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A Neuroeducation Model for an Inclusive School-wide Intervention System

Katelyn Blake

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by

Katelyn Blake

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Approved:

DocuSigned by: REDACTED — 4/9/2021
Chairperson — Date

DocuSigned by: REDACTED — 4/9/2021
Committee Member — Date

DocuSigned by: REDACT — 4/9/2021
Committee Member — Date

If applicable:

DocuSigned by: REDACTED — 4/9/2021
Additional Committee Member — Date

Additional Committee Member — Date

Approved:

DocuSigned by: REDACTED — 4/9/2021
Graduate Program Director — Date

DocuSigned by: REDACTED — 4/9/2021
Dean of the Unit — Date

DocuSigned by: REDACTED — 4/9/2021
Dean of the Graduate School or Representative — Date

Abstract

In 2019, a career and technical education (CTE) school in the Pacific Northwest created and implemented a school-wide intervention system based on the principles of learning from the Neurosemantic Language Learning Theory (NsLLT), called the Neuroeducation Intervention System (NIS). The NIS focused on conceptual learning by providing inclusive, conceptual, language-based interventions to any student at the CTE school. This single case study investigated in what ways the NIS, a school-wide intervention system that focuses on *conceptual learning,* is effective. Institutional data were collected, and interviews were conducted to provide the data for this study. These measures, including staff perceptions, program completion (retention), industry certification (achievement measured by grades), and appropriate behavior (discipline referrals) were analyzed to show changes from with the implementation of the NIS. The results of the study indicated that even amidst a pandemic, the NIS was effective in maintaining or improving student success factors through student-centered instruction and language-based interventions. The implication of this study for high schools is that when teachers understand the role of conceptual learning and language-based interventions it is possible to create inclusive learning environments that improve student success with a limited number of staff on an intervention team. This research provides a contribution to the literature on tiered intervention systems by presenting an option for a neuroeducational basis for conceptual learning rather than behavior-based frameworks.

Keywords: neuroeducation, NsLLT, inclusion, student-centered, conceptual learning, MTSS, intervention.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

Research Purpose

The purpose of this single-case study was to investigate in what ways the neuroeducation intervention system (NIS), a school-wide intervention system that focuses on conceptual learning, is effective, as indicated by multiple measures, including staff perceptions, program completion (retention), industry certification (achievement measured by grades), and appropriate behavior (discipline referrals). I (the researcher and special education teacher) along with the administration at a career and technical education (CTE) high school created a systematic way of providing varied levels of intervention (tiered intervention) for all students (school-wide). This school-wide support system was based on the brain-based and language-based interventions (neuroeducation methods) that I used for many years with special education students at the CTE school. For the purpose of this research I refer to the school-wide support system at the CTE school, based on neuroeducation principles and language-based interventions, as the NIS. This research addressed the ways in which the NIS, implemented at the CTE high school during the 2019-20 school year, is effective. This research was conducted in two phases. The first phase was to analyze the theoretical difference between the NIS and typical multitiered systems of support (MTSS) to establish a foundation for conceptual learning. Conceptual learning was the focus of the special education supports that enabled the application of inclusive, brain-based, and language-based interventions. For this research, conceptual learning was defined as visual or auditory mental concepts formed through higher-order thinking using various literacy processes (Arwood, 2017). This definition of conceptual learning is derived from the Neurosemantic Language Learning Theory (NsLLT), which is the theoretical foundation of the NIS and the basis for special education supports prior to the NIS. The second phase was to study the effectiveness

of the NIS at the CTE school as indicated by staff perception, program completion, industry certification, and appropriate behavior.

The first chapter of this research study includes the background leading up to this study, an overview of the conceptual framework used to ground the study, the research questions, and an overview of the aligned methods. Chapter 2, the Review of Literature, provides an analysis of the literature and research to illustrate the theoretical foundation of the NIS and conceptual learning on which this study was based. Chapter 3, Methods, detail the methodology and specific research methods used to accomplish this study, followed by Chapter 4, Results; and finally, Chapter 5 provides a discussion of the conclusions.

Background

My understanding of MTSS and my teaching philosophy, which reflects my education in the NsLLT, guided my experiences as both teacher and researcher at a CTE consortium school in the Pacific Northwest. The NsLLT explains learning as a neurobiological language acquisition process with four levels of learning rather than the typical two levels of learning (Arwood, 2011). Within the NsLLT, learning is a process of acquiring language through sensory input (level 1) that is overlapped to create perceptual patterns (level two) which layer into conceptual circuits (level three) that are named by language (level four). I applied the NsLLT as the basis of my work when I was hired as a special education liaison, because the CTE school administration identified that 15% of the approximately 1,100 students had individual education plans (IEPs). The teachers and administrators needed additional support to help the students learn to succeed at the CTE school. The CTE school's nature required that intervention and support be inclusive within the program; pulling students out of class for support was not practical or desired. The special education program consisted of two paraeducators and me, as the special educator, which

we called the support team (not to call attention to support provided for specific special education students). The support team's role was to provide specific interventions to students with IEPs within the general education settings. The methods used to provide intervention and support for students were based on the NsLLT.

The NsLLT provides the theoretical foundation for using visual language strategies called Viconic Language Methods (VLMs); for translating auditory learning environments into visual input that aligns with the students' neurobiological learning processes (Jaskowiak, 2018; Robb, 2016). VLMs are a specific type of language-based strategies that can be used in classroom instruction and in this case as tools for intervention. The NsLLT also provided the theoretical foundation for using literacy and language function as cognitive development measures (Arwood, 2011; Arwood & Robb, 2008; Robb, 2016). Therefore, I used language function as a tool for identifying my students' strengths and developmental levels. The support team also used VLMs as specific interventions for translating the CTE classroom/lab learning environments into the student's visual and conceptual thinking.

The VLMs are the visual language-based intervention tools used with students to help provide neurobiological and socio-cognitive meaningful contexts. Initially, these methods were used by the support team while the special education students participated in the classroom. For example, when a student in the culinary program struggled to understand the instructions verbally provided during a brief classroom meeting, the paraeducator would use VLMs to support the student by translating the auditory learning environment into visual thinking strategies. In this type of situation, the para would connect with the student and help the student refine their understanding of the instructions by drawing or allowing the student to draw what they saw/heard and by writing about what the instructions mean in context. My observations

indicated that using VLMs began to shift the focus within the CTE faculty from teaching skills to helping students build literacy (i.e., reading, writing, speaking, viewing, thinking, calculating, and listening) as a part of student learning throughout the school. As the support team began to see more student success, I started to involve more faculty in professional development to understand how students were learning. As this support for teachers grew alongside support for students, teachers and administrators began to ask for help for students who did not have an IEP yet were struggling to acquire the industry language or conceptual knowledge needed for success within the programs.

Soon, my role at the CTE school began to change from an emphasis on the students with IEPs to supporting teachers who needed help with struggling students who did not have IEPs. I began coaching/supporting teachers to help them create learning environments aligned with their students' learning strengths. Teachers began discussing and implementing strategies in their classrooms that support how students learn in varying ways, including VLMs and literacy activities, to make their classrooms more inclusive. The CTE school administration was hoping that teachers would continue to develop more strategies to support all students. However, the administration claimed the use of these types of inclusive learning practices varied throughout the school. The school's administration asked me to provide various professional development opportunities for staff to learn ways to create respectful, visual, language-rich learning environments. In addition to professional development for teachers, I provided the support team with monthly professional development about how and why to use VLMs. The support team also received regular professional development on how students learn with the theoretical foundation of learning from the NsLLT and how to use language to analyze thinking for behavior, social-emotional development, and increased cognition use. The professional development helped the

teachers and the support team develop a shared focus on conceptual learning. Students build language literacy (the students' ability to read, write, think, speak, draw, and calculate using functional language) because the learning environment aligns with the input that each student needs to learn conceptually.

As the school's focus expanded to include conceptual learning, the support team continued to support more students. Teachers increasingly developed classrooms focused on conceptual learning. The administration continued to find value in providing intervention for students who were struggling.

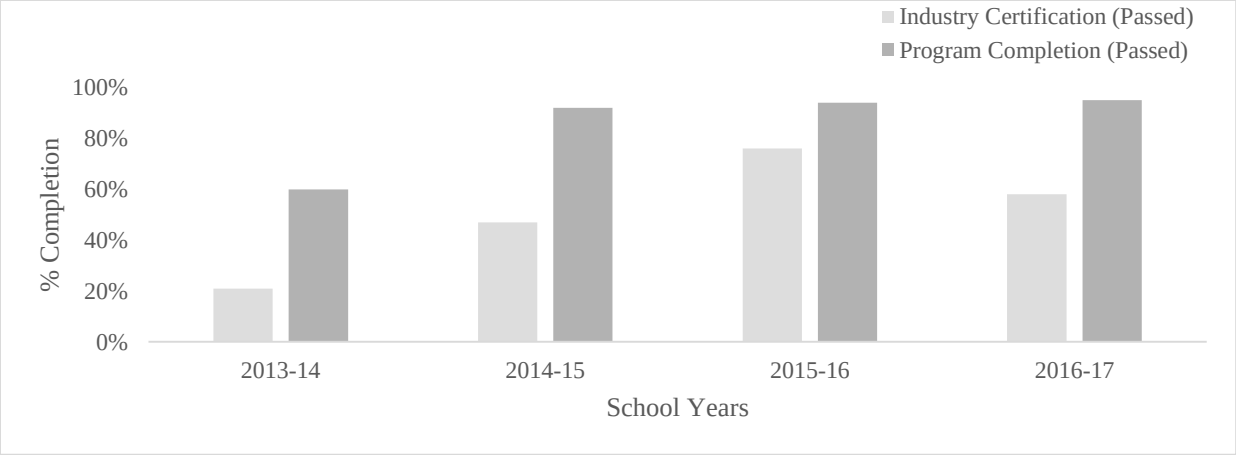
During the 2018-19 school year, the leadership team (i.e., three administrators, special education teacher, and instructional coach) decided that the CTE school needed a school-wide support system to purposefully support all students and teachers within a multitiered system of support (MTSS) structure. Prior to this point in time, the school lacked an intentional school-wide system of support, as the majority of interventions were provided through special education supports and the student success advocate, who focused support for students in transition (homeless youth). Prior to the NIS, the teachers provided universal supports (tier one) through the classroom instruction until teachers were unable to provide the necessary supports. At which point, the administration would implement some disciplinary consequences and additional supports for specific students as needed. It soon became apparent that this means of support for students was not equitable or inclusive, because intervention was reactionary and based on deficits. Meanwhile, the special education model based on the NsLLT was expanding as a system of support for any student.

