Google Scholar was also employed to help pinpoint current articles. For those articles found on Google Scholar that could not be accessed directly, a return to Walden's library allowed the specific journal to be found and used. Descriptor terms used to search the databases follows:

- Effective professional development.
- Teacher professional development.
- Types of professional development.
- Instructional rounds.
- Professional learning communities.
- Peer coaching.
- Self-directed learning.

I was also able to use each article's reference list to find other sources as well as ideas for term searches.

Implications

The research on effective professional development practices allowed me to incorporate many effective elements into the project. Gaining the understanding that allowing people to work at their own pace and be more self-directed in assessing their own needs was valuable in setting the time frame for the three day professional development opportunity. Collaboration amongst peers is another important aspect that is demonstrated as a key element of the project. By allowing biology and special education teachers to work collaboratively, the groups will benefit from the expertise of all members. Having the benefit of using Edmodo as a collaborative tool will allow all participants to ask and answer questions submitted as well as share their products. Lastly, being able to upload teacher activities to the district's online database will allow for all biology teachers within the district to use and tailor all the products to fit their students' and classroom needs. As biology teachers become more confident and proficient in making accommodations for SWD, these students' scores on achievement tests, especially the STAAR biology exam, will become apparent.

Summary

Providing effective professional development opportunities is an essential responsibility for schools. One aspect of effective professional development includes opportunities for collaboration with peers. This can be achieved several ways including viewing master teachers in their classroom, instructional rounds, and peer coaching. Incorporating planning time within professional learning communities is another aspect

of effective professional development. By allowing teachers with common courses to meet and plan lessons, analyze data, and discuss effective learning strategies, their collaborative measures will translate into a better understanding of biology concepts for all students, including SWD. Incorporating time for reflection is a third aspect for effective professional development. When teachers are allotted time to reflect on what happened within the lesson and to determine what changes can be made to improve the activity, both teachers and students will benefit from the experience. The overarching theme in all effective professional development strategies is time. It is essential that teachers be given time to plan, collaborate, and reflect, in order to improve on their skills and help SWD become more successful learners. Allowing biology teachers the time to work with other biology teachers and special education teachers, is one way that the project incorporates best practices found within the literature. Another best practice that the project incorporates is allowing them to implement self-directed learning. The teachers will decide what they need help with while making accommodations and seeking that help from other biology teachers and special education teachers. The project also incorporates reflection time at the end of each day in order for teachers to take stock on what they have learned, and changes that they need to make so that SWD will benefit from their efforts. A final key to effective professional development for adults is to have them actively engaged as agents of change. This project uses the teachers who are more effective with SWD and the special education teachers who have more knowledge of best

practices for SWD to lead the change initiative rather than having the researcher just lecturing on strategies that are most effective with SWD.

Implementation

After conducting the interviews, it became apparent that biology teachers needed training with special education teachers on how to take strategies and activities and modify them to best serve SWD. The next step will be to provide a three day professional development workshop, with the district's permission, where biology teachers can meet with special education faculty from their campuses to create new activities for SWD as well as make appropriate accommodations for existing activities. An overview of the professional development opportunity is detailed within this section and can be found in Appendix A.

Resources and Existing Supports

Within the target district, there are many potential resources to help biology teachers learn to effectively implement evidence-based strategies into the existing curriculum. Each science department has several books and templates for implementing evidence-based strategies into the classroom. Books include Marzano's (2007) *The Art of Science Teaching* and (2001) *Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement*. The district chose Marzano's strategies since he is known internationally as a leader in educational pedagogy (Gall, 2011). The books are centrally located within the departments and available for teacher check out.

Along with the written aids available to biology teachers, the district has also placed science facilitators on every campus. These are teacher/administrators versed several science disciplines who are used as a resource for information and techniques for science teaching. There is also a professional development center, where teachers can take mini-courses as well as online courses, designed to enhance teaching skills and develop new skills. The district also has an online curriculum database that allows teachers access to evidence-based strategies and activities.

Potential Barriers

As with any professional development opportunity, barriers exist. For this project, barriers could include teacher apathy, an unwillingness to change behaviors, and teachers perceptions that they are already doing everything they can to aid SWD in raising achievement scores. Along with those barriers, time and other district initiatives should also be considered. The coaches/facilitators in charge of the professional development will need to work with all the biology teachers to ensure that these barriers can be overcome. This project will facilitate a spirit of cooperation between biology teachers at different campuses as well as foster a relationship between biology teachers and special education teachers, breaking down some of the barriers which may exist. Teachers may become more willing to try new strategies to aid SWD when the Edmodo community is set up, allowing biology teachers and special education teachers from across the district to collaborate and share strategies and activities to aid SWD to be more successful on the STAAR biology exam.

Proposal for Implementation and Timetable

The district already has established days for science professional development. It would be advantageous for the curriculum coordinator to add this project into the options available from which biology teachers may choose. Many times, teachers in certain disciplines are asked to attend specific professional development sessions. Therefore, all the biology teachers could be asked to attend the session designed for this project.

The first of the science professional development sessions are held the week prior to the start of school. This would be the optimal time to begin the project with an introduction as to why it is being offered and the results of my research, as well as the goals that will be accomplished during the school year. The second science professional development sessions are held in January, and could include a time for reflection on how the implementation of activities has progressed, as well as time to work on activities/strategies for the coming semester. A survey could be sent out at the end of the school year, after the administration of the STAAR biology exam, to attain the teachers' perceptions of the professional development opportunity they were given as well as to gain input on how the sessions could be improved.

An outline of the three day professional development follows. For more information, refer to Appendix A.

Day 1: Introduction

For the first hour and a half to two hours, including a break, the project will include:

- Introduce myself and the goals of the professional development sessions.
- Have all biology teachers and special education participants log onto their district-provided iPads and download Edmodo, which is an app designed to allow for groups of people to share information, ask questions, and upload documents. One of the features of Edmodo is the option to ask me a question without posting to the whole group. Each teacher will join the Biology group that I will have established.
- Teachers will view the PowerPoint, which will be uploaded to Edmodo so teachers can access it when needed, of how to decide which types of accommodations and instructional modifications would best serve biology SWD. I will share the data that led to my study, the results of the study, and the implications for biology teachers.

For the next 30-45 minutes, teachers will:

- Share activities that have been successful with SWD. Digital copies will be uploaded via Edmodo and teachers will be given the opportunity to ask questions and comment on the implementation of the activities in the classroom.

- Create a digital journal using Microsoft Word in order to provide a place for reflections at the end of each day.

After lunch, teachers will spend the next 3 hours, including a break to:

- I will explain and model several ways to modify activities such as thinking maps (graphic organizers), as well as how to incorporate modifications into Cornell style note taking for SWD. I will also demonstrate several different activities that can be used to follow up and have students actually use the evidence-based strategy, as this appeared to be the missing component between the teachers at the schools with higher passing rates and the teachers at the schools with lower passing rates. Biology teachers will choose units to create/modify activities that should help improve the achievement of SWD in their biology classes.
- Arrange themselves into groups of three to four. Groups will need to consist of at least one biology teacher and at least one special education teacher.
- Within groups, teachers will brainstorm a list of topics that they perceive as needing accommodated activities within the biology curriculum. Each group will write their list on large post-it paper and explain to the large group why they decided that those topics were in need of accommodations. A master list will be constructed from each group's list and representatives from each group will sign up to create or update activities for all participants. Groups may access a breakdown of the latest STAAR test scores to visualize which

topics SWD had the most difficulty. This information can be accessed from the school district's data base, as well as the TEA website.

- Participants will work on creating/updating accommodated activities and posting any completed activities as well as questions on Edmodo. It will be explained that it is fine that activities are not completed by the end of the day, but whatever has been accomplished, needs to be uploaded so all participants can view the activities.
- Teachers will be able to log into Edmodo any time between sessions and ask questions as well as upload any activities they have created so the entire group will have access.

At the end of the session, all participants will have 15-30 minutes to reflect in their journals on what they have learned about themselves as well as their ideas on what they need to do to aid SWD in raising their biology STAAR scores.

Day 2: Activities

The agenda for the second day of the workshop includes:

- For the first 15-30 minutes, groups will discuss what was accomplished during the first day and outline what they will need to accomplish today. I will be monitoring Edmodo in order to answer questions that small groups may not be comfortable asking as a whole group.
- For the next 3 hours, including a break, groups will continue to work on their lessons that include evidence-based strategies for SWD, as well as

the follow up activities, uploading completed activities to Edmodo and commenting on work as well as asking questions.

- After lunch, participants will continue working on creating/updating accommodated activities and posting any completed activities as well as questions on Edmodo. It is one of the goals that by the end of the day each group will have completed one to two activities; but whatever has been accomplished, needs to be uploaded so all participants can view the activities.
- At the end of the session, all participants will have 15-30 minutes to reflect in their journals on what they have accomplished that day, and how their efforts will aid SWD in increasing their success on the STAAR biology exam.

Day 3: Reflection and Sharing

- The first 15-30 minutes will be used to have teachers review what has been posted, and answer/discuss questions posted day 2. Groups will set goals for what they wish to accomplish their last work day.
- The next 3 hours, including a break, will consist of completing and uploading all activities to Edmodo.
- After lunch, biology teachers will share their activities/strategies from the units they modified and discuss how they will incorporate the activities into the curriculum. One of the goals is for each teacher to take home ten

to twelve activities that are ready to be incorporated into the current biology curriculum.

- During the last 30-45 minutes, teachers will reflect on how the professional development has affected them as teachers, as well as activity/strategy designers. Teachers will also fill out a district-made evaluation of the professional development opportunity and give suggestions for follow up sessions or changes they would like to see happen. The district has a standard evaluation done via Survey Monkey, to determine the effectiveness of the professional development opportunity (see Appendix A).

All teacher developed activities will be sent to the district's science curriculum coordinator for uploading into the district's online curriculum database.

Roles and Responsibilities of Student and Others

The researcher will act as the facilitator during the professional development opportunity, allowing participants to ask questions and seek clarification as they move through the process of modifying activities within the biology curriculum. The special education participants will provide assistance to the biology teachers on the best methods to incorporate for a particular school's population of SWD. This will allow the special education teachers to increase their content knowledge of biology, while the biology teachers will gain knowledge on how to best modify curriculum and instruction for their students, thus using the strengths and skills of each group of teachers to help improve the

achievement of SWD in biology. The biology teachers will provide the activities used within the curriculum that they perceive will best allow for a deeper understanding of the subject matter for SWD. Each school could develop different activities that could then be shared with the entire district via the online curriculum database. The administrators will provide any needed support or materials in order to implement the created activities, and they will arrange for the materials that are developed to be uploaded to the district online database. The administrators may also provide common planning times during the school day for biology teachers to meet and collaborate on activities and strategies. Lastly, administrators may also assign a special education representative to meet with the biology teachers regularly to provide input as well as to give insights on developing further activities and strategies to aid SWD in increasing their scores on the STAAR biology exam.

Project Evaluation

As biology teachers and special education participants work through the accommodation process, the researcher will be listening to their comments and suggestions and making adjustments to the professional development opportunity as needed. For example, if the participants perceive that more time is needed to work as a team on implementing different instructional strategies, the schedule for the three days can be adjusted to accommodate those needs. After the professional development opportunity is completed, an evaluation survey will be done via Survey Monkey on the participant's iPads (see appendix A for sample of a district survey). This is a required

summative evaluation provided by the district, which will allow the researcher as well as the district administration to determine perceptions of the effectiveness of the workshop. A follow up survey could also be sent out after the teachers have had time to use several of the accommodated activities, and their current SWD have taken the STAAR biology exam. The follow up survey would be a formative evaluation that would allow the researcher and the district administration to plan for additional follow up professional development. This follow up can be used to determine if more opportunities for planning and implementing the instructional activities need to take place. The survey will measure the participants' perceptions of the success of the professional development opportunity in terms of how well they have been able to measure the success of SWD on benchmark assessments as well as on the final STAAR results (see Appendix A). The district's science curriculum coordinator will be provided with the results of the survey to determine if follow up workshops or other professional development opportunities are necessary. Surveys allow participants to express their perceptions of the professional development without having to divulge their identity. This allows for an honest evaluation of the professional development's effectiveness in meeting its goals. The results will be a valuable process to compare the biology teachers and special education teacher's perspectives on the project's success.

Implications Including Social Change

Local Community

SWD are present everywhere within our community. As these students are able to achieve at higher rates, they will be able to become more productive members of our community. SWD will be better prepared for life outside of high school, either through having the incentive and confidence to enter a trade school, or to attend a college or university. SWD should be able to share their pride and self-confidence in being able to demonstrate their abilities with their families, employers, and friends. SWD will also be able to share their knowledge in helping to decide on health and wellness options that could affect their families. Hopefully, SWD will also be able to make better decisions about the environment and encourage those around them to join with them in making their community a better place to live. Instructors and administrators can also reflect on the increased achievements of SWD and share in the knowledge that they are able to help students realize their potential. The individual schools as well as the district as a whole will benefit from raising SWD scores on the STAAR biology exam since it will in turn, raise the school's and district's AYP score.

Far-Reaching

With so many laws and regulations regarding health care and food safety, as well the general knowledge that goes with becoming a productive member of society, helping SWD understand how to learn and distinguish between the many choices they face, will be a benefit to society as a whole. As SWD achieve at higher rates on the STAAR

biology exam, they will be able to become better informed on all biology and health related issues that are constantly coming to the forefront in our society. In turn, as SWD have their own children, they will be better prepared for how to teach them to comprehend the wealth of information around them.

Conclusion

I have learned through my research that, even though biology teachers are well-versed in the types of evidence-based strategies that aid SWD in gaining a better understanding of the curriculum, that does not always translate into developing lessons that provide the essential follow-up activities that allows SWD to achieve higher scores on the STAAR biology exam. I also learned that opening up lines of communication with classroom teachers and special education teachers is an essential part of making SWD more successful learners. As teachers become more proficient in implementing evidence-based strategies into their curriculum and work with special education teachers to provide appropriate accommodations for SWD, several positive outcomes will take place. First, the teachers will gain valuable knowledge on preparing more meaningful lessons and the confidence to make accommodations for activities that include SWD. Second, the SWD they help will gain self-confidence and knowledge to make better choices on health-related issues and possible career choices. Third, the entire community will benefit from having a better prepared work force, as well as members that are better equipped to make decisions that could affect the community as a whole. As I completed the interviews and

project study, I was able to grow both as an educator, person and leader. In the next section, I will reflect on my personal growth and my final conclusions.

Section 4: Reflections and Conclusions

Introduction

The project study afforded me a great deal of information, both professionally and personally. I was able to understand the difficulties associated with planning a professional development opportunity. I also discovered my strengths and limitations as a researcher and leader in the educational community. The project has many strengths, but it also has some limitations it brings together biology and special education teachers who may not be used to working together.

Project Strengths

The project is designed to bring together all the biology teachers in the district, so teachers who are more successful with SWD will be able to collaborate with teachers who are less successful with SWD. This will allow all teachers to share strategies and activities to help biology teachers prepare SWD to become more successful on the STAAR biology exam. During the interviews, I discovered that teachers perceived they were lacking in the skills to make modifications, which allowed the inclusion of special education teachers to help biology teachers gain the skills they perceived that they lacked. A strength might also be sharing the strategies and lessons that they develop. This project includes the main points of an effective professional development opportunity I discovered during my research of the literature. The workshop will allow teachers (a) to identify the areas they perceive as needing improvement, (b) time to collaborate with others, and (c) time for personal reflection.