Additionally, the administration was growingly concerned that the focus on reducing unwanted behavior did not provide the same type or level of support as the special education

interventions based on the support team's background in literacy through language. The leadership team also believed the special education support model, that I developed based on the NsLLT, was working well for special education students, in part due to data on program completion and industry certification presented to the superintendent council annually. Figure 1.1 is part of the 2017-18 annual report provided to the superintendent council. The report shows achievement trends prior to creating special education supports for the 2013-14 school year, followed by the start of systematic special education support and the implementation of VLM supports in classrooms beginning in the 2014-15 school year and subsequent years.

Figure 1.1

Special Education Achievement Trends from 2017-18 Report



The leadership team saw a need to have an MTSS to support all students, and the superintendent council agreed that the special education model of support was working well at the CTE school. Therefore, during the 2017-18 school year, the school leadership (including myself) created what this research study refers to as the Neuroeducation Intervention System (NIS), based on the special education support model theoretically based on the NsLLT. The NIS is a school-wide intervention system that focuses on increasing conceptual learning through

support for teachers to develop inclusive meaningful learning environments with interventions that use language-based strategies for all students. The NIS intentionally addressed a gap in equity and inclusivity at the CTE school, by expanding the special education support model to focus on conceptual learning. By addressing equity and inclusivity as a system the goal was to improve student success for all students as had occurred for the special education population in prior years. The NIS was adopted as a school-wide intervention system because the purpose of the NIS aligned with the administration's goal of developing inclusive learning environments to enable all students to succeed, thereby improving retention, achievement, and appropriate behavior.

The concerns of the CTE school were not unique. There is research to support the growing need for multi-tiered systems of support, MTSS. Like the CTE school, high schools across the nation face high numbers of students struggling with attendance, mental health, and low academic performance (Becker et al., 2011; Ginsburg et al., 2018). Due to these challenges, schools are attempting to support students through MTSS structures, but not all MTSS have the same components or are based on the same principles. To determine the differences between the theoretical foundation for the NIS (the NsLLT), as a unique type of MTSS, and typical MTSS, it was necessary to establish the background of what constitutes a typical MTSS. I searched the research base for studies of multi-tiered systems of support. Three search terms used: school-wide systems of support, multitiered systems of support, and intervention systems for high schools. The search was restricted to include peer-reviewed articles from 2000-2019 within Pro-Quest and ERIC search engines. The initial search produced over 1,000 research articles. I reviewed the articles and removed any studies with limited foci such as special education or emotional, behavioral disabilities, or single-attribute intervention studies such as behavior

education plans (BEP), bullying, functional behavioral analysis (FBA), and restorative practices. These studies with limited foci were excluded because I wanted to understand the foundational principles as a system in high school settings, not specific methods, or populations. I identified 170 research articles that addressed school-wide support systems in high schools. This review provided a few generalizations about MTSS. First, an MTSS is a school-wide system that provides tiered intervention to improve student success or any tiered school-wide system that supports teachers and students (Arden & Pentimonti, 2017; Belser et al., 2016; Cook et al., 2015; Horner & Macaya, 2018; Kearney & Graczyk, 2014). Tiered intervention is based on the public health model of intervention: tier one supports are universal supports, tier two interventions are focused, and tier three interventions are more intensive supports (Bradshaw & Pas, 2011; Sulkowski & Michael, 2014; Walker et al., 1996).

Second, in the research MTSS is often interchangeable with response to intervention (RtI) systems, but the two terms are not synonymous. MTSS structures are broader than RtI and can include support for social-emotional learning, academic learning, and behavior (Dulaney et al., 2013; McKenzie, 2010; Mellard, 2017). The distinctions identified from the review of literature are relevant to the context in which this case study was conducted. In the Educational Service District (ESD) where this case study was based, the common distinction between MTSS and RtI is that MTSS is a whole-school system that supports general education and special education students, and RtI is a special education structure to identify general education students needing special education services (Kavale & Spaulding, 2008). The literature on RtI describes it as a system for identifying students with specific learning disabilities (SLD) or as a system to identify struggling students, provide intervention, and to refer for special education services, if interventions are ineffective as related to academic performance (Arden & Benz, 2018; Fuchs &

Fuchs, 2006; Kavale & Spaulding, 2008; Keller-Margulis, 2012; Skedgell & Kearney, 2018; Sugai & Horner, 2009). Aside from RtI, many MTSS structures incorporate school-wide positive behavior intervention systems (SWPBIS) or social-emotional learning (SEL) programs. Much of the literature suggests SWPBIS creates and enforces expected behaviors, while SEL programs explicitly teach the social skills necessary to behave appropriately. Specifically, RtI primarily addresses deficits in academic achievement while SWPBIS primarily addresses reducing unwanted behavior and SEL primarily addresses teaching social skills (Bohanon et al., 2006; Cook et al., 2015; Eklund & Tanner, 2014; Erickson et al., 2012). Leading researchers in the field — Bradshaw (2010), Eklund et al. (2018), and Sugai and Horner (2009), for example — rarely mention language and literacy as critical aspects of intervention systems.

The research regarding MTSS in high schools showed that these systems focus on creating environments that will change behavior or social-emotional behaviors but that fidelity of implementation in high school is less than in middle and elementary schools (Flannery et al., 2014). Research also suggested that typical MTSS are theoretically founded in a two-tier learning process where skills are taught. Learning is demonstrated through the practice, performance, or imitation of the skills taught (Freeman et al., 2017). The search of literature regarding MTSS failed to show any systems that used the Neuro-Semantic Language Learning Theory (NsLLT) as a theoretical foundation.

The NIS incorporated an intentional focus on conceptual learning from the NsLLT within the public health framework of the MTSS structure by systematically identifying student needs and strengths, monitoring the progress of students, providing intervention, collecting data related to student success, and providing learning opportunities to help staff create meaningful, inclusive

learning environments (Bradshaw & Pas, 2011; Mellard, 2017; Sulkowski & Michael, 2014; Walker et al., 1996).

The NIS identifies student strengths and needs through a language-based screening process based on student response to an intervention survey, language function analysis (Arwood, 2011), and industry language pre-assessments. Identification also relies on student-reported needs and teacher concerns. The NIS allows the intervention team (i.e., three paraeducators, the special education liaison, the success advocate, the administration, and the instructional coach) to monitor students' progress using industry language and grades. Based on the strengths and needs identified during the screening process, along with teacher-reported concerns and student-reported concerns, intervention needs are assessed, and supports are provided to students, as needed. Data were regularly analyzed and discussed by the intervention team, who consistently monitored student progress through interaction and support within the classrooms. The final aspect of the NIS structure was to provide professional development for staff, to support the intervention system's tiered structure.

With the implementation of the NIS, the administration focused professional development on student learning as a process rather than on teaching specific skills. The focus on student learning further changed my role from a special educator into a facilitator of student learning, an inclusive function. My role as a facilitator of student learning was related to special education inclusion, where inclusion and student learning became key phrases in professional development at the CTE school. The instructional coach and I taught professional development workshops each month to help teachers create inclusive and meaningful learning environments based on how students learn as tier-one supports. Tier one of the NIS is the development of inclusive learning environments.

As a facilitator of student learning, my role focused on supporting the intervention team and teachers to provide interventions for students identified as needing tier-two or tier-three supports. Tier-two supports were learner-specific interventions that allowed students to engage in the learning environment meaningfully and independently through developmentally appropriate language-acquisition-based supports. Tier-two supports helped students who struggle to progress in the desired area (e.g., academics, behavior, professionalism, industry skills), who had specifically asked for additional support, or needed additional support, according to the teacher. If the student did not progress with tier-two supports or needed additional resources, the student moved to tier-three interventions. Tier-three interventions were learner-specific interventions that included modifying curriculum or expanding networks of support to involve the sending schools. The NIS was a tiered system of support designed to effect student success.

Typical MTSS structures measure student success through retention, achievement, and behavior (Arden & Pentimonti, 2017; Durlak et al., 2011; Flannery et al., 2014; Freeman et al., 2016). The NIS at the CTE school measured student success through program completion, industry certification, and appropriate behavior, respectively. The administration's need for a better MTSS at the CTE school that would develop inclusive learning environments by incorporating language-based interventions that improve conceptual learning led to the creation of the NIS, which incorporates the NsLLT definition of conceptual learning as a language-acquisition-based, visual meta-cognition approach to learning. The NIS was designed to support student learning so that student success factors such as retention, achievement, and behavior would improve. Conceptual learning, as defined through the NsLLT and success factors: retention, achievement, and behavior, is explored in greater detail in Chapter 2: Review of Literature.

Statement of Problem

Research into MTSS systems showed that the research gap was that MTSS systems do not incorporate a theoretical language-based learning framework, such as the NsLLT. The MTSS focuses on behavior and social skills to improve achievement and decrease unwanted behavior, which is different from a system that is intentional about building language acquisition to improve conceptual learning (Eklund et al., 2018; Sukhodolsky et al., 2013). SWPBIS and SEL are systems that measure behavior to address achievement. In addition to the gap in the research suggesting that MTSS rely on a theoretical foundation that addresses the reduction of unwanted behavior rather than the acquisition of language to improve conceptual learning, the research also presented struggles for the implementation and success of MTSS in high school and CTE settings. Research regarding MTSS suggested that the implementation of MTSS is less common or less effective in high school settings (Freeman et al., 2016; Keller-Margulis, 2012). One of the primary conditions that present a challenge to MTSS is the siloed nature of high schools with multiple classrooms and differing academic goals (Freeman et al., 2016; Morningstar et al., 2018). There are also fewer MTSS frameworks in alternative and CTE school settings (Simonsen et al., 2011; Simonsen & Sugai, 2013; Wiest et al., 2001). The nature of student discipline and instructional practices at alternative schools effects the fidelity of implementation of school-wide programs such as SWPBIS or SEL (Morningstar et al., 2018; Simonsen et al., 2011; Theobald et al., 2019). In light of these problems addressed by the research on MTSS, and with the growing push within the ESD to create some type of MTSS that supports all students, the CTE school created a system designed to improve student conceptual learning would increase literacy for academics and reduce unwanted behavior because of the students' higher levels of thinking. The significance of this research is that if the NIS is effective, it provides a basis for an alternative

theoretical foundation for school-wide interventions and systematic means of supporting all student needs within a high school and a CTE school with very independent and unique academic goals within each program. The theoretical differences that make the NIS different from other MTSS and the reason for the apparent successes at CTE led to the development of this research. Chapter 2 provides an analysis of the literature that shows the differences between a typical MTSS and the NIS in the theoretical approach to learning that frames the essential problems that led to this study.