Recommendations for Remediation of Limitations

The project also has limitations that may be able to be overcome as follow-up professional development opportunities occur. Sometimes it is difficult to influence teacher buy-in when they do not perceive the issue to be a problem directly related to them. Teacher apathy is also another limitation that could alter the effectiveness of the project. A third limitation is time available to plan and create the activities using evidence-based strategies.

Some of those limitations may be improved. For example, strategically placing successful teachers with those who are less successful may help the less-successful teachers. That is, less-successful teachers, who do not perceive a problem with SWD achievement, may realize that with a few alterations to their existing curriculum, they could raise those students' STAAR scores. Using the same strategy could also help with teacher apathy. That is, if teachers who are willing to work are seated with those who are not as enthusiastic, the less-willing teachers may not grumble as much but may work with those around them. Keeping the teachers actively engaged throughout the workshop, and allowing them to work on lessons they will actually be implementing, should also help maintain their interest. Allowing biology teachers to bring in activities that they want to update and make accommodations for SWD may also help with the time factor. If there is already an activity with which to start, using the special education teachers' expertise in making accommodations may jumpstart the entire process for the biology teachers. Another limitation is getting the teachers to use the revised lessons. Perhaps the science

facilitators could help with follow-up. The literature has shown that when teachers are supported by administrators and other leaders in the school, they are more likely to use and continue the skills learned in the professional development opportunities.

Recommendations for Alternative Approaches

If a three day workshop is not feasible, there are alternative approaches that can achieve the same results. One possible alternative approach is to incorporate the three days into the already established science curriculum district professional development days. The first day of the proposed workshop could be condensed to allow biology teachers and special education teachers to review the evidence-based strategies and brainstorm which parts of the curriculum is in most need of follow-up activities for SWD. Teachers could formulate a plan for taking one idea back to their home campus to create a modified lesson that could be devised during planning time with the help of the home campus' special education teachers. The product could then be sent to the science curriculum coordinator and uploaded onto the online curriculum database, as well as disseminated out to all biology teachers in the district through e-mail. At each of the successive district science professional development days, biology teachers and special education teachers could work on other lessons, and share what they have developed and learned. There can also be reflection time included for teachers to internalize what they have learned, and to think of ways to implement the activities into the curriculum.

Another alternative would be to use volunteer biology and special education teachers in a pull-out day to meet at the professional development center and work on

revising and developing modified lessons for SWD. This type of opportunity has been used before in the district when writing curriculum and benchmark exams for the STAAR biology exam. The core of volunteers could be pulled out several days during the school year in order to allow other biology teachers to give their input and suggestions on the types of activities they would be willing to use with SWD. Again, the science curriculum coordinator and science facilitators would be able to provide guidance and would upload all activities onto the curriculum database.

Scholarship

Educational scholarship has been described as activities that foster learning, allow for assessment, develop curriculum, provide mentoring and advising, and aid in transforming organizations (Anderson & Simpson, 2012). Evidence demonstrating educational scholarship includes making the activities accessible to the larger community and presenting them in such a way that others can expand and build on the work done. With these criteria in mind, I deduced that the project study has the potential for excellence in scholarship. The project should allow for biology and special education teachers from across the district to come together, and to create activities and strategies that can be tailored to individual's needs. These activities and strategies can be shared via the district's online curriculum, as well as through the Edmodo group created for the project.

As I created the steps for the project, I realized that most teachers provide this level of activities for all of the students, but may not include provisions for modifications

for SWD. Before I started in the doctoral program, I did not always think about how and what accommodations needed to be put into place for my SWD. Nor did I think about sharing all activities with other teachers within the same course. Now, I find myself discussing which accommodations would be best with our special education department on many activities since writing the project study. Several special education teachers also visit my classroom to gain more science knowledge in order to help SWD. I am not sure this would have happened if I had not been in the doctoral program.

Project Development and Evaluation

I had been a project editor for an educational computer company before coming back to teaching, so I had a good understanding of the ins and outs of developing activities and strategies for presentations. However, I had not developed projects specifically designed as a teacher professional development opportunity that involved several days' worth of activities. I realize that good time management is the biggest challenge, since you do not want to rush the participants; but at the same time, you want to be sure to have enough planned so there is no lag time. Setting up the timeline was the easiest part for me, because as a teacher, we use this skill while planning any unit. However, being certain that there is enough time for teachers to work together on specific activities will to be the most beneficial piece of the professional development opportunity, for it is essential that all teachers come away from the professional development with at least one activity completed and ready to go. Building in flex time,

where some groups may finish up an activity while other groups can start on another will require many management skills that I have developed over many years of teaching.

I learned that designing a professional development opportunity for adult learners is very different from designing activities for student learners. The wealth of knowledge that adult learners bring to a session is much different from student learners. Adult learners need to have more autonomy in deciding what they need to accomplish, and they need to have the leeway to adapt to a more cooperative learning style. Giving adult learners adequate time to process and reflect on new ideas and learning, is definitely an area that I improved on greatly. I had to put myself in the perspective of a less experience teacher and adapt timelines. With student learners, my experience as a teacher has allowed me to gauge how long to give for a discussion of a new topic, but with adult learners, my estimation of times may need adjusting, depending on the level of understanding the participants already possess.

Leadership and Change

Change is never easy, but in order to improve student learning and teacher proficiency, change is a necessity. I have determined through the interview process that even though the biology teachers know that changes need to be made, there is still some resistance due to the increased effort it will take. My perceptions of leadership have evolved during the process of interviewing administrators. Leaders at the school level must lead by example. If changes are necessary to increase student achievement, that change needs to be embraced and implemented with enthusiasm. Teachers often look to

the administrative leaders to determine what changes are necessary, along with the time frame for those changes to happen. However, teachers can become the instruments of change and lead that process internally. Leadership, as I perceive it now, is having the ability to affect a change at any level. The proposed professional development opportunity will allow participating teachers to become leaders within their schools, and they can share what they have learned within their individual schools. I now find myself reaching out to fellow teachers that I observe struggling with daily obstacles, such as how to reach students with behavioral issues in the classroom. I try to provide options that may help the teacher, the student, and the classroom environment as a whole. I also speak up more in faculty meetings, giving suggestions on how best to help with the implementation of new technology in the classroom, or strategies to help teachers accomplish the duties that administrators are deeming important. As I find myself more open to giving suggestions, other teachers are becoming more comfortable with speaking up, providing the faculty and administration with new avenues for success. It is not always easy to be a leader, but I have discovered that if I do not step up, change cannot happen as effectively.

Analysis of Self as Scholar

Before beginning my doctoral journey, I had thought of myself as a scholar. However, this program has allowed me to grow tremendously as a true scholar. I am now much more willing to pick up journals and read articles that I would not have read a few years ago. When I first began reading scholarly articles, I found the jargon confusing;

now I am able to fully comprehend the articles and formulate informed opinions based on what I have read. I find myself using a more scholarly vocabulary with my students as well as colleagues. I have realized that many of my students were using the same vocabulary I had adopted, which can only be a positive for their educational journey. As my vocabulary has evolved, so too have my writing capabilities. I am now able to incorporate a wider variety of terms into my writing. I am also more capable of correcting my own punctuation, spacing and grammar issues that I had difficulty with when I began my doctoral pursuit. As I continue my scholarly efforts, I hope to become published, which will require a keener eye and improved use of scholarly language. I am also more willing to discuss with colleagues what I have discovered from my research. This fits into my perception of what a true scholar is: someone who is well versed in several topics and is able to discuss topics intelligently. My goal is to continue to strive to become a scholar in the true sense of the word.

Analysis of Self as Practitioner

As I began the project study, I realized that my skills as a practitioner had a lot of room for improvement. I have several friends and colleagues that helped me rehearse how to be a more effective interviewer. Even though I do not teach biology, I feel that this experience has helped me evolve as a better teacher. I have always provided my SWD with accommodations, but now I have begun giving students more options to show what they have learned. This has allowed my SWD to demonstrate their knowledge at higher levels than I thought they were capable of. I have realized that I am using many of

the researched skills to reach not only my SWD, but students that have English as a secondary language as well. Rephrasing, allowing for more wait time, using more pictures and diagrams, as well as finding shorter, more focused hands-on activities has made a difference in the retention level of all of my students. As a practitioner, recognizing these changes in student behavior is a valuable tool in increasing student achievement. As I analyzed the data by reading the transcripts multiple times, I determined that color-coding themes worked well. I discovered that coordinating colors with my research problems allowed me to piece together overarching themes. I feel I have improved as a practitioner, but I still perceive that I have a lot of skills that still need to be honed.

Analysis of Self as Project Developer

Since I had worked as a project editor for a computer company and had developed educational programs for chemistry and physics, I perceived myself as a confident project developer. Adjustments had to be made in my approach because I was dealing with adult learners instead of students. Giving participants more autonomy and flexibility in making decisions were the largest adjustments that I made. My experience as a teacher was also very helpful as I developed the project. Being able to assess the amount of time needed for activities is one of the skills I applied to this project. I have been able to place myself in the role of the learner, either student or adult, and have realized that being able to manage time is an extremely important skill. Since starting the doctoral process, I have become much better at time management and rarely have down time in my classes. When

my fellow teachers and I meet in PLC, I have become much more adept at moving our meetings along so they can be as productive as possible. As I continue to develop more adult learner projects, my skills as a project developer will continue to be honed.

The Project's Potential Impact on Social Change

As teachers become more at ease with making accommodations for SWD and more proficient in incorporating evidence-based strategies geared toward helping SWD be more successful in biology and pass the STAAR biology exam, many impacts on the school and community will become apparent. One impact could be a change in the school's climate; core course teachers reaching out to the special education teachers and using them as the valuable resource that they are, will allow SWD to be more successful, not only on the STAAR biology exam, but in their overall education. Hopefully, the biology teachers will be willing to talk about what they have learned with the faculty, either casually, or as part of a school-wide faculty meeting to inspire other disciplines to invest in the initiative.

As higher achieving SWD move into the workforce, they will provide a greater service to the larger community and become more productive members of society. The project could also help inspire SWD to pursue educational possibilities beyond high school. Whether choosing a trade school, technical school, or college as their next step, the outcome will be a more educated population, better prepared to make decisions that affect their well-being as well as the well-being of those around them. As SWD realize

their potential, the possibilities for their futures become endless, and with that, the larger community will benefit from that potential.

Implications, Applications, and Directions for Future Research

Classroom teachers are always searching for ways to help SWD, but they do not always have the expertise to make appropriate modifications. The project study conducted for my doctoral degree confirmed this perception. If general education biology teachers are given the opportunity to work with each other and with special education teachers, the benefits for SWD will be two-fold. First, the biology teacher will have the time to devote to planning in order to design activities with appropriate accommodations using the input and guidance of the special education teacher. Second, the special education teachers will also gain greater science knowledge in order to help SWD. The professional development opportunity proposed in this study can easily be expanded for all disciplines. As more teachers become comfortable making appropriate accommodations for SWD as well as seeking out help from special education teachers, the achievement scores for SWD should increase in all subjects.

The professional development opportunity can be taken out of the district and be offered through regional education service centers and at teacher conferences, expanding the opportunity for the achievement of SWD at the state, or even nation-wide level. The entire project has educational applications, from collaboration efforts between biology teachers to interdepartmental collaboration with special education teachers. The key goal of raising the scores of SWD on the STAAR biology exam could only be the beginning.

The educational applications could be endless as other disciplines incorporate the model for this type of professional development opportunity. There are several journals that I would be interested in submitting my project to for publishing. The first journal would be *Exceptional Children*. As I researched the literature, this journal stood out as one that published many articles that related to my project. Two other journals I applied during my research were *The Journal of Special Education* and *Learning Disabilities Research and Practice.* If any of these three excellent journals would be willing to publish my paper, it would allow teachers of all disciplines and their administrators to visualize how SWD scores can be raised within any curriculum or on any state or national exam. The more the issue of improving the achievement of SWD can move to the forefront of teacher and administrator thoughts, the more professional development opportunities can arise to help SWD demonstrate their capacity for learning. With a professional development opportunity already planned out, district and building administrators can tailor the workshop to their specific needs, which would benefit both teachers and SWD.

Possible future research could involve giving SWD a pretest before implementation, then allowing time for teachers to implement strategies and activities that have been produced at the professional development opportunity, followed by a post test. This would allow for a quantitative element to the research. Another beneficial extension of the project would be to incorporate follow-up interviews with the biology teachers, special education teachers, and administrators, to determine if they have had a change in perception and if so, what those changes were. It would also be interesting to

see which of the evidence-based strategies worked best at raising the scores of SWD on the STAAR biology exam. Perhaps a study could be designed where different schools or different teachers implemented a different strategy, for example, using Cornell notes versus guided notes, then comparing the test scores on benchmark exams given throughout the school year, which are modeled after the STAAR exam in order to quantify the method which plays to the strengths of SWD. The cumulative data could then be compared to the change in the actual scores from STAAR biology exam given at the end of the school year.

Conclusion

This project study has allowed me to become a much better researcher as well as a better teacher. I have found myself in more leadership positions with my discipline's team as well as within the school itself. I am more apt to discuss trends in education with colleagues, and read journal articles that I may not have picked up before I began the doctoral process. I find myself providing better accommodations for my own SWD, and sharing those accommodated activities and strategies with other teachers across the district. The project study has also showed me many strengths and areas for improvement, including my skills as a project developer, practitioner, as well as overall scholar. As I continue my pursuits as a researcher, I hope to affect a larger change in how SWD are viewed, both academically and within the community as a whole.

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Appendix A: Project

Accommodating Activities in the Biology Curriculum to Aid SWD Raise their STAAR biology exam Score

This project will allow a science facilitator, coordinator, regional educational service center, or teacher with a special education background to conduct a three day workshop to increase the number of modified activities for use in the classroom. The trainer needs to be familiar with the effective use of accommodations such as guided notes, Cornell notes, mnemonics, graphic organizers, and cooperative learning. The training has been designed specifically for biology, but practitioners from any discipline can implement the format to aid SWD. The district's professional development department, or science curriculum coordinator can send out the notice for the workshop and designate the campus and room to be used since those forms are usually done from central office. Since the teachers will be able to work, edit and upload documents, explaining that either a room with desktop computers will be provided, or having teachers bring a district issued or personal device needs to be made clear in the notice for the professional development.

The notice could be sent to all district teachers within the target discipline, or if at the regional level, all teachers within the region that fit the target discipline. Edmodo, an application which allows participants to comment, ask questions, and upload information within a group specifically designed for the professional development will be used. If

using a wireless environment, Edmodo can be applied as written in the accompanying PowerPoint. If using a desktop environment, Edmodo has a desktop version that can be used by going to www.edmodo.com. If desktops are being provided, the technology department should pre-load the application. Again, if using a desktop environment, all participants should also bring a flash drive on the last day, so all activities can be downloaded and taken with them. Be prepared to pull up on the screen, or hand out the latest STAAR biology exam data depicting the district's student performance percentages by TEK or question.

Trainer Materials:

- Laptop or tablet that can be connected to projector for PowerPoint and using Edmodo comments.
- PowerPoint presentation. Contact [redacted] for copy of PowerPoint.
- Colored squares (card sized and table sized) for introduction activity.
- Large Post-it paper for groups to brainstorm topics.
- Markers.
- Example of guided notes, activity based on guided notes, and lesson plan.
- Copies of the latest STAAR biology exam data showing district information on student performance by TEK.

The schedule for the three day workshop follows. The PowerPoint has detailed notes to aid presenters with information to assist in facilitating the workshop.