Conceptual Framework

The conceptual framework used to guide this research study was the Arwood Neuroeducational Model (ANM). The ANM is a conceptual framework integrating research and literature from neuroscience, cognitive psychology, and language (Lam, 2017; Merideth, 2017; Robb, 2016). The triangulation of these fields of literature provides the theoretical foundation for the NsLLT, which provides the understanding of conceptual learning that is the heart of the NIS interventions. Through the ANM, the literature review integrates neuroscience research, cognitive psychology pedagogy, and language literature to address the theoretical foundations of typical MTSS structures, compared to the literature about the research and theory that supports the NsLLT is at the heart of the NIS. Finally, the conceptual framework of the ANM enabled the researcher to show how the NIS is different from typical MTSS structures to address the following research question: In what ways is the NIS effective at the CTE in this case-study, as indicated by multiple measures including staff perceptions, retention, achievement, and behavior?

Research Questions

This research had two phases. The first phase, established by the apparent research gap (the

lack of MTSS frameworks with a foundation in the NsLLT), used literature through the ANM lens to analyze the theoretical foundational difference between typical MTSS and the NIS. The second phase of this research was to investigate in what ways the NIS, a school-wide intervention system focusing on conceptual learning, is effective, as indicated by staff perceptions, program completion (retention), industry certification (achievement), and appropriate behavior (referrals). Clearly, instituting a school-wide intervention system would have some effect on student success so this this single-case study (Creswell & Poth, 2018) addresses the overarching research purpose: In what ways is the NIS effective?

1. What are the perceptions of the staff (intervention team and teachers piloting language-based interventions), as measured by virtual one-on-one interviews and supported by their shared evidence of what they did with the language strategies through shared artifact exhibits?
2. In what ways did the students' program completion (retention) change after the implementation of the NIS, as measured by student attrition data (student withdraw count and reason) and program completion grades?
3. In what ways did students' industry certification (achievement) change after implementation of the NIS, as measured by industry certification exams (program-specific exams and 21st-Century certification) and college/industry equivalency grades?
4. In what ways did student behavior change after the implementation of the NIS, as measured by office discipline referrals?

Overview of Methods

The methodological approach of this research aligned with Creswell's (2013) definition of a case study "as a qualitative approach in which the investigator explores a bounded system

(case) . . . over time through detailed, in-depth data collection involving multiple sources of information" (Merriam, 2016, p. 40). For this case study, it was a single-bounded case; the case investigated was the NIS, and it was bounded within the CTE school. The case study sources of information included interviews with the intervention team and three teachers who piloted/implemented neuroeducational classroom practices (language-based interventions) along with three years of institutional student data for student success factors including, achievement (grades and certification), retention (withdrawal and grades), and behavior (discipline referrals and intervention) and additional documents, notes, and other artifacts related to methods, implementation and student success factors. For this study, the investigation of the case included a descriptive approach to investigate the sources of information to inform the rich description and themes of the case (Merriam, 2016). A qualitative descriptive analysis of staff interviews and artifacts was combined with an analysis of descriptive statistics of student success factors (i.e., behavior, retention, and achievement) to create a rich description of the NIS to address this study's research questions. The purpose of this research was to investigate whether the NIS was effective. The NIS efficacy was investigated in two ways; through the review of literature connected to the analysis of each research question and the analysis of multiple sources of information regarding the NIS addressed through each research question. The research analysis has two sections. The first section addressed Research Question 1: What are the perceptions of the staff (intervention team and teachers piloting language-based interventions), as indicated by virtual one-on-one interviews, and supported by their shared evidence of what they did with the language strategies through shared artifacts exhibits? The first section addressed the implementation of the NIS at the CTE school by coding the staff interviews through the ANM lens to provide a rich description of the NIS.

An additional source of information within the case study was the student success data for retention, achievement, and behavior collected by the CTE school, which was addressed in the second section of the research analysis. Descriptive statistics were analyzed to add to the description of the NIS: Descriptive statistics of grades and attrition data were used to describe program completion to show retention. Descriptive statistics of program-specific examinations and 21st-century certification and grades were used to describe industry certification to show achievement. Descriptive statistics of the number of office discipline referrals data were used to describe behavior, a common measure of student behavior. These data were analyzed to show a change in student success factors. The data of office discipline referrals were compared between the 2018-19 school year and the 2019-20 school year. Multiple sources of information were analyzed to create a description of the case (the NIS) that, when combined with the research and literature presented in Chapter 2, illustrated the effectiveness of the NIS while providing an alternative theoretical approach to student learning. Based on the analysis of these data and the evidence from the literature review, this research provided evidence of the effectiveness of the NIS at the CTE school, as measured by perceptions of the staff, retention, achievement, and behavior. No student identification data were collected or used for this study. Specific details on the means of data collection and the process for data analysis are provided in Chapter 3. Chapter 3 also addresses how COVID-19 resulted in a change in the delivery of support and data collection. The data analysis results in response to each of the research questions are presented in Chapter 4. The discussion of the summary of results and conclusions is presented in Chapter 5.

Chapter 2: Review of Literature

This single case study of the NIS investigated in what ways the Neuroeducation Intervention System (NIS), a school-wide intervention system that focuses on conceptual learning, is effective, as indicated by multiple measures, including staff perceptions, program completion (retention), industry certification (achievement measured by grades), and appropriate behavior (discipline referrals). The student success measures were set in place as goals for the CTE school prior to the NIS, as they are typical student success factors within MTSS. The CTE school needed an intervention system aligned with the school's mission to create inclusive learning environments where students could successfully complete the programs, receive industry certification, and learn professional/appropriate behaviors. However, the school administration believed that typical MTSS frameworks that focus on teaching skills and reducing unwanted behaviors would not provide adequate support for all learners. Therefore, the NIS was created to support all students' learning needs, using a different theoretical approach than the typical MTSS models. The goals for the reduction of behavior problems and to increase academic performance are typical for MTSS models. If the NIS is effective then program completion, industry certification and appropriate behaviors should continue to improve for all students at the CTE school. Also, suppose the NIS is effective in improving these measures of student success. In that case, the theoretical differences between the two support systems become very important to understand why focusing on conceptual learning improves behavioral and academic achievement. If effective, then the significance of this research provides alternative means of school-wide support, especially for high school and CTE settings. The literature review provided the research basis for the NIS methods and theoretical foundation compared to typical MTSS models.

NIS: Learning and Support Basis from Special Education

The NIS was established based on supports and interventions used within the special education supports at the CTE school. The following research and literature illustrate that the theoretical foundation of the NIS, the NsLLT, allows for interventions and methods that support conceptual learning to improve student success factors like retention, achievement, and behavior. The NsLLT is based on the triangulation of research from cognitive psychology, neuroscience, and language literature. The next section is an overview of the learning tenets of each of these disciplines as they relate to the NsLLT**.**

Cognitive Psychology

Learning is defined as a permanent change in behavior (Lachman, 1997). Both behavior and cognition are essential components of learning within the cognitive psychology lens. Learning, specifically student learning, is a foundational purpose of education (Postman, 1996). Today much of the educational pedagogy (beliefs about how to teach) comes from the field of cognitive psychology, where practices in education still apply many of the principles from behaviorist research and methodology, like direct instruction and modeled responses (Gallistel & Matzel, 2013; Reeves et al., 2017). In this dominant paradigm, learning is a product of teaching (McCarthy, 2006; Robb, 2016). Therefore, methods of teaching determine the outcomes of learning. Cognitive psychology theories about learning add the Theory of Mind (ToM) to behavior and teaching outcomes, where the mind is the source of executive processing, memory, emotions, and higher-order thinking (Anderson, 1988, 2020; Blakemore et al., 2004; Happé et al., 1997; Imuta et al., 2016). The following is a brief overview of the dominant lens for learning that shapes how educators teach and support student learning. Within this overview, behaviorism provides a theoretical approach to understanding behavior. Behaviorism is a field of research that

developed from understanding human learning through a process of reinforcing correct behavior and extinguishing unwanted behavior (Forsyth & Eifert, 1996). Also, cognitive psychology focuses on searching for the role of mind (thinking) in the process of learning behaviors (Bargh & Ferguson, 2000). In addition, cognitive psychology provides the research perspective for social development and the role of memory in learning.

Behaviorist Theory and Theory of Mind

Behaviorism provides the foundational theory of learning and behavior. One learning tenet from cognitive psychology is that perception is the process or result of organizing sensory input based on meaningful relationships of ideas (Anderson, 1978, 2013; Binder, 2016). The cognitive psychology lens results in the interpretation of research leading to an input-output learning model (Gallistel & Matzel, 2013; Lam, 2017). The input-output learning model refers to the sensory input or teaching material being the input for the student learner. The output is the thinking or behavior demonstrated or performed as learned material by the student (Jaskowiak, 2018; Lam, 2017). The input-output model of learning uses associative memory theory that suggests memory is connected to the sensory input connected to a reward, practiced, and then habituated. In this way, all structures like words can be taught with behaviors as examples of learning (Anderson & Bower, 1972; Gallistel & Matzel, 2013). The input-output type of learning and memory allows for recall of practiced input, often described in education as rote memory. Learning, therefore, becomes evident when the behavioral output (action) matches the input (instruction/teaching). In educational terms, this definition of learning appears as the foundation for standardized testing, product-based grading, explicit instruction, direct instruction, and skills training.