Day 1:

9:00-10:00	• Introductions and first three PowerPoint slides (which follows at the end of the schedule) over goals. • Edmodo introduction and download (if needed). • Teachers practice posting and uploading on Edmodo.
10:00-10:15	Break
10:15-10:45	Next slides over effective strategies for SWD and samples of possible accommodations to be used with SWD (especially accommodating Cornell style notes)
10:45-11:00	Sharing/discussing strategies and activities used with SWD (talk with teachers from more successful schools to be sure that they have samples to upload)
11:15-11:30	Download My Private Journal from App Store to create digital journal for use during workshop and beyond
11:30-1:00	Lunch
1:00-1:30	• Break into groups of 3-4 with at least 1 special education person in each group. • Brainstorm list of units/topics each group would like to see at least one accommodated activity created. Groups can look at data provided of latest STAAR exam to help determine areas of concern. • Each group will put their list on large Post-it paper and put up in room. • Large group discussion on lists and make a master list of units/topics seen repeatedly. • One representative from each group will put his/her name by 1 unit/topic they will work on that day.
1:30-1:45	Groups select topic
1:45 – 2:45	Groups will develop the accommodation Break will be between 2:00 and 2:15

2:45 – 3:30	Groups work on creating activity – groups may post any completed work on Edmodo
3:30 – 4:00	Groups will develop the lesson plan using the accommodation and the activity
4:00-4:30	• Reflection time to write in journal about what they discovered/accomplished today. • Large group discussion on questions posted on Edmodo.

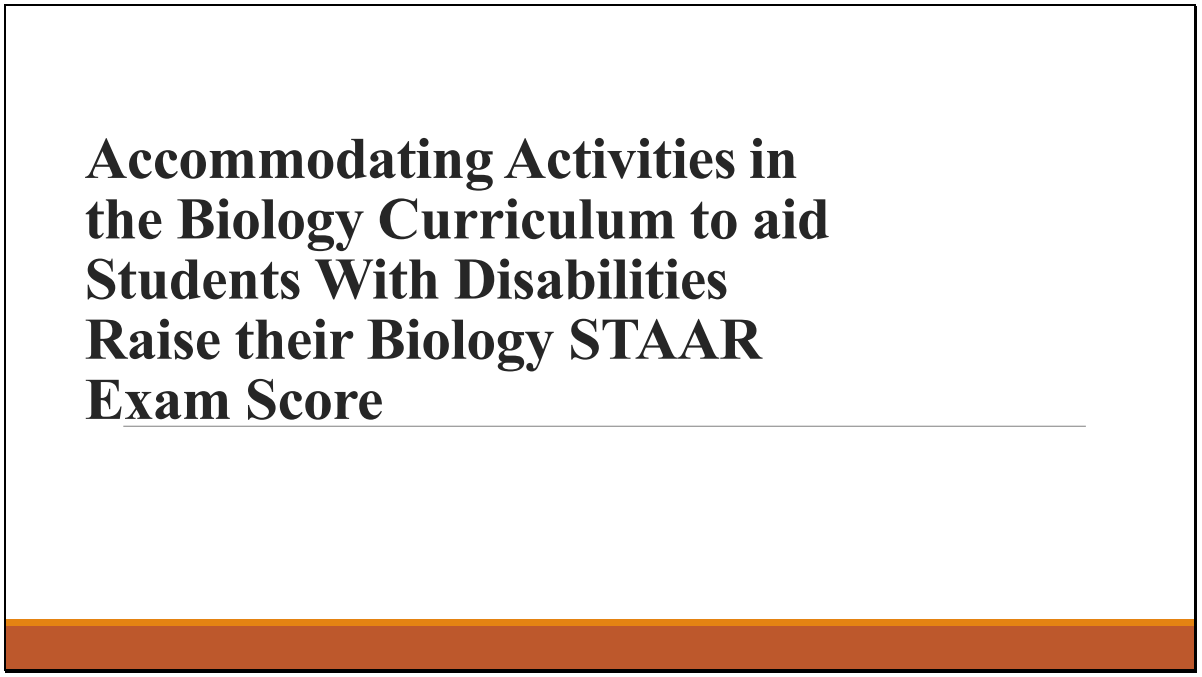
Day 2

9:00-9:15	Recap what was accomplished – Have groups develop game plan for the day – groups will sign up for 2nd activity to create
9:15-10:15	Groups will complete any work needed from previous day, upload to Edmodo Groups will develop the 2nd accommodation Break between 10:15 and 10:30
10:15 – 11:00	Groups will work on creating 2nd activity – groups may post any completed work on Edmodo
11:00– 11:30	Groups will develop the lesson plan using the accommodation and the activity
11:30-1:00	Lunch
1:00-1:30	Large group discussion over posted activities – discussion how they can be used in the classroom and discuss any suggested changes
1:30-1:45	Groups select 3rd topic
1:45 – 2:45	Groups will develop the accommodation Break will be between 2:00 and 2:15
2:45 – 3:30	Groups work on creating activity – groups may post any completed work on Edmodo
3:30 – 4:00	Groups will develop the lesson plan using the accommodation and the activity
4:00-4:30	Reflection time to write in journal about what they discovered/accomplished today Large group discussion on questions posted on Edmodo

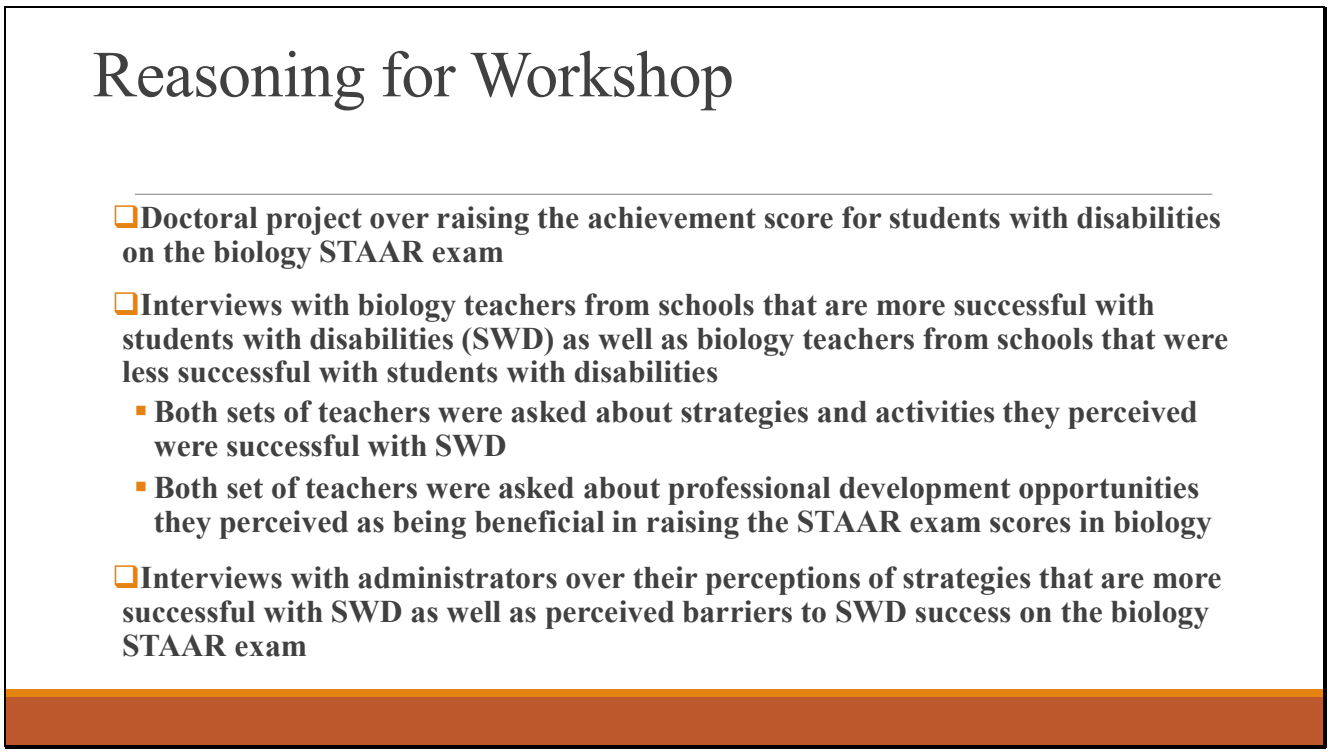
Day 3:

9:00-9:15	Recap what has been accomplished. Have groups set goals for completing all work today.
9:15-10:00	Complete all creations and upload to Edmodo.
10:00 – 11:00	Begin reviewing all activities and formulate questions and comments on how and when to implement activities into curriculum. Break from 10:15-10:30
11:00 -11:30	Groups will make revisions/updates from suggestions and comments made during discussions
11:30-1:00	Lunch
1:00-1:30	Share all work via Edmodo
1:30 – 2:00	Large group discussion on how to implement activities into curriculum. Post comments on Edmodo in order for everyone to have a copy
2:00 –2:30	Download all activities to teacher's home drives Break from 2:00-2:15
2:30 – 3:00	Final reflections – participants will write about how they will implement what they have learned and make notes on any changes they will need to make on activities to fit their classroom
3:00 – 3:30	Have participants share their "aha" moments with large group
3:30 – 4:00	Scan QR code and complete district evaluation on survey monkey Be sure to have participants share their e-mail with you so you can send a follow-up evaluation

TITLE SLIDE

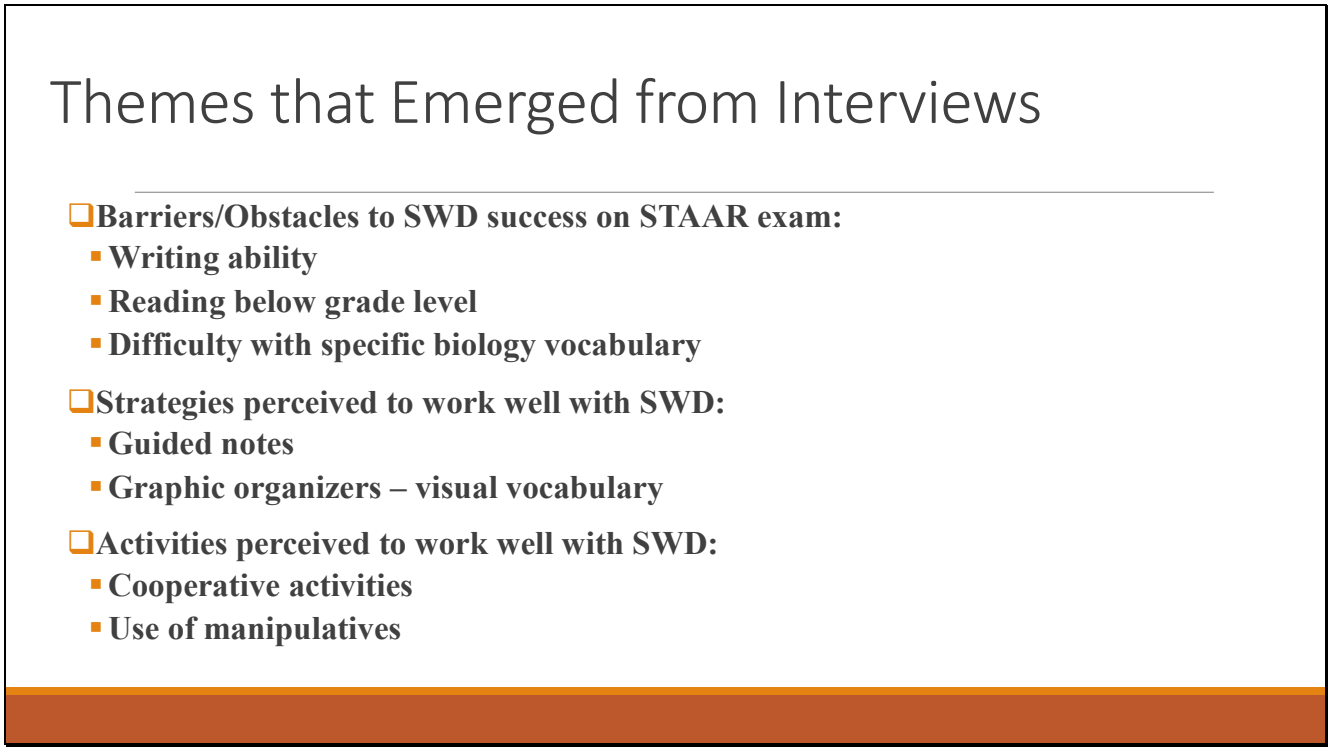

Accommodating Activities in the Biology Curriculum to aid Students With Disabilities Raise their Biology STAAR Exam Score

BACKGROUND FOR WORKSHOP



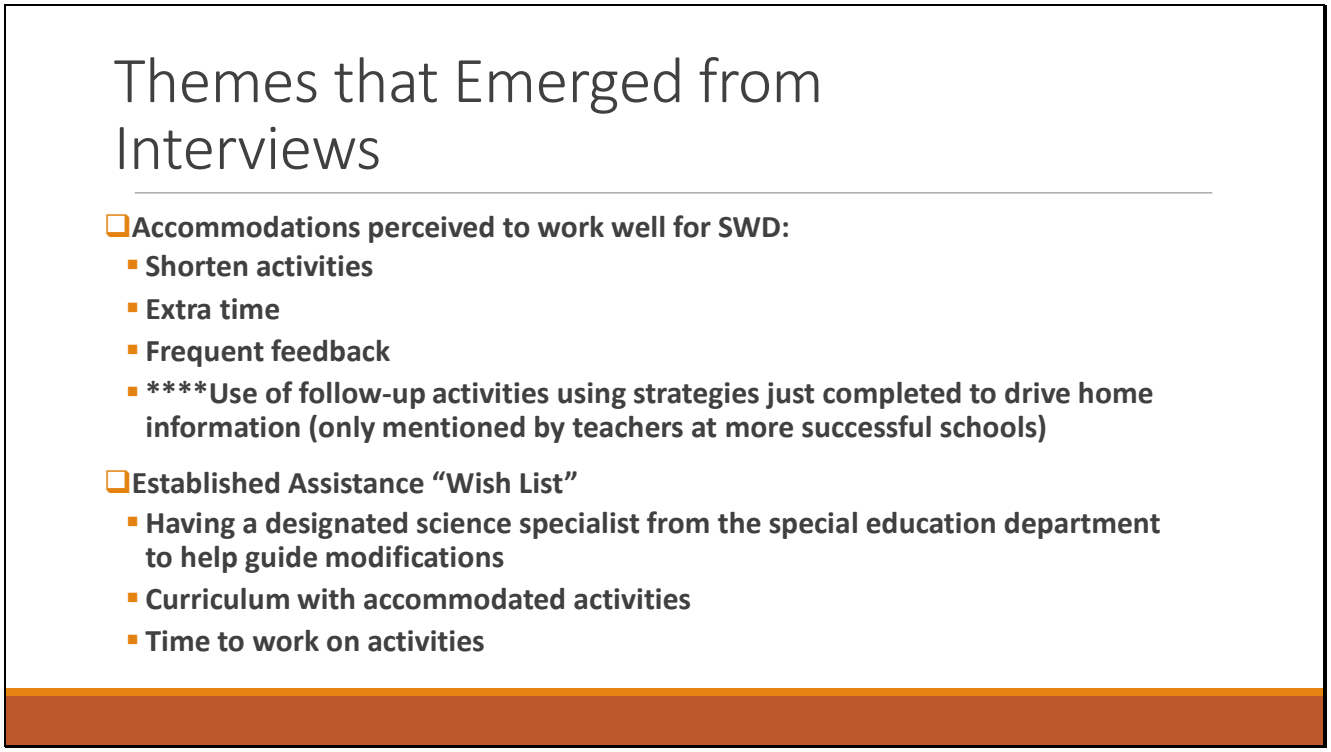
This slide can be used to explain how the professional development opportunity came to be. This can be deleted, if the presenter chooses.