Behaviorism allows for the interpretation of neuroscience, where teaching and learning are the same as an input-output model (Garrett, 2008; Schuh, 2004). Theory of Mind allows for the interpretation of neuroscience, where learning is a process of reduction or parts to whole learning. ToM explains learning, where the human mind uses mental products like motivation, attention, self-regulation, and memory to organize and create thinking (Blakemore et al., 2004; Howland & Wang, 2008). ToM accounts for the assumptions in pedagogy and intervention that adult introspection of how a person thinks is the same as how a person learns (Baars & Gage, 2013; Happé et al., 1997; Imuta et al., 2016). The parts to whole perspective on learning is most notable in education where language is concerned. Sounds and letters build into words, and words build to make language.

Within the typical cognitive psychology lens, language is viewed as a performance (behavior) of structures evolved from brain development (Anderson & Bower, 1972; Gallistel & Matzel, 2013). Furthermore, language comprehension is assumed to be required for language performance (Daneman & Merikle, 1996; Nip Ignatius et al., 2009). This parallel assumption between comprehension and production of language structures does not consider language acquisition.

Social Development

The discipline of cognitive psychology also provides an interpretation of learning as a staged social development process. Piaget (1959) provided the framework for social development as part of staged cognitive development where learning occurs at specific stages. The cognitive stages of development are sensory-motor, pre-operational, concrete, and formal. Each represents a typical age range and social and cognitive learning level according to

behaviors observed as specific to each stage. In this way, social and cognitive development unfold in parallel stages.

Cognitive-Neuroscience

The cognitive psychology lens today incorporates some neuroscience. It interprets learning, neurobiologically, as sensory input processed by the mind (brain) and organized into perceptions or neural circuits (Ghazanfar & Schroeder, 2006). Perceptions are organized and retrieved through memory systems, and thinking about these perceptions is measured through behavior (Anderson, 2015; Ghazanfar & Schroeder, 2006). Within cognitive psychology, cognition is closely related to memory. Associative learning or memory also includes reinforcement learning, where the reward acts as a reinforce if the recall is likely to happen. The challenge with associative learning is that it is short-term (Gallistel & Matzel, 2013; Luck & Vogel, 1997). Students can remember and recall perceptual patterns as long as they are practiced, but these patterns do not necessarily form long-term memories or concepts (Howland & Wang, 2008). Associative memory is related to input-output learning, where a conditioned stimulus is associated with a response. Anderson et al. (1996) provide an updated theory of associative learning, which explains associative learning as working memory, which is often limited by the cognitive load or memory load. A learner's ability to recall patterns learned through associative learning is time limited. The more time that passes, the more challenging it is to recall the patterns (Gallistel & Matzel, 2013). Learning as a two-tier (input-output) model relies heavily on associative memory, repetition, or practice. Cognitive neuroscience interprets based on the assumptions of cognitive psychology and therefore does not include the intersection of language acquisition with neuroscience and cognitive psychology.

Neuroscience

The definition of learning, within neuroscience, is that learning is a permanent change of the brain (Pulvermüller, 2019). One learning tenet supported by neuroscience is that learning changes the brain when input is semantically relevant and meaningful (Arwood, 1983; Gainotti et al., 2009; Getha-Eby et al., 2014; Pulvermüller, 2019). The brain structure changes as the function of the brain changes (Gallistel & Matzel, 2013; Pulvermüller, 1999). Specifically, an increase in meaning and use can change how the brain excites and inhibits sensory input (Le Prell et al., 2016, 2017; Pulvermüller, 2005, 2012). When sensory input is not meaningful, it is not processed by the neuron, meaning that regions of the brain will not activate due to a lack of meaningful input. Neuroscience researchers explain students with learning disabilities and disabilities related to inappropriate behavior as a lack of inhibition and prefrontal regulation of input characterized by increased risk-taking and poor decision making (Lamblin et al., 2017; Melli et al., 2016; Menghini et al., 2018). This research suggests that students with these learning disabilities do not receive input that is meaningful enough for their brains to process. One conclusion from this research was that not all input is equally meaningful to each student. For information to be meaningful in the brain, semantic features are processed on a sensory level that is overlapped with different yet similar semantic features (Anderson, 2015; Stevenson et al., 2014). Movement provides neurobiologically meaningful sensory input, accessing the middle temporal regions of the brain with circuits connecting the visual cortex and motor cortex (Albright, 2016; Boyce, 2016; Damasio & Damasio, 2012). These sensory semantic features form perceptual pathways (Ghazanfar & Schroeder, 2006; Pulvermüller, 2005). The acquisition of perceptual pathways requires the overlap of meaningful sensory input (Dijkstra et al., 2017) Perceptual pathways can be linked with the motor systems to produce output, but the brain's

ability to organize semantic input does not usually stop at the development of pathways (Arwood, 1991; Ghazanfar & Schroeder, 2006; Lenneberg, 1962; Pine, 2007; Robb, 2016). The pathways innervate in the cerebrum, interconnecting to form neural semantic circuits. The development of neural circuits connects semantically related perceptual patterns to form visual or auditory conceptual thoughts or images (Damasio, 2003; Just et al., 2010; Robb, 2016; Tranel et al., 1997). These images represent meta-cognition. Visual metacognition is the process of "seeing" the sensory perceptions as thoughts, memories, and knowledge (Anderson, 1988; Barsalou, 2003; Dijkstra et al., 2017). Thus, thinking is in image form, not in words (Anderson, 1988, 2015; Arwood, 2011; Pulvermüller, 1999). The brain does not use words; rather, the brain uses the function and purpose of the neuro-semantic circuits (Just et al., 2010). These neuro-semantic circuits interconnect regions of the brain and hemispheres into networks of neurons (Pulvermüller, 1999; Snyder et al., 2010). The interconnected networks are represented as language functions (Arwood, 2011; Gainotti et al., 2009; Pulvermüller, 2012). The neurological process of layering sensory input based on semantic connections suggests the function of meaningful input will create pathways, circuits, and synergistic networks within the brain. Meaningful input scaffolds and creates the language learning system. The next section brings language into the neuroscience of learning.

If the material is not novel, creating new meaningfulness, then the repetition of patterns does not build thinking but can disengage the brain (Bookheimer, 2002). Neuroscience research is consistent in the synergistic networks created through novel meaningful input in the brain can change the structures of the brain, aiding in the repair of language delay/damage, anxiety, learning deficits, and traumatic damage (D'Ausilio et al., 2009; LeDoux & Pine, 2016; Melli et al., 2016; Pine, 2007; Pulvermüller & Shtyrov, 2006).

Another tenet of learning supported by neuroscience research is that not all sensory input is equally meaningful; in other words, people can process sensory input differently, creating different perceptions and different types of neural circuits or concepts (Anderson, 2015; Pulvermüller, 2005). Visual sensory input connects to sensory-motor pathways creating visual perceptions or visual concepts. Movement, both visual movement by the eyes and kinesthetic movement, combine as sensory modalities to form visual perceptual patterns and concepts (Krüger et al., 2020). The visual concepts vary from person to person (Barsalou, 1999). Variations in the sensory input due to the eye and motor system's multimodal semantic features allow for variations in the semantic relationships that form perceptual pathways and conceptual circuits. Because the function of perceptions changes the conceptualization of sensory input, the propositional function and language structure applied to the concepts vary (Anderson, 1978; Barsalou, 1999). The surface differences of languages mediate learning by adding more meaning to the underlying concepts (Arwood, 1991).

With insights from neuroscience, learning is no longer limited to input of sensory information and perceptual output; learning becomes a process of semantically connecting input to layer into interconnected perceptual patterns, based on semantic (meaningful) relationships of meaningful concepts or images that network in the brain as language networks of meaningful performance. Arwood (2011) refers to this acquisition theory as the Neuro-Semantic Language Learning Theory (NsLLT). Pulvermüller (2005) proposes that the function of language has a significant impact on the plasticity and synergy within the brain. Rather than processing words as components of the brain's surface structure, processing of language and thinking is mediated by the function or purpose of the language (Arwood, 1983). Understanding this function of language makes incorporating language literature with neuroscience research significant for

understanding how the brain uses language to function synergistically. Additionally, the focus on the need for meaningful sensory input or semantically related input leads us to incorporate the language theory literature on semantics to expand on the relationship to learning as a concept acquisition and language acquisition process. Additional research and literature from language research also connect the neurobiological process to the socio-cognitive or conceptual learning process.

Language

As noted in the previous section, learning is a neurobiological set of internal processes. However, learning is also defined as a set of socio-cognitive processes, where language is assigned from others as input to the neurobiological system (Perniss & Vigliocco, 2014). This assignment of meaning or language of others sets up a conventional set of signs and symbols as a means of communicating need, function, and purpose among social agents (Lam, 2017; Nöth, 2014; Spencer, 2017). According to Vygotsky (1962), sound and meaning are not separate concepts in learning or language acquisition, and communication requires the conceptual meaning, not merely the transference of sound. Vygotsky explained that learning is a process of acquiring language and thinking through social interactions and instruction, not as a developmental unfolding. This suggests that learning is more than an input-output model of practice, imitation, and copying. Rather learning requires conceptual and meaningful thought that includes the neurobiological processing as well as the external assignment of meaning. Bruner, Dewey, Vygotsky, and Clark proposed that language is a meditating factor in turning perception into cognition and that the language process is socially driven (Bruner, 1986). Bruner also proposed that value and purpose are fundamental in creating the need for learning, and that value and purpose derive from socio-cultural environments (Olson, 2001).

Neurobiologically, language is more than lexical tags that name objects; meaning is derived through the function, purpose, social interactions, and internal neurobiological connections among semantic features and their relationships to form meaning from external input within the internal neurobiological systems (Lam, 2017; Lenneberg, 1962). Both semantic refinement and meaningful external interactions surpass the limitations of input-output models of learning. Therefore, as part of the socio-cognitive learning processes, an outside agent will assign meaning to refine the learner's perceptual patterns and concepts in multiple novel and distinct ways. This assignment of meaning allows context to build connections among multiple patterns in ways that the learner can create concepts such as agent, action, and object within semantic relationships (Arwood, 1991; Brown, 1973; Shibatani & Thompson, 1996). These meaningful, relevant, and practical social relationships create the conceptual thinking or mental images that become pro-social thought, unless the agents assigning meaning are doing so in an anti-social manner, in which case the learner would develop anti-social conceptual thinking (Arwood, 2011; Green-Mitchell, 2016; Jaskowiak, 2018). One conclusion from this research is that learning language is both a neurobiological and a socio-cognitive set of processes mediated by others' language. Language functions help change the meaning of input and allow for the acquisition of language to support pro-social changes of the brain (Arwood & Young, 2000; Green-Mitchell, 2016; Jaskowiak, 2018; Pulvermüller, 2012).