THEMES FROM INTERVIEWS



This slide goes over all the research done within the doctoral study to help teachers decide on which accommodations would work best with their students. Be sure to go over what guided notes, graphic organizers, and cooperative activities entail. These are terms we use quite often, but some may not remember what the essential definitions are.

THEMES FROM INTERVIEWS

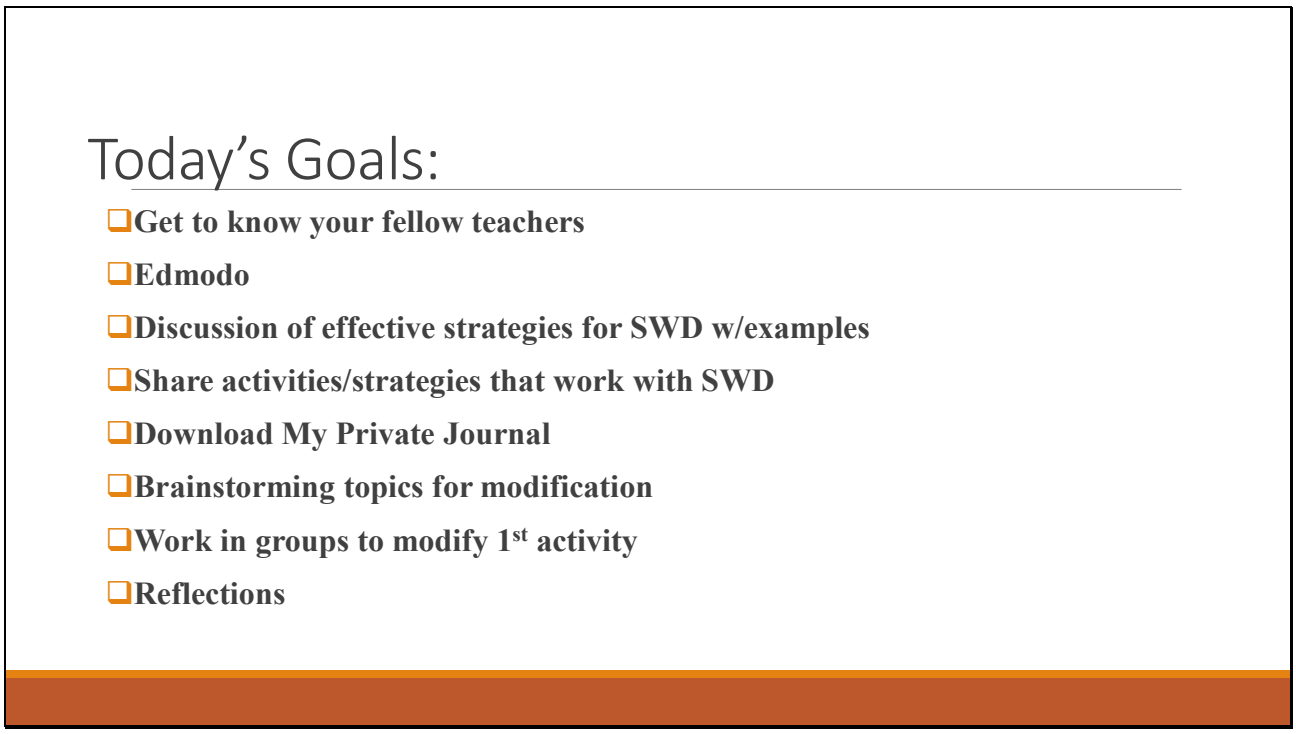


A continuation of the previous slide. These are actual results from the interviews with biology teachers.

The follow up activities using the strategies seem to be particularly critical and will be a focus of the workshop.

State that the workshop is based on the input from the interviews and from the "wish list" that participants in the study created.

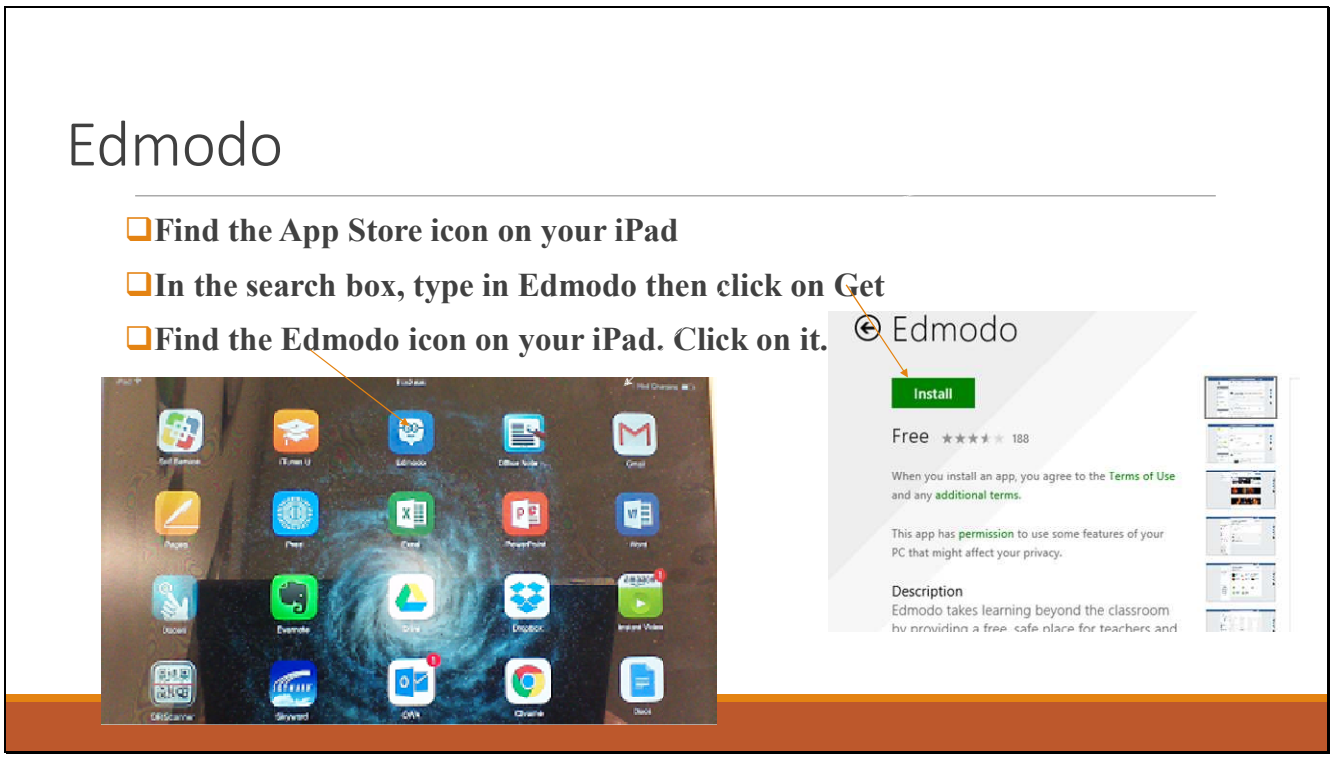
GOALS FOR DAY 1



As teachers come into the room, hand out different color cards to participants to help them find where they can sit. Have large colored cards on the tables or computers to help teachers determine their spots. Give teachers 2-5 minutes to introduce themselves to the other members sitting in their group. Have them introduce themselves, give their home campus, their current teaching assignment(s), and how long they have been teaching. Be sure to familiarize yourself with Edmodo so you will be able to answer teacher questions. Explain that Edmodo is a collaborative tool that will be used to ask questions, make comments, and upload documents throughout the workshop. Read

through the effective strategies and download the examples to show participants. Elicit participants to share activities and strategies via Edmodo that they have used with SWD and share those thoughts with the whole group via Edmodo so that the teachers are giving each other ideas and strategies that work. My private journal is an application that can be downloaded from the app store. It is a free app. This is where teachers can reflect on their learning and determine their next steps in helping SWD raise their achievement scores. Have large Post-it paper for groups to be able to brainstorm topics that they feel need to have accommodated activities in the curriculum. Make a master list of topics to make it easier for groups to choose their topics and put the master list up in the room for everyone to see and use. It is important that the day end with teachers taking the time to reflect on what they have learned that day and how they can incorporate what they have learned into their everyday teaching.

DOWNLOADING EDMODO APPLICATION

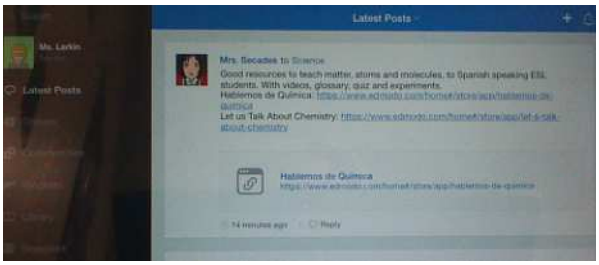


Most teachers should come with Edmodo already loaded, but some will need you to lead them through the process. If your district or regional service center is using desktops, the technology department should already have the app loaded. If teachers are using their own devices, they may need a little time and/or assistance in loading the app.

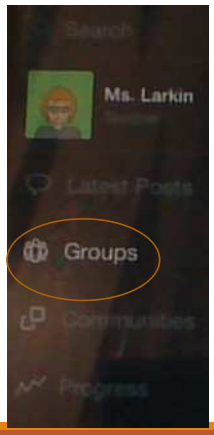
NAVIGATING IN EDMODO

Joining an Edmodo group

- **This is your home page, you can search for and join different groups. You can also create groups that you can use with your class.**

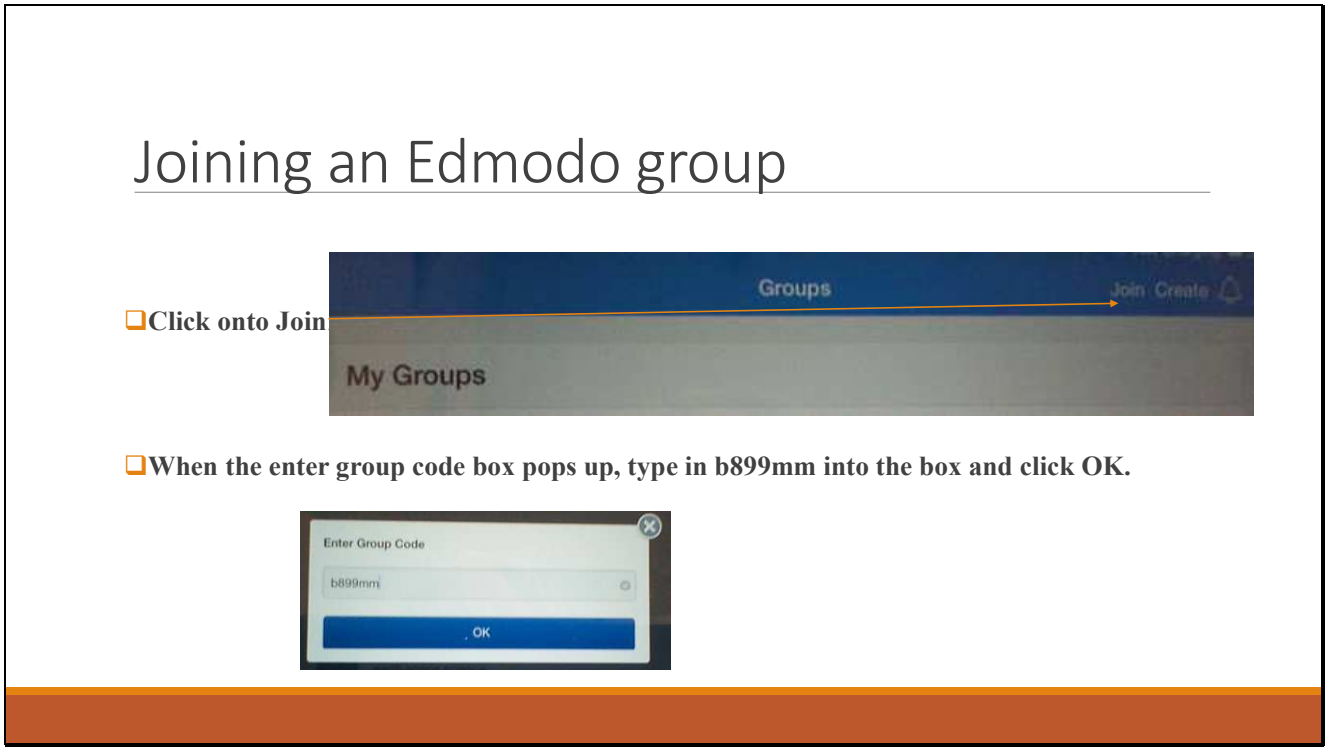


- **Click onto groups.**



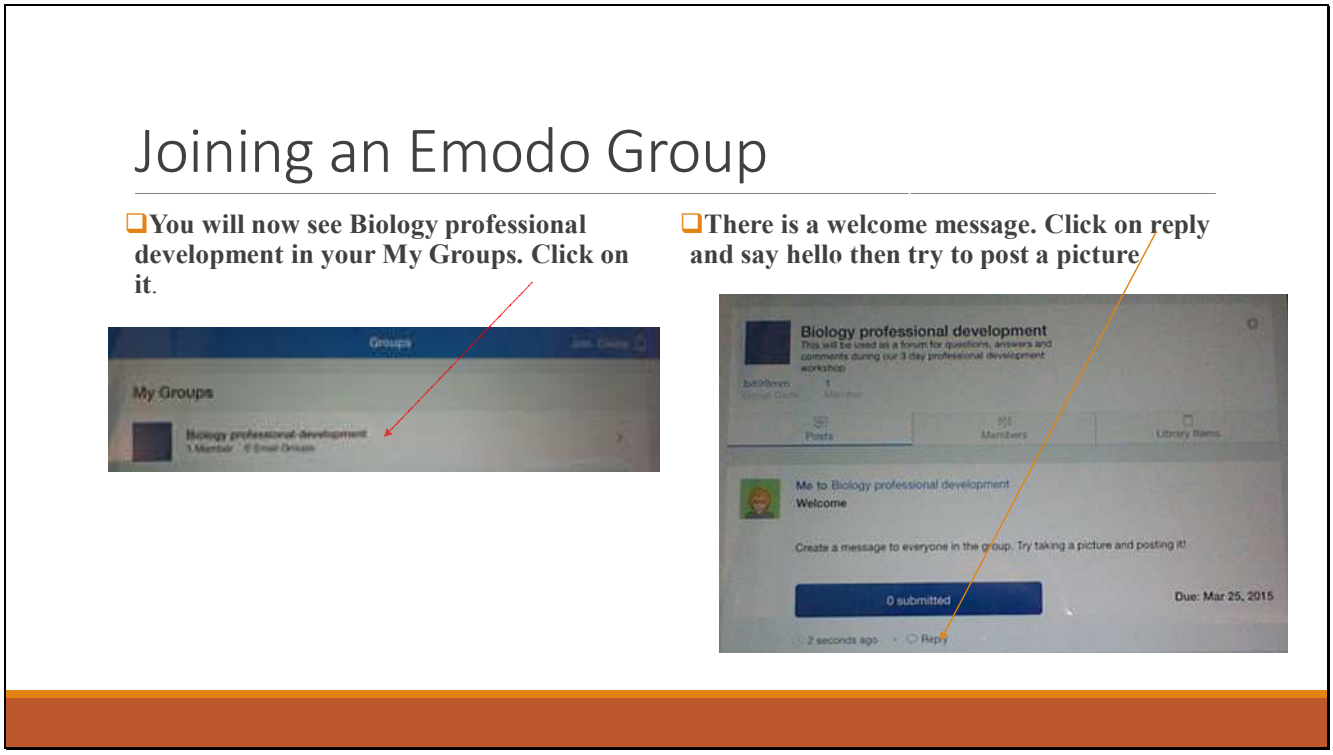
To get to this page, the participants will need to create a log in. Suggest that they use their school log in information so it will be easier to remember. Make sure everyone gets to this page so they can join the group that you have already created.