Research regarding language is also clear that language has a functional process represented by structural products (Jaskowiak, 2018; Robb, 2016). Language as structural products includes words, morphemes, phonemes, sentences, and other grammatical parts that can be copied or mimicked without necessarily sharing meaning or function (Lenneberg, 1962; Perniss & Vigliocco, 2014). Language function is measured through literacy to show conceptual

thinking (Arwood, 2011; Arwood & Robb, 2008; Robb, 2016). Language function includes the literacy processes of psychologically creating meaning through reading, writing, thinking, speaking, viewing, calculating, and listening (Cooper et al., 2012). Robb (2016) adds drawing to this literacy list. Literacy processes facilitate the conceptual semantic circuits that allow for the acquisition of higher-order thinking, emotions, behavioral, or physiological responses (Johansen, 2013) as demonstrated through the functional aspects of language or literacy (Pulvermüller, 1999; Robb, 2016). Once children age 7-8 have acquired adult grammar (Arwood, 2011), they can use language to refine their thinking or deepen their conceptualization. Multiple forms of literacy allow older students to refine their conceptual thinking into meaningful higher-order concepts, including pro-social concepts of agency represented through behavior (Cooper et al., 2012; Green-Mitchell, 2016). For older students, language is a mediator for thinking, as a socio-cognitive process, and as a learning acquisition process within literacy processes. The function of language continues to be acquired through the four levels of learning discussed in neuroscience research to produce the theoretical foundation of the NsLLT (Green-Mitchell, 2016; Robb, 2016). In addition to the triangulation of research from the fields of neuroscience, cognitive psychology, and language, research related to memory and cognitive load provides essential insight for conceptual learning.

Neurosemantic Language Learning Theory

By integrating the definitions of learning from the fields of cognitive psychology, neuroscience and language, the definition of learning expands. The following section will analyze literature and research from neuroscience and language to expand on the cognitive psychology lens of two-tier learning: sensory input and perception to address conceptual learning as the third tier, named by language in the fourth tier of learning from the NsLLT (Arwood,

2011). The NsLLT is a theory that articulates the neurobiological process of learning as a language acquisition process that also includes the socio-cognitive processes related to the input of meaning based on meaningful learning experiences (Arwood, 1991; Lam, 2017). The definition of learning with the NsLLT is that all learning is brain based and pro-social and occurs through context (Arwood & Rostamizadeh, 2018). Learning within the NsLLT has four levels identified within neuroscience and language disciplines. These levels include sensory input, perceptual patterns, conceptual thinking, and language, which names thinking. Both the socio-cognitive and neurobiological aspects of learning are incorporated into the NsLLT to provide an understanding of learning that is based on how a student processes sensory information to create perceptual patterns that are neuro-semantically (meaningfully) connected in highly contextual ways to form concepts named by language and refined through pro-social interactions (Arwood, 1991, 2011, 2017; Arwood et al., 2015; Lam, 2017; Robb, 2016).

Visual or auditory concepts, as the third level of cognition according to the NsLLT, are key to conceptual learning, whereas perceptual patterns, even as output patterns, are limited to working memory and, therefore, subject to cognitive load production limitations. In education terms, working memory and memory access limited by cognitive load requires that the pattern is practiced and repeated so that recall is possible. Concepts, especially visual concepts, are stored as semantic long-term memory, for which recall is more accessible (Brady et al., 2008; Jacobs et al., 2018; Konkle et al., 2010). Learning, therefore, that is long-term, conceptual, and meaningful requires that perceptual patterns overlap in contextual, relevant, pro-social ways to form concepts that are named by language (Arwood & Robb, 2008; Barsalou, 1999; Bartolomeo, 2002; Green-Mitchell, 2016; Hadie et al., 2018; Konkle et al., 2010; Merideth, 2017; Spencer, 2017).

Language acquisition is a neurobiological and socio-cognitive learning set of processes in the NsLLT (Arwood, 2011). Language mediates all behavior and academic performance, as a mediator language is a mirror to the function of the brain, not the mind (Arwood, 1983). The NsLLT postulates two types of conceptual thinking or metacognition: auditory and visual concepts (Arwood, 1991). The brain's sensory input for distance learning is visual input (light and movement) and acoustic input (sound waves: time, tone, and pitch) (Anderson, 2015; Arwood, 2011). These semantic features are processed bi-modally (Ghazanfar & Schroeder, 2006), meaning that visual input integrates with acoustic input simultaneously to form auditory concepts (Arwood, 1991), or visual input overlaps with visual input to form visual concepts (Arwood, 1991; Campbell, 2008; Gallistel & Matzel, 2013). Individuals who think with auditory concepts can integrate sound (time) features conceptually with visual features. In contrast, individuals who think with visual concepts integrate a combination of movement (spatial) and/or light features to create perceptual patterns and visual concepts. Most students in schools today rely on visual conceptual thinking (Keogh & Pearson, 2018; Lam, 2017). These aspects of the neurobiological learning process are key to providing meaningful and appropriate interventions and supports for student learners. Learners with visual metacognition acquire concepts best through the spatial orientation of location, movement, figure-ground, and motion, and through highly contextual settings with semantically related ideas (Lam, 2017; Meadan et al., 2011; Spencer, 2017). In a classroom setting, a student with auditory metacognition may learn concepts well through a lecture with limited context (non-story-like). In contrast, a student with visual metacognition learns concepts well through contextual stories (who, what, where, when, why, and how) or through drawing and writing about the relationships (agent, action, object) of the concepts (Arwood, 2011; Robb, 2016; Spencer, 2017).

English is an auditory-time-based language where time concepts (acoustic input has a time feature) are regularly used to relay information and information with little context (Arwood & Kaulitz, 2007; Weist et al., 1999). For example, the teacher walks into the classroom and says, "Today, we are going to learn about photosynthesis." There is little context provided. The learners may be thinking about lunch, after school, what they were just doing, last class, etc. The teacher "helicopters" the words about photosynthesis into the middle of the students' thinking images about other topics or ideas. Students are supposed to be able to make immediate meaning out of the sound of the words. The educational content of lessons tends to follow the characteristics of auditory English. These sound parts, such as words out of context like "photosynthesis," are also taught from parts to whole. For example, English is often broken down into parts of processing words, assuming that learners process words "out of context" as sounds. However, it is recognized that most of today's learners think in visual metacognition (Keogh & Pearson, 2018; Robb, 2016; Spencer, 2017). Visual metacognition integrates visual, spatial, and other contextual sensory input (Arwood, 2011; Jacobs et al., 2018). The auditory-time-based nature of English, especially in classroom instructions, does not always align with the visual, spatial, and contextual processes for visual metacognition. Memory is another aspect of learning that is neurobiologically related to conceptual learning.

Within cognitive psychology, memory is associative, and pattern based. In other words, memory is accessed associations between perceptual patterns (Anderson, 1978; Luck & Vogel, 1997). Neuroscience provides an understanding of the role of language and conceptual thinking in semantic memory. Semantic memory or long-term memory is acquired through circuits that semantically connect perceptual patterns (Howland & Wang, 2008; Pulvermüller, 2013). Long-term memory is related to spatial memory (Gallistel & Matzel, 2013), which means that long-

term memory requires concepts or image circuits. Therefore, conceptual learning is connected to long-term memory (Lam, 2016; Leonard et al., 2007). Semantic memory or long term memory occurs through the use of language to name the thinking or conceptualization (Anderson & Reder, 1974; Binder & Desai, 2011). So, language provides an avenue for long-term learning and thinking. Thinking is predicated on the processing of sensory input. Different types of processing will produce different types of images; motor movements are significant sensory input for visual images or concepts (Anderson, 1974; Krüger et al., 2020). These images are conceptual and are then named by language. The third and fourth levels of learning, according to the NsLLT, depict learning as a visual or auditory concept named by language. Neurobiologically, concepts form circuits, and language connects the circuits to form networks. Semantic memory allows the recall or access to conceptual circuits and language networks, especially as the function of language is accessed (Pulvermüller, 2013; Pulvermüller, 2005; Webster & Whitworth, 2012).

At the CTE school, the administration needed to provide strategies to teachers to make the learning environment more neurobiologically meaningful for the students. The administration provided professional development to teachers to address how students learn and how to incorporate literacy-based teaching strategies into CTE classrooms. Likewise, there was a need to provide interventions and supports for students to translate the auditory lessons into visual patterns and concepts that are easier for most students to process neurobiologically. The intervention strategies for students included various Viconic Language Methods (VLMs). The administration at the CTE school provided this type of support through the NIS by incorporating the NsLLT, specifically the use of VLMs that align the visual metacognitive strengths of the learners with the language process that help most learners acquire the semantic features of concepts for higher-order thinking and behaving.

Use of Viconic Language Methods

Viconic Language Methods (VLMs) are intervention strategies that aid in the acquisition of conceptual learning by translating auditory learning environments into visual thinking. Spencer (2017) and Robb and Arwood (2016) described the use of VLMs for students in a classroom designed to support behavior concerns. The article explained the benefits of using VLMs to help students learn concepts and language that enabled them to be more successful academically and socially. Likewise, Meredith (2017) described the use of VLMs as intervention tools to support the language acquisition for students with anxiety to learn how to use strategies and concepts necessary for success at school. Robb (2016) provided research that showed the need and benefit of providing instruction that aligns with students' neurobiological learning strengths. Robb's research showed that when instruction aligns with the visual learning strengths of students, literacy and language function improve. Based on these studies and experience from support for special education students at the CTE school, the NIS used VLMs as learning tools to translate the auditory environment into meaningful visual input (Lam, 2017; Robb, 2016; Spencer, 2017). The goal was to help students acquire conceptual thinking for better language function.

To summarize, the NsLLT provides a more complete definition of conceptual learning by integrating the tenets of learning from cognitive psychology, neuroscience, and language literature. Neurobiologically, learning as postulated by the NsLLT is a four-tier process including sensory input, perceptual patterns, concepts, and language. Conceptual thinking can be a visual or auditory metacognitive process, but most students have visual systems (Arwood, 2011). Having a visual metacognitive learning system in an auditory culture can present challenges, neurobiologically and socially (Stevenson et al., 2014). However, learning opportunities can

align with the student's neurobiological strengths, creating meaningful learning environments (Arwood & Robb, 2008; Merideth, 2017). Learning environments that address the strengths of the learner rather than deficits are more inclusive by nature (Daniels & Gamer, 2013).

Inclusion in Learning Environments

Inclusive education is the idea that all students are supported and included within the general education setting to provide the most meaningful learning opportunities. In education terms, inclusion includes promoting equal access and comparable activities throughout the educational setting (IDEA, 2014; Section 504 of the Rehabilitation Act, 1973). This research is addressing inclusion in the classroom within a system of level one interventions. Inclusion was a CTE school goal because approximately 15% of the student population had a special education identification, and those students needed to be included in the learning, not simply present. Inclusion of special education students in general education settings and CTE settings effectively increase student academic achievement and attendance (Casale-Giannola, 2020; Daniels & Gamer, 2013; Hehir et al., 2016; Nind, 2011; Pirttimaa & Hirvonen, 2014; Theobald et al., 2019). The benefits to all students of placing students with special needs in these types of learning environments are evident (Hehir et al., 2016; Wigle & Wilcox, 2003).

Inclusive practices may also be a pathway to improving schools' culturally responsive practices (Bottiani et al., 2018). Special education is generally culturally disproportionate due to the deficit model used to identify disabilities (Daniels & Gamer, 2013; Hehir et al., 2016; Nind, 2011). In contrast to inclusive practices are exclusion type supports, where students are removed from certain learning environments. Exclusion requires that the problem with student success is inherent in the student rather than the environment (Daniels & Gamer, 2013; Hehir et al., 2016; Nind, 2011). Inclusive practices allow students to succeed by creating meaningful, relevant, and

practical learning environments (Casale-Giannola, 2020). Research suggests that learning environments can be changed or modified to meet the needs of all learners (Casale-Giannola, 2020; Cornelius-White, 2007; Tangen & Spooner-Lane, 2008). One way to meet the needs of all learners is to implement learner-centered rather than teacher-centered classrooms. Learner-centered is a term that addresses inclusive environments by identifying and supporting student learning (Brown, 2003; Brown, 2003; Schuh, 2004). Teacher-centered practices refer to the input-output pedagogical teaching practices rather than learner-centered, based on the student's ability to use or process information. Inclusive practices also allow for intervention and support to students based on the learning environment rather than a disability (Brown, 2003; Daniels & Gamer, 2013; Garrett, 2008) through the roles of educators and paraeducators (Pirttimaa & Hirvonen, 2014; Radford et al., 2015). Inclusive practices include the idea that interventions and supports for students can be provided within a meaningful learning environment to provide students with learner-specific strategies, like VLMs, that enable them to engage in learning (Green-Mitchell, 2016; Spencer, 2017). These practices require support and intervention from teachers and paraeducators (Radford et al., 2015; Wigle & Wilcox, 2003).

Inclusion requires more focus from special education teachers to provide consultative or collaborative support to general education teachers (Wigle & Wilcox, 2003). Inclusion also requires a change in how educational paraprofessionals (paras) provide intervention and support to students (Radford et al., 2015). Within an inclusive practice model, special educators have a consultative and collaborative role in supporting the teacher (Pirttimaa & Hirvonen, 2014; Radford et al., 2015; Wigle & Wilcox, 2003). The roles of paraeducators are also different than in typical learning environments. For paraeducators to successfully meet students' needs and identify and utilize students' strengths in highly contextual learning environments, they need to

have extensive training in how students learn (Radford et al., 2015). Radford et al. (2015), suggests that paras should have professional development opportunities to learn theories and strategies to support how students learn conceptually.

Inclusion requires more than simply keeping all students in a classroom. Inclusion requires that staff understand how to support student learning (Brown, 2003; Radford et al., 2015). The NIS intentionally provided training and learning opportunities for staff to learn about VLMs, the NsLLT, how language mediates thinking, and how memory relates to learning.

Behavior Goals in MTSS

The following sections analyze how MTSS structures incorporate the dominant paradigm model of learning along with how these systems intervene and measure student success, specifically achievement, behavior, and retention. MTSS is a system designed to prevent and address academic concerns, behavioral issues, and mental health challenges that students face (McIntosh et al., 2014). MTSS systems use a variety of intervention structures to provide support for students. The most common structures are Response to Intervention (RtI), School-Wide Positive Behavioral Intervention Supports (SWPBIS), and Social-Emotional Learning (SEL). These intervention structures identify students who demonstrate unwanted behaviors, and the interventions explicitly teach correct behavior (Debnam et al., 2012; Horner & Macaya, 2018; Sugai & Horner, 2009). The unwanted behaviors could be related to academics, compliance to expectations, or social interactions. Many schools use RtI as a structure for identifying and intervening with students' academic needs, SWPBIS to address the behavioral expectations and consequences for students, and SEL programs to support and teach expected social behaviors and skills. RtI is a tiered structure within schools to identify students who struggle with academics, originally reading, and provide increasingly intensive interventions until they demonstrate

academic proficiency (McKenzie, 2010). RtI interventions usually include specialized programs or classes that explicitly teach deficient skills. If students continue not to make progress, they are referred for special education services and may be removed from the general education settings (Fuchs & Fuchs, 2006; Kavale & Spaulding, 2008). SWPBIS is a system that prevents problem behaviors and teaches social competency (Flannery et al., 2013). SWPBIS relies on school-wide initiatives that model and reinforce appropriate behaviors and discourage or discipline unwanted behavior (Eklund & Tanner, 2014; Noltemeyer et al., 2019). The research suggested that SWPBIS systems do not consistently align with disciplinary procedures, which results in student exclusion from learning environments when they do not meet the expectations for behavior (Bottiani et al., 2018; Haymovitz et al., 2018). SEL is defined as supports and interventions that enhance students' ability to think, feel, and behave (Zins et al., 2007). Students are explicitly taught social competency skills designed to change student behavior. However, when students' behavior does not match the expectations, either disciplinary actions occur, or students are removed from learning environments to receive additional support for social/emotional skills (Higa-Mcmillan et al., 2016).

The goal of MTSS is to teach behavior so that students can attend to the classroom to develop the cognitive skills, social awareness, and decision-making skills to be effective in schools (Bohanon et al., 2006; Scott et al., 2010). Researchers claim that student learning increases when student behavior improves (Eklund & Tanner, 2014; Freeman et al., 2016; Horner & Macaya, 2018; Sugai & Horner, 2009). Researchers use reduction in unwanted behavior, specifically reduction of office discipline referrals, to measure changes in behavior that support the effectiveness of the MTSS (Eklund & Tanner, 2014; Flannery et al., 2014; Goldberg et al., 2018; Horner & Macaya, 2018).

Cognitive Psychology Assumptions

The theoretical foundation within MTSS systems is based on the cognitive psychology assumption that teaching and learning are the same (Bohanon et al., 2016; Sink, 2016). One assumption is that teaching and learning are viewed as the same process because learning is measured by the student's ability to create products (learning) that match what the teacher has taught (Arwood & Robb, 2008; Hadie et al., 2018; Maniglia, 2017). This assumption also relies on associative learning or reinforcement learning (Gallistel & Matzel, 2013). MTSS models intend to reinforce appropriate student behavior.

The dominant theoretical approach to learning in MTSS structures is that students learn to behave through reinforced expectations (Horner & Macaya, 2018), improving student achievement. The relationship between behavior and learning is a result of modeling expected behavior that students are encouraged to practice (Horner & Macaya, 2018), which is an aspect of behaviorism theories (Bargh & Ferguson, 2000; Forsyth & Eifert, 1996) and is commonly referred to as an input-output type of learning (Arwood & Young, 2000; Gallistel & Matzel, 2013; Robb, 2016). However, an MTSS based on language acquisition (NsLLT) would consider using language for improved literacy, where thinking also improves behavior.

Measure of Student Success

MTSS can support all students when the structure matches that of clinical models that prevent, intervene, and care for all students' needs when the priority of the systems is to identify and address the barriers to learning, like inappropriate behavior, limited social skills, and mental health challenges. To support the complex needs of all students, schools need to focus on removing barriers that prevent students from being successful (Adelman & Taylor, 2002). There needs to be a systematic way of identifying, intervening with, and supporting all students

(Adelman & Taylor, 2002; Atkins et al., 2010; Kilgus et al., 2015). MTSS systems, typically, require a process of universal screening that will identify academic, behavioral, or mental health concerns (Splett et al., 2018). However, some screening methods may only identify academic and behavioral concerns. In some situations, students who are screened and identified as needing additional intervention are labeled as at-risk and often leave general education settings for alternative schools (Mellard et al., 2016). In other cases, as a result of how MTSS structure addresses academic, social, behavioral, or mental health concerns, students receive disciplinary consequences that exclude them from learning environments (Kearney & Graczyk, 2014; Vincent et al., 2011). Because systems identify behavioral deficits rather than learning strengths (Kilgus et al., 2015; Kilpatrick et al., 2018), identifying how students learn through their strengths lacks the systematic evaluation of student barriers in typical MTSS systems (Romer et al., 2018).

MTSS systems typically measure student success through retention, achievement, and behavior referrals. If a student lacks in one of these areas, then explicit teaching is used for achievement and/or behavior/social skills. Achievement is typically measured through grades and through standardized achievement tests. Typically, grades are derived from how well students can match the products related to what was taught (Lalley & Gentile, 2009). This is commonly referred to as an input-output model of teaching and learning (Commons et al., 1998; Gallistel & Matzel, 2013; Jaskowiak, 2018; Robb, 2016). The input of academics is given in explicit teaching of skill sets or patterns that students will give back. This paired learning is increased through a system of reinforcement in a social context (Bohanon et al., 2006; George et al., 2003). The interdependence between achievement and behavior uses the same assumptions. For example, an improvement in achievement results from improving behavior and/or social-

emotional skills (Wiest et al., 2001). Moreover, the improved behavior should show better achievement. However, the studies related to SWPBIS and SEL programs have mixed results as to the effectiveness of these intervention models on the academic success or achievement of students (Becker & Domitrovich, 2011; Bradshaw et al., 2010; Domitrovich et al., 2008; Goldberg et al., 2018; Noltemeyer et al., 2019). There is limited consistency in the teaching of social skills related to academics, and there is limited standardization of what constitutes appropriate social/emotional behavior (Eklund et al., 2018; Horner & Sugai, 2015; Sugai & Horner, 2009).