JOINING AN EDMODO GROUP



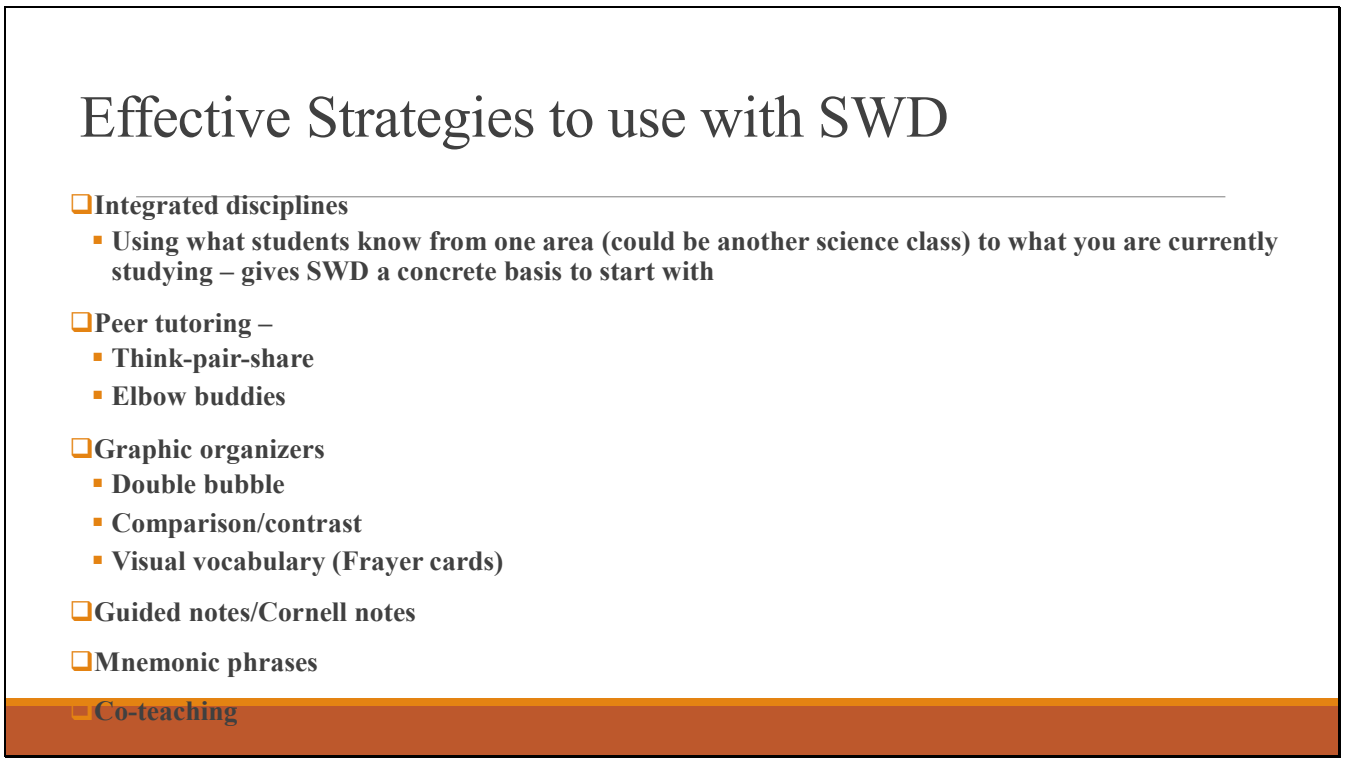
You will need to change the group code to whatever yours is. My example is for the group I created specifically for this PowerPoint. To create your group, instead of clicking join, click create and follow the instructions to get your specific code.

POSTING COMMENTS IN EDMODO



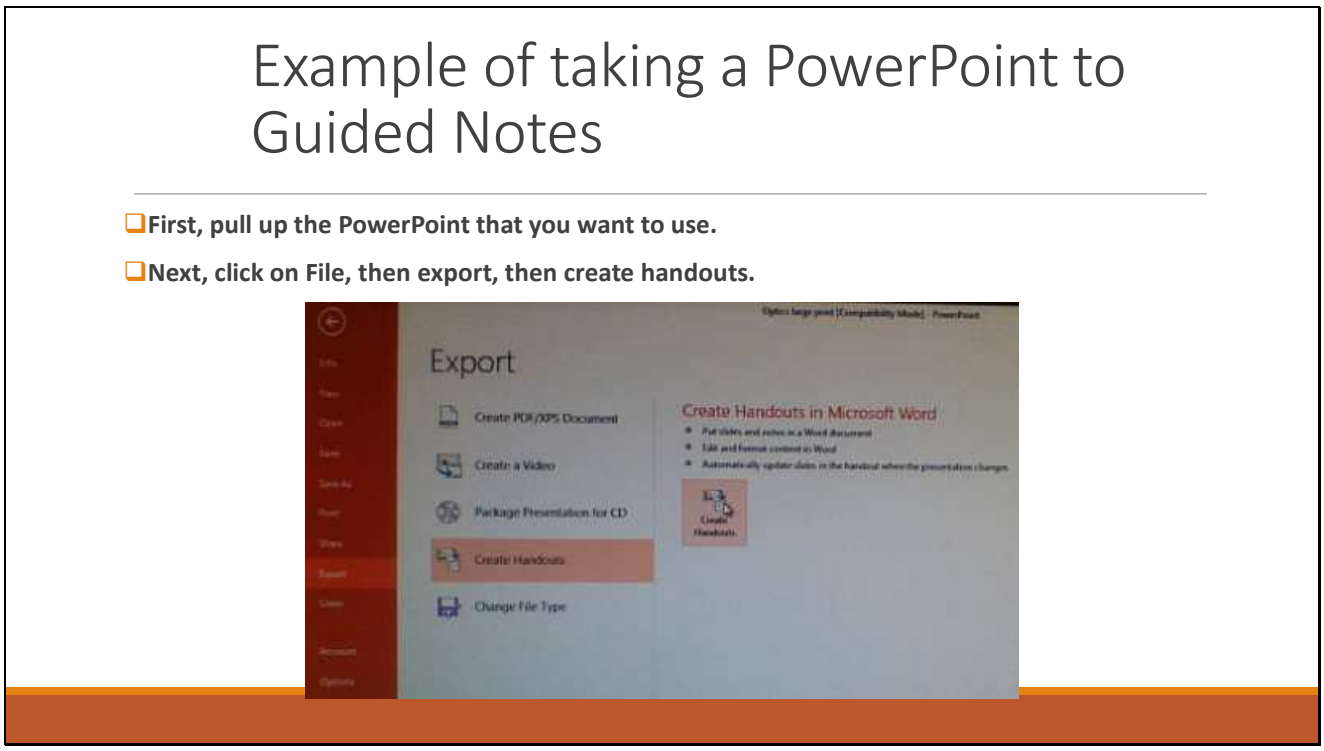
Explain to participants that they need to become familiar with posting comments and other documents since this will be how we disseminate information during the workshop. Explain that this is a tool they can also use with their students for uploading projects and assignments as well as a collaboration tool for their classroom. The more familiar they are with the app, the easier it will be to implement into their classroom.

EFFECTIVE STRATEGIES WITH SWD



Have participants discuss/post what each of the strategies are and why they think they are effective with SWD. Have participants share how they have used any of these in the classroom and which ones they are not familiar with. Most of these are also AVID strategies, so most teachers should be familiar with them, but be sure to check for understanding. Have participants post any examples they have for the different strategies.

CREATING GUIDED NOTES FROM POWERPOINT

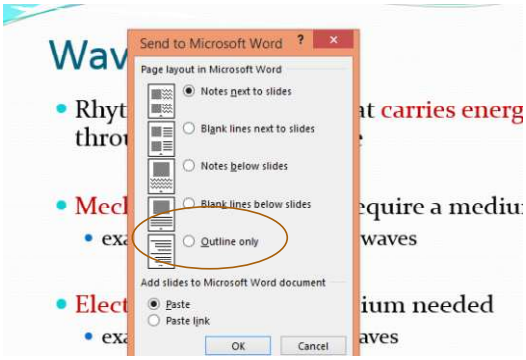


Have participants pull up a PowerPoint and follow through the directions with you. It will give them the confidence to do it later.

MOVING A POWERPOINT TO WORD

Example of taking a PowerPoint to Guided Notes

- **Next, choose how to send the slides to Word, in order to create guided notes, choose Outline only**



- **When the document opens in Word, the size and bullets will need to be changed.**
- **Select all and then change the font size to 12 and clean up the copy so it looks the way you want.**

Simple Harmonic Motion
Part 3 - Waves

- Waves
- Rhythmic disturbance that carries energy through matter and space
- Mechanical- waves that require a

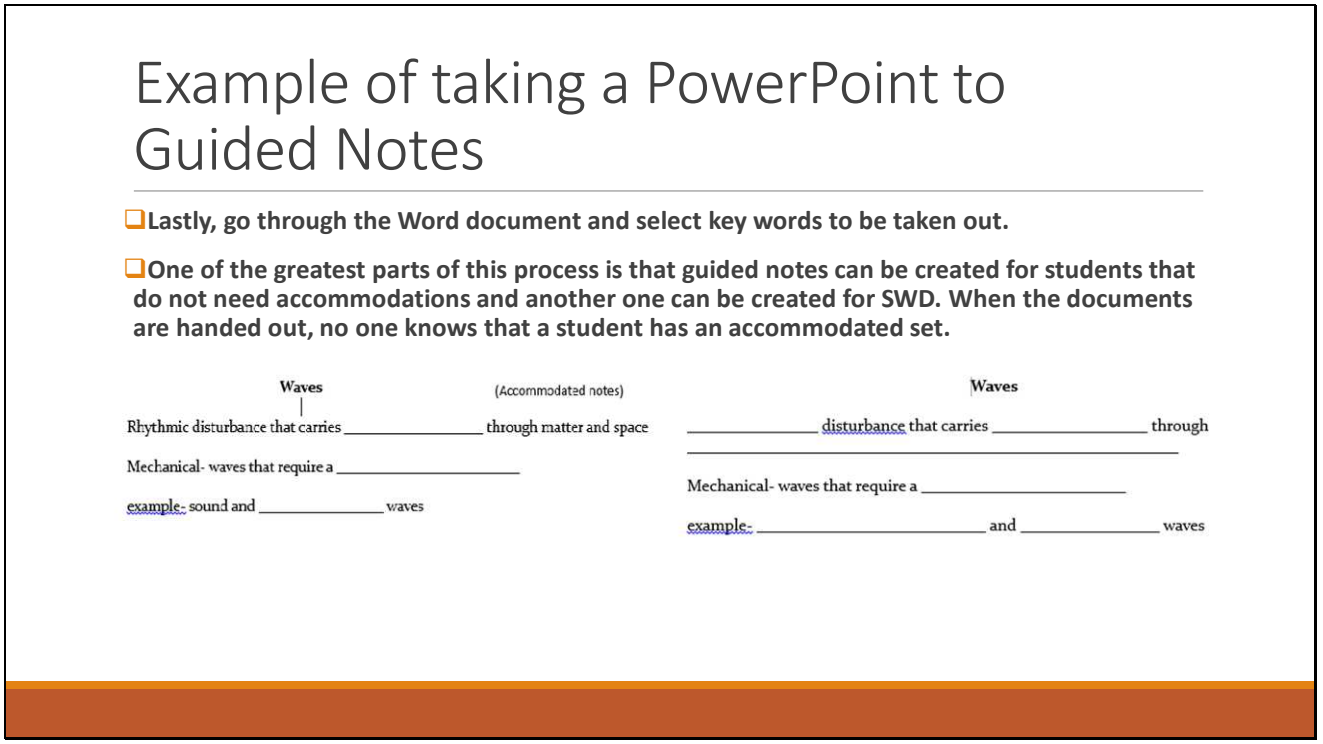
Waves
Rhythmic disturbance that carries energy through matter and space

Mechanical- waves that require a medium
example- sound and water waves

Electromagnetic- no medium needed
example- light and radio waves

Go through the process of taking the document through Word and making the changes so that the participants are happy with the way it looks on the page.

CREATING ACCOMMODATED NOTES IN WORD



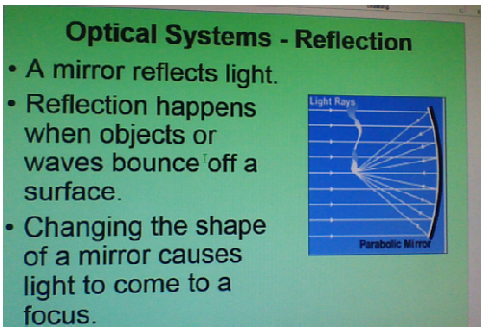
Just a continuation of the previous slide. Reiterate that teachers would not put accommodated notes on the document. This was done on the slide so participants could see the difference in how the documents would look.

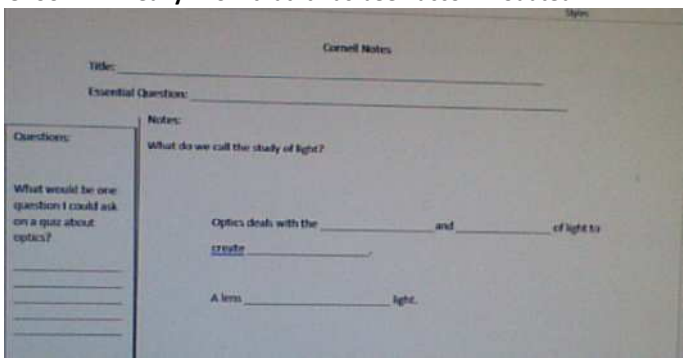
Remind participants that some SWD do not like to be singled out for getting a different looking document. This alleviates that issue.

CREATING ACCOMMODATED CORNELL NOTES

Example of accommodating Cornell notes

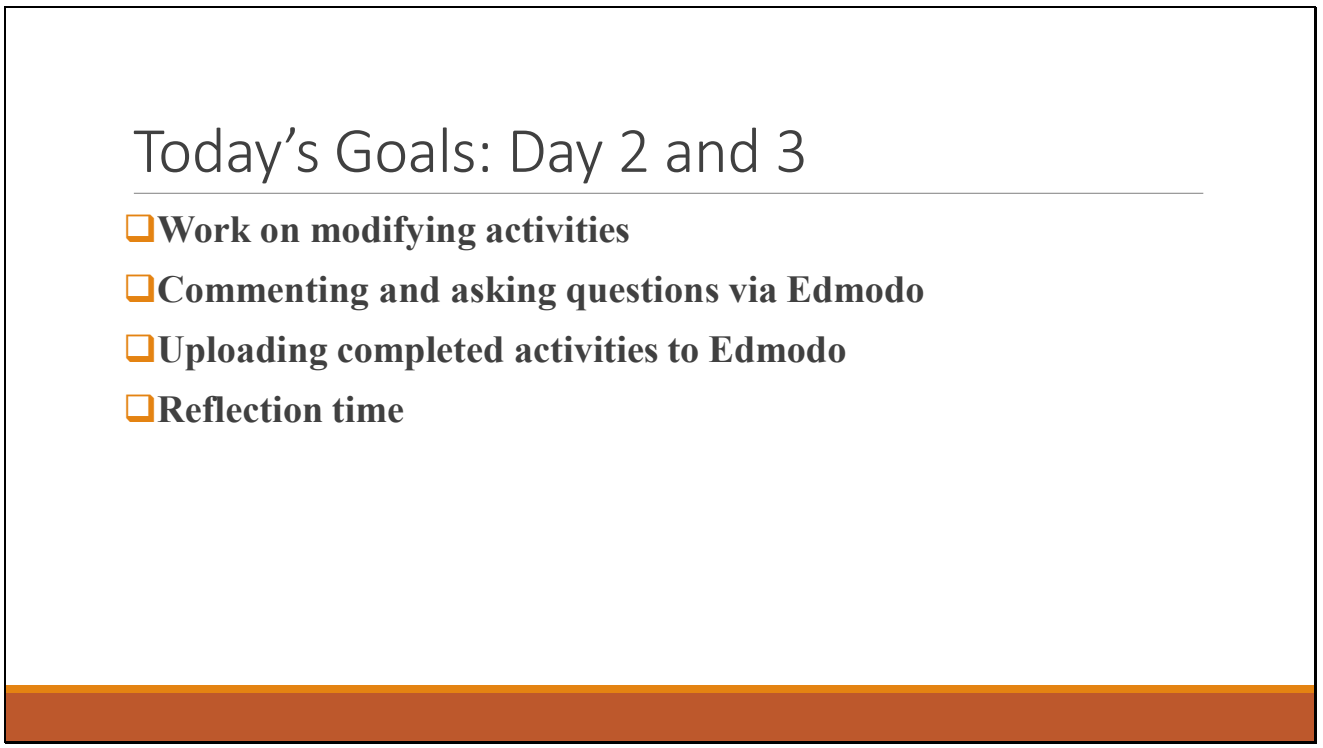
- **For schools using AVID strategies, the same process can be used by taking the Cornell notes form and adding hints and directions to help SWD, whereas students that don't need accommodations can use the standard form. Again, no one in the room will really know that it has been accommodated.**





If your participants are not using AVID strategies, this slide can be skipped. Remember, Cornell notes is just another type of graphic organizer used to help students with their thought processes as well as demonstrating that they comprehend what they've taken notes over.

GOALS FOR DAYS 2 AND 3



This slide will not need to be shown on the first day. Use it to go over what will need to be accomplished on days 2 and 3.

Sample Lesson Using Accommodations

The following lesson, provided by J. W., a colleague currently teaching biology, is done during a class period for block scheduling, or two class periods for regular scheduling. Students take notes then use the notes to complete the follow-up activity. Accommodations will be pointed out within the document.

Lesson Plan:

Objective: TEKS

- **B.8B** categorize organisms using a hierarchical classification system based on similarities and differences shared among groups.
- **B.8C** compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals.

Guiding Question:

How are classification schemes created?

Essential Question:

How are organisms separated into groups (classified)?

Procedure:

- Lecture/class discussion on Modern Taxonomy. Check for understanding using questions such as:
    - What characteristics make up an organism that is autotrophic?
        - What is an example of an autotrophic organism you see every day?

    - What is the biggest difference you can tell between an organism that is classified as a plant and an organism that is classified as an animal?
- Students will take notes over modern taxonomy. Can be done via guided notes, Cornell notes, or other graphic organizer.
- Check guided notes and go over what students should have to be sure they have written them correctly.
- Break students into cooperative groups of 3-4 students. Assign jobs such as:
    - **Materials manager**: collects all needed materials and returns materials at the end of the activity.
    - **Task manager**: reads all instructions and makes sure all in group understand directions. Calls teacher over and asks questions the group may have.
    - **Implementation manager**: Follows instructions and uses the materials appropriately – asks for all participants' input.
    - **Data manager**: Ensures all participants have correctly filled out the data sheet and everyone agrees on the appropriate answers.
- Students will classify pictures of different organisms based on their characteristics.

Materials: See attached notes and follow-up activity. Pictures were sourced from biology-based websites and assembled by the contributing teacher. Students may be able to find similar pictures using an available biology textbook, if available. Materials include:

- Guided notes handouts for Modern Taxonomy.
- Identification cards for cooperative activity.
- Data sheets for cooperative learning activity.

Evaluation: Classification activity will be graded.

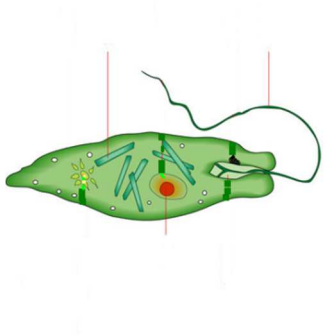
The follow-up activity, again provided by J.W, a colleague currently teaching biology, has students classifying the kingdoms of organisms using their guided notes. Students will work in small cooperative groups, using their notes and textbooks, if needed, to classify the 12 pictures. The pictures should be enlarged, laminated, cut out and placed in baggies so that groups can easily get their materials and complete the activity. The original document has students describing all five of the characteristics present or absent in the organism that allows it to be placed in a certain kingdom. The accommodated version requires at least 3 out of 5 characteristics be described.

Modern Taxonomy

Six Kingdom System

Aristotle & Linnaeus recognized only _____ kingdoms. (_____ & _____)

Scientists later discovered a unicellular organism called _____ which posed a problem to classify:



Accommodations include taking less information out of the original student notes. Only key words were taken out of the accommodated version whereas, the non-accommodated version has students filling in most of the information.
On the second page of the guided notes, pictures were provided to help SWD visually associate the kingdoms with organisms.

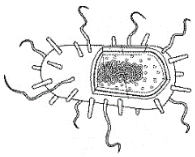
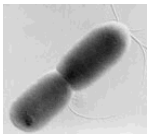
Characteristics **Kingdom**

1.Posses _____, therefore is _____ → Plant
- can make their own food

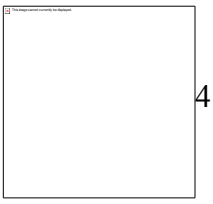
2. When placed in the dark, however, *Euglena* will _____ (consume) other organisms for food. → Animal

Scientists solved this dilemma by creating a new _____ *called* _____.

Today we use a _____ Kingdom system

	Kingdom	**Characteristics of Members**
	1. _____ **"_____ bacteria"**	Found _____; _____karyotic; have cell walls *contain* chemical called _____.
	2. _____ **"_____ bacteria"**	Live in _____ environments; _____karyotic; have cell walls that _____ chemical called *peptidoglycan.*

***** All bacteria used to be grouped together in Kingdom "Monera". Scientists split this kingdom when we discovered chemical differences in their cell walls.***

	3. _____	_____karyotic; mostly _____cellular, some are autotrophic (chloroplasts) other are heterotrophic & some are both; most with cell walls.
	4. _____	_____karyotic; mostly _____cellular; all are _____trophic (secrete digestive enzymes, digest externally and then _____ nutrients through direct contact with food source.) Have cell walls made of _____; multi-_____ cells.
	5. _____	_____karyotic; All _____cellular, all photoautotrophic; All have green organelles called _____ and cell walls made of _____.

6. _____

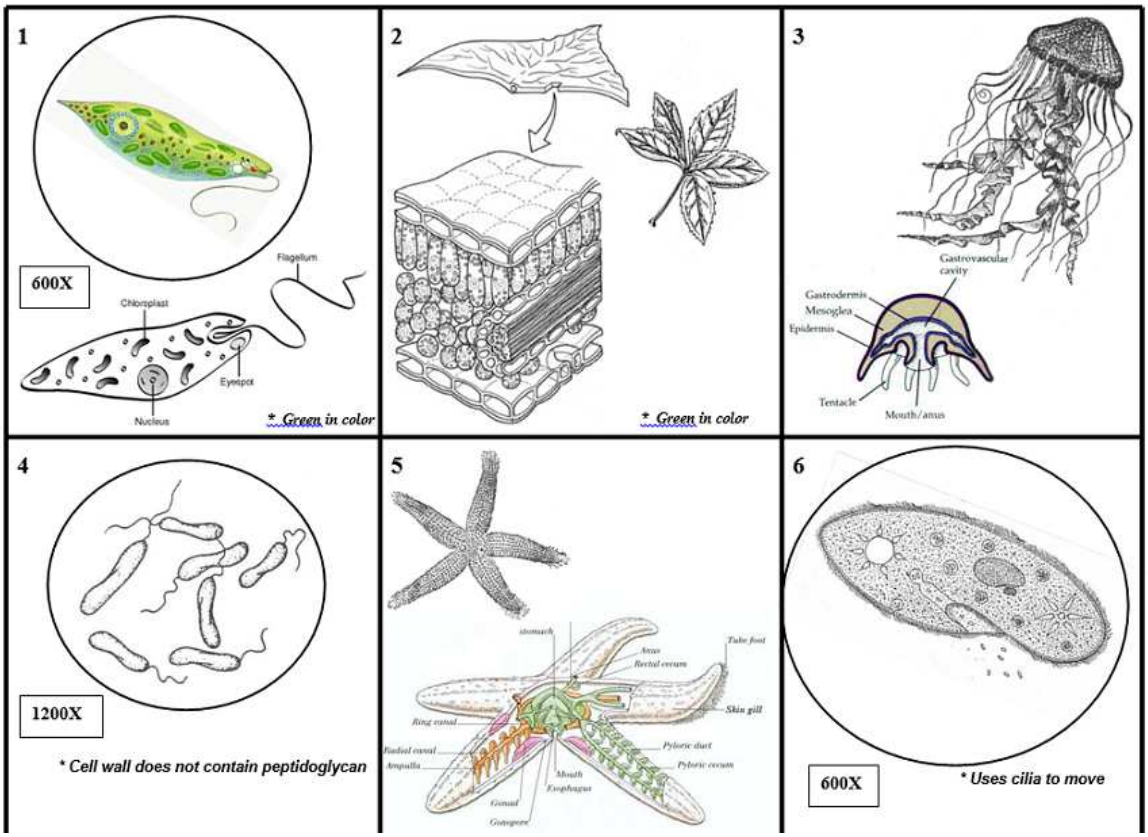
_____karyotic; all
_____cellular, all
_____trophic (mostly by
_____); no cell walls
or chloroplasts

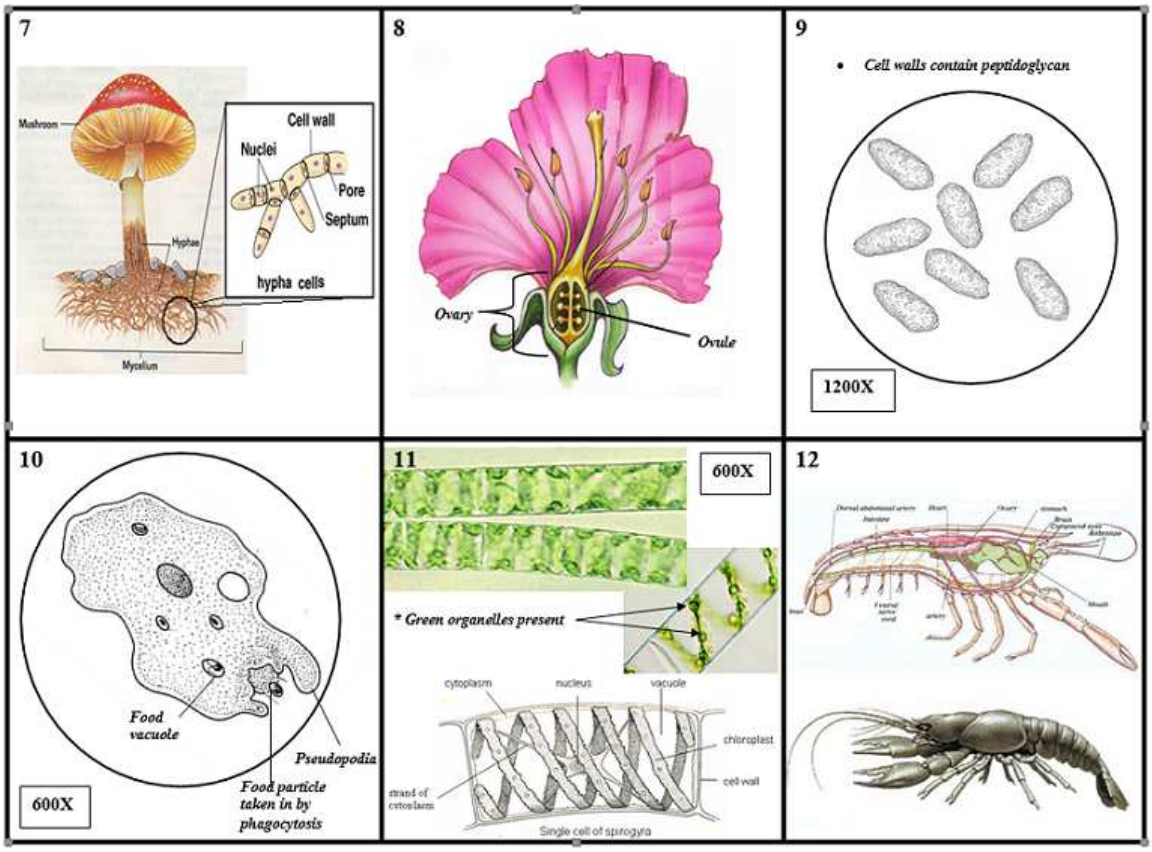
Name That Kingdom

Your job as a taxonomist is to classify organisms. Now that you are familiar with the 6 kingdoms of living things and have reviewed the type of characteristics found in the members of each kingdom, ***classify*** the twelve organisms pictured below into their appropriate kingdom. ***Describe three out of five*** of the characteristics present or absent in the organism that cause it to be grouped into its particular kingdom.

KINGDOM **Mention Three out of the Five**

1. _____ **Characteristics:**_____
_____
2. _____ **Characteristics**_____
_____
3. _____ **Characteristics:**_____
_____
4. _____ **Characteristics:**_____
_____
5. _____ **Characteristics:**_____
_____
6. _____ **Characteristics:**_____
_____
7. _____ **Characteristics:**_____
_____
8. _____ **Characteristics:**_____
_____
9. _____ **Characteristics:**_____
_____
10. _____ **Characteristics:**_____
_____
11. _____ **Characteristics:**_____
_____
12. _____ **Characteristics:**_____
_____


1
600X
Flagellum
Chloroplast
Eyespot
Nucleus
* Green in color
2
* Green in color
3
Gastrovascular cavity
Gastrodermis
Mesoglea
Epidermis
Tentacle
Mouth/anus
4
1200X
* Cell wall does not contain peptidoglycan
5
6
600X
* Uses cilia to move


7
Mushroom
Hyphae
Mycelium
Cell wall
Nuclei
Pore
Septum
hypha cells
8
Ovary
Ovule
9
Cell walls contain peptidoglycan
1200X
10
Food vacuole
Pseudopodia
Food particle taken in by phagocytosis
600X
11
600X
* Green organelles present
cytoplasm
nucleus
vacuole
chloroplast
cell wall
strand of cytoplasm
Single cell of spirogyra
12

Sample of District Required Evaluation

The following is from an online district professional development session conducted at the beginning of a school year.

- What is the title of the district professional development session you just attended?

- In general, tell us how much you agree or disagree with the following statements related to this beginning of year (BOY) district provided professional development session. Check one box per statement.