MTSS systems also track student retention to measure the success of interventions (Flannery et al., 2014; Swain-Bradway et al., 2014; Zaff et al., 2017). One purpose of MTSS structures is to reduce the number of students who drop out of school. Retention in education is the idea that students remain in school and are successful instead of struggling in school and dropping out. Retention is a common measurement of school success and is often used to measure the effectiveness of school-wide support systems (Saenz, 2013; Sulkowski & Michael, 2014b). However, research is mixed as to the effectiveness of school-wide intervention systems on high school retention. It is clear that student dropout rates result from failures within the system and that increasing attendance should improve retention, but additional connections are limited (Freeman et al., 2015; Jean-Pierre & Parris-Drummond, 2018). Much of the challenges to implementing MTSS structures in high school settings is aligning the interventions to the discipline systems. When removal from school is the primary disciplinary action, it is challenging for educators in those systems to teach students (Bradshaw et al., 2010; Flannery et al., 2009; Horner & Macaya, 2018). Improving retention and discipline systems are often counterproductive, requiring students to maintain pro-social behaviors in a system that relies on

rewards and punishments that may not be implemented pro-socially (Haymovitz et al., 2018; Jean-Pierre & Parris-Drummond, 2018). For students to remain in school, skills for appropriate behavior and social skills must be taught, but research suggests that even in well-implemented MTSS programs, retention of high school students is still problematic (Flannery et al., 2014; Sulkowski & Michael, 2014b). Research studies also suggest that alternative schools with inclusive meaningful supports are a common resource for students who were unsuccessful in MTSS schools (Pirttimaa & Hirvonen, 2014).

Methods for Interventions

One of the challenges schools face when implementing an MTSS model is the fidelity of implementation (Bruhn et al., 2015). Since there are various strategies and methods used to support students within typical MTSS, the fidelity of implementation can vary. Some examples of utilized strategies include classroom behavioral management (typically a system of rewards to reinforce appropriate behavior), or the Good Behavior Game (GBG) or Check-in Check-out (CiCo) systems for additional reinforcement of appropriate behaviors (Adamson et al., 2019). Some of the methods used to address mental health concerns and social-emotional struggles include Functional Behavioral Analysis (FBA) and Cognitive Behavioral Therapy (CBT), both of which are rooted in behaviorism principles. Social-emotional learning strategies include various classroom curricula focused on multicultural relationships or emotional regulation skills (Durlak et al., 2011). Many SEL programs are specific to an area of need, like bullying prevention programs, suicide prevention programs or groups, and restorative practices (Acosta et al., 2019; Benner et al., 2013; Mok, 2019). Despite the plethora of programs, strategies, and methods for teaching social skills and behaviors, there is a lack of assessments to measure effectiveness.

Identification of Needs

Part of what makes an MTSS a systematic approach to intervention is the means of identifying and measuring student need. Although the input-output model of learning can lead to deficit-based reactions to behavior and learning, most MTSS research suggests these systems effectively support student success (Horner & Sugai, 2015; Mcintosh et al., 2006; Walker et al., 1996). The deficit-based procedures of most MTSS suggest that systems for intervening with student needs are not fully equitable since the students identified in need are those with deficient skills. Students who are perceived as deficient in an academic or social area are subsequently affected by disciplinary consequences. The deficit-based reactionary nature of discipline limits the equity of interventions. Despite these limitations, research supports MTSS structures as effective means of supporting retention, achievement, and behavior. This suggests MTSS structures may be effective in terms of student success measures without necessarily providing inclusive learning environments that support all students' learning needs. Therefore, the disconnection between student success measures and learning may result from the theoretical foundation of learning within MTSS systems.

Similarities between MTSS and NIS

One similarity between the NIS and typical MTSS models is the public health structure of systemization (Bradshaw & Pas, 2011; Sulkowski & Michael, 2014b). The systemization includes the identification of students' needs. However, the NIS uses different tools to identify student needs (McIntosh et al., 2010): progress monitoring, providing intervention, and using data collected throughout the process to monitor, change, and address student success (Bradshaw & Pas, 2011; Mellard et al., 2012; Walker et al., 1996b). Like most school-wide systems, the NIS incorporates learning opportunities for staff to create a shared language and common

understanding of the initiatives and supports used to encourage student success (Dulaney et al., 2013). Based on the research discussed previously, the NIS measures student success using the three most common success factors used to show the efficacy of MTSS: behavior, retention, and attrition. The previously mentioned research also suggested that inclusive practices are becoming important aspects of intervention systems (Goldberg et al., 2018). Due to the school's Career and Technical Education perspective, where the NIS is implemented, inclusive practices are even more necessary because there are no options for removing students from the learning environment and very limited options for providing alternative learning experiences (Theobald et al., 2019). Some models of intervention like RtI are specifically intentional about creating alternative learning environments rather than strictly inclusive environments (Fuchs & Fuchs, 2017). Even where the NIS is similar to typical MTSS, there are significant differences.

Difference between MTSS and NIS

As the previous research has demonstrated, the main difference between the NIS and typical MTSS is the theoretical approach to learning. Research into MTSS models showed no systems that incorporated the NsLLT as a framework for learning. The NsLLT provides a theoretical basis for learning that moves beyond rote or associated learning to conceptual learning mediated by language for long-term or semantic memory (Arwood, 2011; Arwood & Young, 2000; Lam, 2017; Robb, 2016; Spencer, 2017). Because of this foundational understanding of learning, staff throughout the CTE school are using VLMs and strategies that support visual metacognition of students to help students acquire conceptual thinking and language rather than using reinforcement or skill development to teach students appropriate behaviors (Adamson et al., 2019; Spencer, 2017). The paraprofessionals, administration, and many of the teachers understand how students learn neurobiologically and socially due to

professional development and coaching conversations related to the principles of learning from the NsLLT. As a result of understanding learning principles, the staff can provide supports and interventions that build upon meaningful experiences in highly contextual/relevant classrooms so that students can build semantic relationships between what they are learning and doing. These meaningful, relevant, and practical learning experiences and supports that align with the students' learning abilities allow students to access long-term semantic memory. This is different from many intervention programs with typical MTSS, which rely on practice, repetition, and reminders to maintain appropriate behavior or social skills (Benner et al., 2013; Pitts et al., 2018). Table 2.1 illustrates the differences between the NIS and typical MTSS.

Table 2.1

Synthesis of Learning Theory and Methods

MTSS	NIS	Methods
Sensory input: Sensory input for learning is acoustic input (sound) and visual input (Anderson, 2015).	Level one learning – Sensory input: Sensory input results in different mental images (Damasio, 2003). Neuroplasticity is related to a person's ability to integrate sensory input (Boyce, 2016). Sensory input must be integrated neurologically (Stevenson et al., 2014).	In American education, classroom instruction is typically very auditory (sound-based with limited context) (Robb, 2016). Classroom instruction and interventions can include more visual features (visual sensory input) (Lam, 2017; Robb, 2016; Spencer, 2017). Associative memory accessed through pattern repetition (Anderson, 2015; Anderson & Bower, 1972; Anderson & Spellman, 1995).
Perception: "stimulus features and context combine to determine perception" (Anderson, 2015, p. 49). Perception is closely linked with the Theory of Mind, which connects behavioral output or actions with how the brain experiences perceptions (Gallistel & Matzel, 2013).	Level two learning – Perceptual patterns: "The greater the subjective need for a socially valued object, the greater the role of behavioral determinants of perception (Bruner & Goodman, 1947, p. 39). Perceptional patterns are multimodal – acoustic and visual or visual and visual (Ghazanfar & Schroeder, 2006; Robb, 2016).	Perceptual patterns are formed through overlapping sensory input (Arwood, 1991, 2011). Patterns need to be copied, replicated, practiced, or reinforced to maintain (Anderson, 2015; Arwood, 2011; Arwood & Kaulitz, 2007; Bookheimer, 2002; Robb, 2016).

The MTSS do not have a third or fourth level of learning	Level three learning – conceptual circuits: Perceptual patterns layer to form visual or auditory conceptual circuits (Arwood, 1991, 2011).	Methods to acquire conceptual learning include Viconic Language Methods (Lam, 2017; Merideth, 2017; Robb, 2016; Spencer, 2017). Literacy is a means of identifying conceptual learning; literacy includes the ability to: read, write, view, speak, think, listen and calculate and draw (Robb, 2016).
	Level four learning – language function: Language names concepts through a social process of refinement and acquisition (Arwood, 2011; Pulvermüller, 1999; Pulvermüller, 2012). Language networks are the connection of multiple semantically related conceptual circuits (Pulvermüller, 2005).	Methods for acquiring language include natural language, or a persons' thinking used to refine conceptual relationships. Concepts are acquired through meaningful connections, semantic refinement, practical application of learning (Arwood & Robb, 2008; Lam, 2017).

Conclusion

Neurobiologically, conceptual learning is a process of acquiring language through four levels of learning: sensory input, perceptual patterns, concepts, and language. Learning is also a socio-cognitive process in which pro-social learning is acquired through the assignment of meaning in relevant and contextual ways. Conceptual learning utilizes long-term semantic

memory. The NIS uses intervention methods that empower students to learn how to think and behave pro-socially and acquire industry-academic language within meaningful, relevant, practical classrooms. Therefore, if the NIS is effective, then behavior, achievement, and retention measures of success should continue to improve.