Statement	**Strongly agree**	**Agree**	**Disagree**	**Strongly disagree**
Information presented during this BOY professional development was appropriate for my role within the district.				
Information presented during district BOY professional was appropriate for my role within the district.				
Information shared during district BOY professional development was relevant to my job.				
Material provided supported or extended information shared during district BOY professional development.				
The professional development was engaging.				
The presenter(s) was knowledgeable about the topic.				
The pace of the training was not too fast or too slow.				
The district BOY professional activities were well organized.				

- Overall, on a scale of “Awesome!” to “Poor”, how would you rate your experience with this BOY professional development session?

Awesome (5)	**Agree (4)**	**Disagree (3)**	**Strongly disagree (2)**

- In 100 characters or less per text box, list 2-3 ideas/experiences during this district BOY professional development that you can implement:
    - This week
    - In the next month
    - In the next six months
- What is your most significant “take away” or “aha-moment” from this district BOY professional development session?

- How could this session of district BOY professional development be improved in the future?

- What follow up training to this session would like to be provided?

Thank you for providing information about your experiences during district BOY professional development. Your feedback is critical to ensure that you are provided with opportunities that will enhance your ability to support your students, expand your instructional tool box, and increase student learning.

Sample Follow-up Evaluation of Professional Development Workshop

Please circle your answers to the following evaluation. When you are done, please put it in the folder at the front of the room. Thank you for your attendance and participation.

1. Which of the following statements best describes the *primary* purpose of Accommodations for the Biology STAAR?
   The purpose of the professional development was:
   A. To communicate new ideas for me to consider using in my classroom.
   B. To provide an opportunity for me to learn from other teachers.
   C. To help me understand accommodations in the classroom.
   D. To help me apply/implement accommodated evidence-based strategies for SWD to help raise scores on the STAAR biology exam.
   E. Not clear.
   F. Other (Specify)
      _____

2. Which of the following statements best describes the usefulness of this professional development workshop?
   A. It was a good start.
   B. It was a good start, but I have a lot of questions.
   C. It was a good start, and I look forward to implementing the new activities in my classroom
   D. It provided everything I need to implement the new activities in my classroom.
   E. I don't think that I will be able to implement these new activities in my classroom.

3. Indicate the extent to which this professional development workshop met your professional learning needs.
   A. It addressed my professional learning needs completely.
   B. It addressed some of my professional learning needs.
   C. It did not address my professional learning needs.
   D. This professional development did not help much because I was already familiar with this topic.

4. To what extent was this professional development workshop aligned with the district goals for improving instruction?
   A. The professional development was very closely aligned with the goals for instructional improvement.
   B. The professional development was somewhat aligned with the goals for instructional improvement.
   C. The professional development was not aligned with the goals for instructional improvement.
   D. The professional development was inconsistent with the goals for instructional improvement.

5. Which of the following statement best describes the support you received from you principal to participate in this professional development workshop?
   A. The principal strongly encouraged me to participate.
   B. The principal encouraged me to participate.
   C. The principal tried to discourage me from participating.
   D. I did not discuss the professional development with the principal prior to participating.

6. Which of the following statements best describes the support that you received from your principal to apply what you learned in this professional development workshop in your classroom?
   A. The principal has encouraged me to apply what I learned in my classroom.
   B. The principal has encourage me to apply what I learned in my classroom and has offered to help.
   C. The principal has not encouraged me to apply what I learned in my classroom.
   D. I have not discussed what I learned with the principal.

7. Which of the following statement best describes the likelihood that you will apply what you learned/developed during this professional development in your classroom?
   A. I have already implemented several accommodated activities in my classroom.
   B. I have already implemented several accommodated activities in my classroom, and it seemed to work well.
   C. I have already implemented several accommodated activities in my classroom, but it was not appropriate for my students.
   D. I look forward to implementing accommodated activities in my classroom in the next few weeks.
   E. I look forward to implementing accommodated activities in my classroom sometime later this year.
   F. I don't think that these accommodated activities will work with my students.

8. Which of the following statements best describes how this professional development workshop compares with other professional development opportunities you have participated during the last six months?
   A. This professional development was more useful than other professional development workshops that I have participated in.
   B. This professional development was about the same as other professional development workshops that I have participated in.
   C. This professional development was less useful than other professional development workshops that I have participated in.
   D. I don't have an opinion because I haven't participated in any other professional development workshops in the last six months.

Thank you for your input.

Appendix B: Biology Teacher Surveys

My name is Nancy Larkin. I am currently working on my doctoral study and would like your assistance. Completing the following information is strictly voluntary and is being used only to gather information for my doctoral study. Please return the completed survey to nancy.larkin@waldenu.edu by _____.

2. Total years experience teaching. ☐

3. Number of years' experience teaching biology. ☐

4. Number of biology classes you are teaching this semester. ☐

4. Total number of SWD in your biology classes this semester. ☐

5. I would be interested in taking part in a study to determine which evidence-based strategies would increase SWD achievement on the STAAR biology exam.

Yes ☐

No ☐

Please provide your e-mail address if you answered yes to question 5. I will contact you with further information.

☐

Thank you so much for your input and help with my doctoral study.

Appendix C: Permission to Use Teaching Activities

To: J. W.

(address undisclosed)

This letter is asking your permission to use the following activities within my doctoral project at Walden University:

Modern Taxonomy guided notes

Name that Kingdom identification activity

These activities could be seen by others reading the doctoral study and you will be given credit for creating both activities. Your signature below demonstrates your knowledge and consent for me, Nancy K. Larkin to use the two above noted activities as part of my doctoral project.

I give my permission for Nancy K. Larkin to use the Modern Taxonomy guided notes and Name that Kingdom identification activity within her doctoral project from Walden University

_____

Printed name

_____

Signature

_____

Date

Appendix D: Teacher Interview Questions

Introduction: Hi, thanks for meeting with me today. Get comfortable. I'm just going to ask you a few questions about teaching biology with SWD. Feel free to ask me questions or ask for clarification on anything.

This study is for my doctoral degree and I really appreciate you volunteering your time to help me with my endeavor.

All information will be kept confidential.

I just want you to inform you that you can withdraw from participation at any time. I will be collecting data concerning your perception about the STAAR exam as it relates to SWD.

I have an informed consent form for you to look at and sign and again, I really appreciate you helping me with my doctoral study.

Interview questions for teachers:

1. Tell me a little about yourself, how did you end up teaching biology?
2. I know you answered how many years you have taught biology within the survey, but please describe why you enjoy teaching this course, if you do enjoy it.

Probing Questions:

A. (If teacher does not enjoy teaching biology)—Why do you continue teaching biology?

B. Out of the time you have taught biology, how many years have you had classes with SWD?

C. When teaching biology with SWD in the classroom, describe what positives you see in any form, such as administrative, other teachers, self-satisfaction, etc.

D. Based on the same question above…what about barriers?

3. What types of activities, do you plan for your biology classes most of the time?
4. What types of instructional strategies do you use in your biology classes?

Probing Questions:

A. How often are the strategies used?

B. How are the strategies used?

C. How effective do you perceive strategies are with SWD?

5. Of all the different activities and strategies you use in your classes, which do you find work best with SWD?

Probing Questions:

A. Can you tell me why?

B. Would you be willing to share a copy of some strategies with me?

6. Tell me about what you observed was your greatest success with a student with disabilities?
7. Tell me about what you observed was your greatest failure with a student with disabilities?
8. Tell me about how you implement the online curriculum for your lessons?

   Probing Questions:

   A. What types of lessons designed for SWD are on the online curriculum?
   B. How easily are these lessons are implemented into your classes?
   C. What accommodations do you find most helpful for SWD?
   D. Are some of these accommodations NOT on students' IEPs?
   E. If not, do you use the accommodations along with the IEP accommodations?
   F. If you use accommodations from the on-line curriculum that are not on a student's IEP, how do you reveal that they are successful for the student to the special education department? (At the annual meeting; at the time you recognize it; never?)

9. How helpful are Individual Education Plans (IEP's) in determining accommodations and modifications for SWD?
10. Please tell me what you perceive as obstacles for SWD concerning the STAAR biology exam.

11. Please tell me about other strategies you have used in your classroom for SWD.
12. What assistance would you like to see established in order to aid SWD in passing the STAAR biology exam?

    Probing: I will ask follow up questions to elicit information regarding changes to the online curriculum, staff development, etc.

13. Explain how you collaborate with colleagues to help with preparation for the STAAR exam concerning SWD.

    Probing: Do you use staff development with other schools, or with other biology teachers in the same school, or a partner teacher or on-line support from software companies, etc?
14. Describe your perceptions as a biology teacher concerning administrative support for anything you might need to help SWD with the STAAR exam.

15. Please tell me what else you do on your own to prepare SWD for the STAAR exam.

I really want to thank you for all your time and efforts. If you would be interested in seeing the results of the study, let me know and I will be glad to provide them to you.

*The order of the questions as well as the actual questions asked may change depending on the responses of the teachers and is just a flexible guide. It is not to be used as a script except for the introduction. Probing questions will be used as needed.

Appendix E: Administrator Interview Questions

Introduction: Hi, thanks for meeting with me today. Get comfortable. I'm just going to ask you a few questions about teaching biology with SWD. Feel free to ask me questions or ask for clarification on anything.

This study is for my doctoral degree and I really appreciate you volunteering your time to help me with my endeavor.

All information will be kept confidential.

I just want you to inform you that you can withdraw from participation at any time. I will be collecting data concerning your perception about the STAAR exam as it relates to SWD.

I have an informed consent form for you to look at and sign and again, I really appreciate you helping me with my doctoral study.

1. Tell me a little about yourself, how did you end up as an administrator?
2. How many years were you in the classroom before you became an administrator?

   Probing Questions:

   What was your main discipline or disciplines?
3. Out of that time, how many years did you have classes with SWD?
4. What types of activities do you look for when you observe classrooms?

   Probing questions:

   A. How would you know if teachers are using accommodations as in the IEP's?

      (In other words, when you observe a teacher and the effectiveness of that

teacher's teaching methods, how do you know the teacher is implementing EACH SWD's IEP accommodations?)

B. Which types of activities do you perceive as being effective for SWD?

5. What types of strategies do you look for when you observe classrooms?

6. Please tell me what you perceive are obstacles for SWD concerning the STAAR biology exam.

   I will ask probing questions as needed:

   A. What do you think are some barriers for SWD when it comes to teachers teaching to all student learning styles, IEPs, and such?

   B. Please describe what you believe might be some administrative barriers concerning teachers preparing students for the STAAR exam (Things such as those that might hinder a teacher from incorporating certain strategies or activities).

7. How do you assist a teacher who is not using evidence-based strategies?

8. What assistance would you like to see established in order to aid SWD in passing the STAAR biology exam?

   I will ask probing questions to elicit information regarding changes to the online curriculum, staff development, and other such issues.

Appendix F: Sample of Biology Teacher Interview

Interview done 8/7/2014 with T2 from S3

Researcher: Hi, thanks for meeting with me today. Get comfortable. I'm just going to ask you a few questions about teaching biology with SWD. Feel free to ask me questions or ask for clarification on anything.

This study is for my doctoral degree and I really appreciate you volunteering your time to help me with my endeavor.

All information will be kept confidential.

I just want you to inform you that you can withdraw from participation at any time. I will be collecting data concerning your perception about the STAAR exam as it relates to SWD.

I have an informed consent form for you to look at and sign and again, I really appreciate you helping me with my doctoral study.

Researcher: Tell me a little about yourself, how did you end up teaching biology?

T2S3: I wanted to teach for a long time when I was younger, then I got into school and college I changed my mind and wanted to go into physical therapy or be a doctor but one day I remember sitting in college and decided I didn't want to do this anymore. What can I do that I can get out now and still be involved in science, so I though teaching science would be a good idea.

Researcher: I know I'm familiar with how many years you have taught biology, but just for the record: how many years have you taught biology?

T2S3: 7 years

Researcher: Why do you like teaching biology?

T2S3: I like teaching biology because I like seeing the kids become excited when that are able to see things in experiments work or go correctly. I think that biology tends to be very interesting with many of the topics we teach so we can really get them interested in it.

Researcher: Have you always had SWD, we call them special ed, but the term used now is SWD, in your classes

T2S3: Yes, for all 7 years I've had SWD.

Researcher: When teaching biology with SWD in the classroom, describe what positives you see in any form, for having the kids included in the regular classroom

T2S3: I think it's a positive to have students of varying ability because I don't think it ever hurts to work with people who are above your ability as well as being able to help teach those below.

Researcher: Based on the same question above…what about barriers?

T2S3: I would say reading ability and vocabulary. I've had students that who either could not read or read at an elementary level. It is difficult to interact appropriately in a high school level science class when you cannot read the curriculum or understand the words that are being used. That also depends on the degree of disability…like we've all had students that benefit greatly from being in a mainstream classroom and had students that

would have benefitted from being in a "life" class, but their IQ is a point or two too high to be considered for that.

Researcher: What types of activities, do you plan for your biology classes most of the time?

T2 S3: The school is really pushing Cornell notes right now, but many students don't come to us with a prior knowledge of, so we rely heavily on note-taking. We do a lot of manipulative activity…I don't know if I would call it labs, but hands on, puzzle piecing. We do wet labs when we can, computer simulations, we do a lot of group work…cooperative activities.

Researcher: What types of instructional strategies do you use in your biology classes like graphic organizers, mnemonics, etc.?

T2S3: We use graphic organizers or thinking maps as they prefer to call them. But we do a lot of those. We use mnemonics when appropriate like classification

Researcher: Do you do things like guided notes?

T2S3: I really prefer guided notes, and based on the AVID training I went to this summer, the school is going to require Cornell and only Cornell. If it were up to me, I would do guided notes because with cornel students get too bogged down with what they are writing than paying attention to the discussion, but clearly I'm in the minority.

Researcher: Of all the different activities and strategies you use in your classes, which do you find work best with SWD?

T2S3: I think anytime, I think it depends on the students and the time, I think if you can do a visual, or a presentation or something like a visual vocabulary type of thing. That is always helpful to have a picture or an example or a, uh, a simile or a metaphor of something.

Researcher: I know we use interactive notebooks in science, do you find doing right side-left side activities help with SWD or are they having issues with that?

T2S3: I don't know if I have any personal evidence to show that one way is better than the other, but I do think in theory it is good, but with as many kids as we have absent on any given day that it is hard to sometimes keep track of what goes on what page. We are doing this on this page and then flipping it over and doing this on the back and I think it gets confusing, especially with SWD's

Researcher: Tell me about what you observed was your greatest success with a student with disabilities? I know I'll have to let you think about this for a while. Think about one of the kids that when they came to you, you thought OMG, what am I going to do? But they ended up doing really well.

T2S3: I had a student in my A1 class and it worked out very well, since my 1st period was very small, only about 8 students. It was tiny. This particular student was a SWD, he had autism. I remember going to an ARD at the beginning or the middle of the year and they just made it seem that he was not going to be able to perform well in classes. Everybody was really worried about this and the way that he has outbursts in class, which wasn't a problem because we had so few students that everyone just learned to ignored it or just

went along with it. This student made the highest grade on the STAAR test in that entire class so despite all that, he was brilliant.

Researcher: In that same idea, what do you feel was your biggest failure with student with disabilities?

T2S3: Thinking about many years ago, when I was talking about reading disabilities, I did not realize that that student could not read. I knew he had reading difficulties, but when we did TELPAS writing samples, in March or April, he just wrote the prompt 4 times to make it look like he had taken enough space. I caught on to that and told him that I needed him to really write something and I realized that he could not read or write, and I felt that I had let him down since it took me so long to realize that.

Researcher: Tell me about how you implement the online curriculum for your lessons?

T2S3: Is there an online curriculum? What is that? We make new things, improve on old things, take from pre-AP and make them more on level appropriate. I can't even remember the last time, I even attempted to use it or yes I can…they had completely wiped everything out and had not put it back yet. I think they do have the, what do you call them? 5e lessons, but that is just about it.

Researcher: Ok, I'm going to ask this: What types of lessons designed for SWD are on the online curriculum?

T2S3: None that I can think of

Researcher: What accommodations do you find most helpful for SWD?

T2S3: Giving more time and making sure that you are prevalent in the classroom and going by their desk constantly to make sure they are on task and getting out of the activity what they should be… providing frequent feedback and checks for understanding

Researcher: And are most of these on their IEP or are they things that you have noticed that SWD need that aren't on their IEP?

T2S3: Like extra time

Researcher: How helpful are IEP's with helping with accommodations?

T2S3: I don't want to say that they are not helpful, but they are either vague or overly specific. I've been in ARD's when I've been literally yelled at for giving a kid a modified test when his IEP doesn't call for it. But, as an educator, that's a call I can make for any kid in my classroom. And he wasn't successful until I made those adjustments. Well sometimes you get those yellow folders and you try not to have preconceived notions about a kid, who is a kid with disabilities that supposedly has these horrendous behavior problems but you try not to let that bother you.

Researcher: what to you perceive as obstacles for SWD concerning the STAAR biology exam.

T2S3: I think that biology is almost like learning an entirely different language. It is so vocabulary heavy with words they have probably never heard before um, and that can be an obstacle. I also run into problems where a kids may need extra help in content mastery that's going to be virtually non-existent. Those teachers are not science teachers and their understanding of the material is often at a lower level than the kid. Last year I sent a kid

to content mastery and 40 minutes later he comes back saying they didn't know how to do this…what have you been doing for the last 40 minutes, why didn't you come back and I'll do the best I can in here. I feel like the resources that are there are not always helpful. The questions are often wordy and the answer choices are written to a level where often 2 of the choices can be taken away pretty quickly but the other choices can be viable, so you have to have a pretty deep understanding of the material

Research: What assistance would you like to see established in order to aid SWD in passing the STAAR biology exam?

T2S3: The use of a person from special ed coming to our PLC's like the ESL person did last year. Absolutely, I think she did a good job and if we could find out how to institute the same type of program with SWD I think that would be really good.

Researcher: Explain how you collaborate with colleagues to help with preparations for the STAAR exam concerning SWD's.

T2S3: This past year was a little different, but the year before that, we always meet in our PLC's you know how in years past, we had tutorials after school that were open to everyone, but this year we didn't do that so much. Things were a little volatile in the biology department last year.

Researcher: What kind of staff development would like to see happen to help you be more successful with SWD

T2S3: I would like to see more examples of activities or curriculum that other people are using that students are having success with. I know some districts purchase curriculum I'm sure there are resources there instead of us having to invent everything.

Researcher: Would you like to see something along the lines of our special ed department overlapping some of our staff development so that they see what is happening with us and maybe be able to mesh?

T2S3:They've made elementary steps toward this, but they are like…I'm going to science development, but I don't know any of this…I guess it is a good start, but we don't have clear end goals for what needs to be accomplished.

Researcher: Describe your perceptions as a biology teacher for administrative support for anything you might need to help SWD on the STAAR exam.

T2S3: I think our administration wants to help, but I don't think they know how to help. Not have to combine classes. Last year we had to run labs with 64 students in order to handle the spaces.

Researcher: Tell me about anything else you do on your own to help SWD with the STAAR test

T2S3: offering tutorials. I've had kids come before/after school worried that they would not do well on the test. I've given them released tests and gone over it with them and let them work on it and then go back over it with them again. 2 years ago, when we did the after school tutorials, once a week, it was open to all students, not just SWDs. It was like an hour, hour and a half where we picked the SE's they were having the most trouble

with and concentrated on that. Gave them a notes section and then a lab so they could work on things like viruses or biochemistry …things they had trouble with.

Researcher: Ok, are there any other concerns that you would like to have me address?

T2S3: I think it is so easy to let them fall through the cracks, both on my end and from a special education department because you are dealing with so many students…the sped department doesn't seem to care as long as they are passing. It just becomes easier to just pass them along but I don't want to get into the situation where I'm just passing them along and then they do miserably on the STAAR. Sometimes it is hard to bridge that gap.

Researcher: I really want to thank you for all your time and efforts. Let me know if you are interested in seeing the results of the study and I'll also be sending you a copy of the transcripts so you can review it and determine if what you said was really what you meant to say. I know sometimes when we get talking we sometimes our brain just clicks into another gear, but I really want to thank you for helping me.

Appendix G: Sample of Administrator Interview

Administrator interview A1 S1

Recorded 8/8/14

Introduction: Hi, thanks for meeting with me today. Get comfortable. I'm just going to ask you a few questions about teaching biology with SWD. Feel free to ask me questions or ask for clarification on anything.

This study is for my doctoral degree and I really appreciate you volunteering your time to help me with my endeavor.

All information will be kept confidential.

I just want you to inform you that you can withdraw from participation at any time. I will be collecting data concerning your perception about the STAAR exam as it relates to SWD.

I have an informed consent form for you to look at and sign and again, I really appreciate you helping me with my doctoral study.

Researcher: Tell me a little about yourself, how did you end up as an administrator?

A1S1: I began my passion in education about 14 years ago. I started teaching chemistry at the high school level. And then I pursued this position where I could help more students so I was assigned to a low performing campus. I was assisting all subject areas, at the beginning it was TAKS, and has developed since then into a little bit TAKS, which is phased out then through the gambit along with EOC, Biology EOC, Chemistry EOC, with that going away.

And my job for the past few years has been on teacher coaching and instructional strategies and also working directly with students that have been identified as needing some special help on passing the Biology EOC.

Researcher: How many years were you in the classroom before you became an administrator?

A1S1: I was in the classroom for 8 years.

Researcher: What was your main discipline or disciplines?

A1S1: Chemistry, Pre-AP Chemistry, AP Chemistry, TAKS remediation and scientific research and design

Researcher: Out of that time, how many years did you have classes with SWD?

A1S1: All 8 years

Researcher: What types of activities do you look for when you observe classrooms?

A1S1: I'm a big proponent for inspecting what I expect. If our team agrees on particular approaches so our final goals are in mind, and we agree that differentiation is going to happen. We agree that meaningful small group discussion is going to happen or question stems or exit tickets are going to happen, then that is what I expect to see.

Researcher: How would you know if teachers are using accommodations as in the IEP's? (In other words, when you observe a teacher and the effectiveness of that teacher's teaching methods, how do you know the teacher is implementing EACH SWD's IEP accommodations?)

A1S1: That is a difficult question to answer sometimes because I may not be privy to the IEP. I will look at the students or teachers actions, you can see that some type of accommodation is happening. The teacher may be close by, or there is some kind of different work that they are doing. The helping teacher may be close by to them. I have also seen on several occasions, very meaningful intent of placing students with others. I've also seen teachers incorporate some skills that these students can offer the group and matching them up.

Researcher: Which types of activities do you perceive as being effective for SWD?

A1S1: Depending on the disability, the use of technology in particular is of benefit. Having students having the opportunity to capture their ideas on video, verbally and not so much written, but a way for the teacher to have a formative check on that student I believe has helped. At the school I service we have mini iPads and there are some full iPads that can be checked out. Our department has mini iPads available. Some of our chemistry and biology teachers have used aspects of flipped classroom and that seems to have helped student scores as well.

Researcher: What types of strategies are you hoping to see when you observe classrooms that you know have SWD?

A1S1: The strongest thing I look for is formative assessment that has been a very big push the last 2 years at the high school. I believe, and I believe that the teachers I work with prescribe to this idea is that we have got to get them back on track as soon as possible. The use of formative assessments as often as possible so they don't get off that

path too quickly. Our teachers have a very good system in place when they see students off track. They will get the help of our science helping teacher, hey will meet with the science helping teachers. The use of our common assessments have been very powerful as well to keep students on tract. So I think that the use of formative assessments have been very helpful

Researcher: Please tell me what you perceive are obstacles for SWD concerning the STAAR biology exam.

A1S1: What is unique to the STAAR biology exam is the amount of reading involved. The district has done a good job in terms of their benchmarks and assessments and teacher have done a good job with their common assessments to model as much as possible the formatting of the test, the amount white space, the font of the test, the font size of the test. In addition, the students, although they are well versed at this point, As 14 and 15 year olds, of answering a multiple choice test. The use of question stems and having students write just a little bit on a common assessment, on a quiz, gives the teacher a lot of information for all students, but in particular, the special education students, the teacher can pull the student aside and ask "what did you mean by this", almost like a writing conference, to help students explain their thought process.

Researcher: Please describe what you believe might be some administrative barriers concerning teachers preparing students for the STAAR exam (Things such as those that might hinder a teacher from implementing certain strategies or activities).

A1S1: Some things that have been brought up in the past, and I may not be fully understanding your questions, but pulling students out for assemblies, particularly in that, anything after spring break and before the test. There is an unfortunate perception that since the LA test is earlier in the year, and because, based on scores this is a real focus, especially in this district, that there is, not smooth sailing, some breathing room after this test. And all too often, it's let's fill out the school choice forms and let's do this, and there are these field trips. And unfortunately we all have the similar philosophy that kids need the entire experience of high school and it's unfortunate that those types of things, like field trips, even though we know it is good for the child, cause issues with absences when we are trying to prepare students for the EOC test.

Researcher: How do you assist a teacher who is not using evidence-based strategies?

A1S1: It depends on the teacher, and if they are a veteran teacher, which I think of as a teacher with more than 3-5 years of experience, or if it is a beginning teacher. I like to coach a teacher for coming up with their own plan. Using phrases like: how do you envision your scores to look this year using the strategies that you have, and if they say something like I'm not really sure, what things do you see that you can do? Instead of dictating that they will do this, this and this… Once they have agreed that perhaps they need assistance, then its: Ok, would you like someone to come in and co teach? We use the guise of a guest lecturer that is an expert on the subject matter. Or co teacher, you, know, this is the instructional facilitator and she just loves you guys and want to get some teaching out today, so we kind of play that kind of game. It could be that they need a half

day and want to see a certain teacher's classroom. Or they need to take a full day and we may take them to another campus so they will see a different environment. They will watch a teacher's classroom for 2 class periods, then have lunch and have reflection then 4th period we will debrief. I did not have to do this last year, but I did do coteaching with a new teacher. I pulled a strong biology teacher that co taught with the new teacher and I taught the strong teachers class that day. There's lots of ways to go about it. The teacher has to have the power and control and the choice at all times. No teacher wants to do anything that will be detrimental to a child's learning. And there is an approach to tell a teacher a good idea to try…it has to be their choice or they're not going to embrace it and they are not going to do it.

Researcher: What assistance would you like to see established in order to aid SWD in passing the STAAR biology exam?

A1S1: I think the use of formative assessments if very strong. It appears as though the district is going back to curriculum assessments. Being mindful of a student's IEP, and having review of it frequently with the teachers in the tested area is even more critical that having a general ed teacher with a subject that is not tested and getting quality feedback. Sometimes, on an IEP, they are writing this, this, and this, and it is very general. They will write put in small groups, well, OK, we can place them in small groups, but what strengths does this student have so that it is meaningful for the student and those working with them. You know, how can we get this synergistic, because, just because students have something labeled as a disability, is it really a disability, what I

mean by that is are there other abilities that can be enhanced that we have not uncovered yet that can help the group.

Researcher: I know that your school has a dedicated special education person for science. How has that helped with accommodations for the types of activities for your teachers?

A1S1: I think it has been a big relief, particularly for the biology teachers. I believe that teachers want to do the best job they can. If a teacher says they differentiate 100% of the time, then they are not really differentiating. Because you would not be able to get any teaching done if you are differentiating all the time. That's why we need the support of the special education teachers. And ours in particular have been so helpful and focused on the biology students. When they come into the high school level, it is a new experience for them and they need that social transition and we don't know what type of background support they had from their middle schools. We have a large transient population so they could come from a different school district or state or whatever and I think that our teacher have been good at concentrating on the freshmen classes to build the whole student and see what the students' needs and don't need anymore. For the teachers in particular In terms of preparing them for a test, you have freshmen, being a tested area, being a title I school, having all these initiative the district wants in place, Understanding that every school is its own little universe, with its own culture and nuances, they want to do the very best that they can. I have had the honor to work with teachers that are not afraid to ask for help. I don't think we need to be egotistical as teachers. In our biology

group, there are teachers that are very strong with logistics, other that are good at let's look at the big picture and others that ask what this can do for our students. I think the past two years has shown large progress in our scores.

I don't know if you had time to look at our data, like last year to this year, but in the 7 school, our school has had the largest increase again, so it's finally that we are trying to fit the pieces together. So it's not for a lack of instruction, the teachers are very strong, it's just trying to fit the pieces to meet the needs of our students.

Researcher: One of the things I'm looking at it is to develop some type of professional development that would help the teachers either become more proficient with evidence based strategies or another idea would have a pairing of teachers with special education teachers either during district PLC time or building PLC time could actually build in and hopefully do what your school is modeling, do you think that would be a worthwhile professional development to actually get special education teachers from across the district working with biology teachers?

A1S1: Yes, and I think there are 2 things that I think would be very strong. To have a well-established protocol to not only look at assessments, not only formative, but common assessments, but to have some type of protocol where biology teachers and special education teachers that say this is the quiz or common assessment that I'm going to give, what is the lens of the special education student when they are taking this; what is the lens of the teacher- what are they trying to get out of the assessment? And what kind of implications do we have by giving this type of assessment. I find it interesting when

you try to have the student lens – that's what the special education teacher can provide – they are going to have the lens to say there is not enough white space; the font is off - the phrasing is odd – the student is not going to understand what you are meaning on this question.

The other type that is critical is looking at student work – and it is the same type of protocol and looking at the work, not judging the work at this point, but looking at the work and what do you see about the work – what was the goal of the assignment to begin with; having the special education teacher looking at the SWD work and what do they see– the teacher may be reading it and thinking that the students get the point at all, but the special education teacher can say, no, they not only get it, they did a brand new view of it. The way we set up PLC's, before my role was changed, the PLC was set up if the PLC fell on Wednesday that was special populations day, and so it was either someone from ESL or special education would come in and these are the conversations that would happen. Protocols were not really set, so unfortunately teachers would come in and fuss about the paperwork, etc. If I could change anything, I would like to have set up specific protocols to say Hey, if PLC falls on Wednesday, bring in student work or bring an assessment that ya'll want to look at and have our teachers look at it and say do we need to reword this, do we need a different version, a new accommodation?

Researcher: This will be so helpful for my final paper, and will hop0efully guide me for my final projects. I'm going to transcribe this and will send you a copy of the transcript

for you to look at and make any changes, any wording changes or “I meant to say this” and get it back to me so I can complete my analysis.

Appendix H: Sample of Researcher Codebook

Category	Participant key terms	
	T1	T2
What works with SWD?	Teach above their level	Varying abilities within class
Barriers for SWD?	Behavioral issues Writing lab reports Writing difficulty in general	Reading ability Degree of disability Writing ability
Types of activities?	Cooperative	Cornell notes Manipulatives Computer simulations Cooperative learning
Strategies and SWD	Mnemonic phrases Guided notes Graphic organizers	Any visual vocabulary strategy Guided notes
Modifications	Shorten activities break up follow up activities into manageable activities that reflects strategies	More time Frequent feedback Use of follow up activities that use strategies