Chapter 3: Research Design and Methodology

This chapter provides the research design and data analysis methods used to address this research's purpose and support the specific research questions. The purpose of this study was to investigate in what ways the Neuroeducation Intervention System (NIS), a school-wide intervention system that focuses on conceptual learning, is effective, as indicated by multiple measures, including staff perceptions, program completion (retention), industry certification (achievement), and appropriate behavior (referrals). As an active participant in this research the methodological approach and the research design provide a distinct explanation of my role in implementing the NIS and my role as a researcher investigating the efficacy of the system (Spradley, 1980). The methodological approach of this research aligns with Creswell's (2013) definition of a case study "as a qualitative approach in which the investigator explores a bounded system (case)… over time through detailed, in-depth data collection involving multiple sources of information" (Merriam, 2016, p. 40). As a case study the interviews are the primary source of information to build the rich description of the NIS. The quantitative institutional data analysis was approached descriptively to add to the case. The case study approach to this research was used to provide a thorough and rich description of the NIS, including the neuroeducation focus within special education prior to 2019-20 school. Since the NIS is a theoretical framework developing an understanding of the case and how it changed was necessary to investigate the research questions in this study. The NIS is a single-bounded case; it is bounded within the CTE school for the 2018-2019 and 2019-2020 school years. The investigation of the case included a descriptive approach to analyzing the data from multiple sources of information to develop the rich description and themes of the case (Merriam, 2016). The case study sources of information included interviews with the Intervention Team (three administrators, one instructional coach and

one success advocate), and three teachers who piloted Neuroeducational classroom practices as part of the special education interventions before the implementation of the NIS in the 2019-20 school year. The institutional data includes two years of institutional student data from 2018-19 and 2019-20 for comparing student success factors, including achievement (certification and grades), retention (attrition and grades), and behavior (office discipline referrals). A qualitative descriptive analysis of staff interviews was supplemented with a descriptive analysis of quantitative data related to behavior, retention, and achievement to create a rich description of the Neuroeducation Intervention System to address this study's research questions: In what ways is the NIS effective based on perceptions of staff along with measurements of retention, achievement, and behavior referrals? The following questions support the overarching research purpose: In what ways is the NIS effective?

1. What are the perceptions of the staff (intervention team and teachers piloting language-based interventions), as indicated by virtual one-on-one interviews and supported by their shared evidence of what they did with the language strategies through shared artifact exhibits?
2. In what ways did the students' program completion (retention) change after the implementation of the NIS, as measured by student attrition data (student withdraw count and reason) and program completion grades?
3. In what ways did students' industry certification (achievement) change after implementation of the NIS, as measured by industry certification exams (program-specific exams and 21st-Century certification) and college/industry equivalency grades?
4. In what ways did student behavior change after the implementation of the NIS, as measured by office discipline referrals?

Setting & Participants

The CTE school in this study was a unique general education setting. As a consortium school, the CTE school contracted with multiple school districts within the county, serving a geographically broad and culturally diverse region. It served juniors and seniors in high school for half the day, the other half of the day students spent at their comprehensive sending school. The CTE school had 15 career and technical programs, ranging from cosmetology to construction and medical science to engineering. Each program had student success measures, including specific industry certifications, development of industry language, and skills and professional behavior. Due to the CTE school's unique attributes, the structure of the NIS was created to align with the program and consortium requirements of the school. The CTE school has a moderate sized staff there are 23, with 3 paraeducators and 12 pro-techs (industry specific paraeducators).

The participants in the interviews included three teachers and the intervention team, composed of the three administrators at the CTE school, the instructional coach, the student success advocate. Due to the role of the intervention team in implementing the NIS, this team's perspective was crucial for developing a rich understanding of the effectiveness of the NIS. In addition, three teachers who have been piloting language-based support methods within the programs for at least all of the 2019-2020 school year were included in the interview process to provide a teacher perspective on the efficacy of the NIS. The administrative perspectives on the efficacy of an MTSS may be limited due to the inherent interest in success. Therefore, teacher perceptions are additionally beneficial in creating a holistic description of the efficacy of the NIS (Erickson et al., 2012). Although the special education team was part of the intervention team, they were not part of the interviews. The special education team has operated with a

neuroeducation intervention framework for many years. Due to my supervisory role with the paraeducators, the paraeducators were excluded from the interview portion of this research.

The interview participants were chosen for a number of reasons. They participated in the study as part of a convenience sampling, in that they were available to participate in the study as part of the present (2020) staff. The participants also represented the varied perspectives of the intervention team including teachers, administration, classified staff, and instructional support. The participants in the interviews are representative of the work experience of the staff at the CTE school and provide a variety of expertise. Of the 23 teachers at the school, seven teachers were piloting neuroeducational strategies at the start of the 2019-20 school year and were currently employed at the CTE school at the start of the 2020-21 school year. The staff that participated in this study had an average of 8 years working at the CTE school ranging from 1 year to 17 years. The teachers averaged 10 years at the school. The staff had over 20 years on average of experience in education. All but two of the staff had some professional development training (outside the CTE school) in neuroeducation and the NsLLT (both administrators without neuroeducation background were employed at the CTE school less than 2 years at the time of the study).

Qualitative Data

Data Collection

The following data were collected between August 26, 2020 (when the IRB approved the research study) and October 31, 2020. The staff interviews were conducted in October using an interview protocol with six questions designed to identify staff views and perceptions on the efficacy of the NIS during the 2019-20 school year. See Appendix B for the interview protocol.

The staff that was interviewed included three CTE teachers (T1, T2, and T3), the student success advocate (A5), the instructional coach (A4), and three administrators (A1, A2, A3).

The qualitative data collected for this study included Zoom recorded interviews with each of the 8 participants. Each interview was approximately 30 minutes. The Zoom platform used to conduct the interview recorded and transcribed the interviews. An interview protocol was used for each of the interviews; see Appendix B. During the interviews, all of the staff referenced specific artifacts or stories in their discussion of the NIS. These artifacts were collected and included for analysis in Chapter 4. All of the referenced artifacts were collected either from the NIS shared Google Drive or from intervention files collected by the Intervention Team as part of the institutional data of the NIS. To add to the rich description of the NIS, artifacts saved as institutional data in the shared Google Drive or in files by the intervention team were included for analysis. As the interviews were conducted, if the participants referenced artifacts or the use of specific language-based strategies collected as part of the NIS data monitoring process, then the referenced artifact or document was collected for analysis. In addition to referenced artifacts interview memos notes were collected. The following is a description of the artifacts and documents collected within the NIS data monitoring process that *could be* referenced during participant interviews. The intervention team collected notes, student work samples, and teacher correspondence in a shared Google Shared Folders. A Google Sheet was used to track the type of intervention and effect of the intervention on student learning as part of the progress monitoring protocol. Additionally, examples of classroom instruction using VLMs and metacognitive learning strategies were collected by the intervention team as part of professional development and instructional coaching, these artifacts were recorded and shared through Google Shared

Folder. Not all of these sources of data were included in analysis but were available for use if referenced by the participant during the interview.

To address the purpose of this study: In what ways is the NIS effective? Research Question 1 allowed the researcher to understand, using themes from the interviews, the staff perceptions regarding their thinking about the NIS effectiveness. The interviews with the staff were designed to elicit responses regarding the perceptions of participants related to the implementation of the NIS, the stories and examples of student supports and interventions, the use of language-based interventions, and the perceptions of students' success to develop an understanding of staff perceptions regarding the efficacy of the NIS (Appendix B). The participants were asked the following questions:

1. Please share what it was like to transition to the NIS.
2. Based on your role within the school, how do you think the NIS has affected students in terms of learning, behavior, achievement, or retention?
3. Thinking back to the 19-20 school year when students were on campus (pre-COVID), tell me about what you saw from students, in terms of learning, as a result, or part of the school-wide intervention supports.
4. Please share any stories, examples, or artifacts that relate to your understanding of language-based interventions to support student success.
5. How do you think the NIS is the same and/or different from the supports or interventions provided prior to the 2019-20 school year?
6. Can you share any additional artifacts or stories that you think highlight the effectiveness of the NIS?

This research study was conducted in a shortened time frame due to the increased challenges educators at the CTE school faced with distance learning policies related to COVID-19. The Institutional Review Board (IRB) approval was received on August 26, 2020, to start the research (see Appendix A). Once the study was approved, it was imperative to collect the data quickly, especially the interviews, since the case-study was bound to the 2018-19 and 2019-20 school years, and the 2020-21 school year was about to begin. The institutional data, including student grades, office discipline referrals, industry certification exams results, and student attrition data, were collected from the registrar on August 28, 2020. The next key step in the process was to schedule and conduct interviews with the CTE school staff. The first step was to invite the teachers who piloted language-based intervention strategies in the classroom as part of the special education inclusive practices prior to the implementation of the NIS. During October, the interviews were scheduled with all three administrators, the instructional coach, and the student success advocate and three participating teachers. After conducting the interviews, they were transcribed and sent to each participant for the option to member check. The following section describes the methods and process for the qualitative data analysis.

Data Analysis

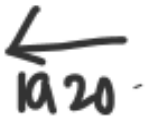
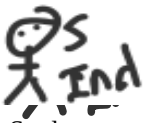
To develop a thick description of the NIS, the researcher analyzed multiple sources of data from within the NIS at the CTE school and established themes that were aligned to the review of the literature. The interviews discussed previously were analyzed to addressed Research Question 1: What are the perceptions of the staff (intervention team and teachers piloting language-based interventions), as indicated by virtual one-on-one interviews, and supported by their shared evidence of what they did with the language strategies through shared artifact exhibits? The staff responses provided a basis for both a description of the perceptions of

staff related to efficacy and an understanding of the theoretical approach to conceptual learning as the basis for the NIS.

The analysis of these interviews was supplemented with artifacts referenced by participants and related to each participant's experience. The interviews and artifacts were analyzed inductively using Saldaña's first and second cycle coding to identify themes (Saldaña, 2013). According to Saldaña, the first cycle of coding was a descriptive coding process to identify codes (Saldaña, 2013). As a researcher with a visual-movement access learning system, I did not use a software program for the coding process. Rather, I used conceptual images/drawings to describe each comment in the interviews. The first cycle of coding was a descriptive almost verbatim visual cartoon of the participant responses. The visual cartoons were refined into representative visual images (much like phrases would be condensed into words, only the visual images allowed for conceptual consistency). Through the reiterative process of refining the codes, these conceptual images were refined into a representative image that became a code used to describe each participant's response. There were 18 codes that appeared consistently through staff responses. Table 3.1 shows the descriptive codes that were identified through a reiterative analysis of the interviews and artifacts. The codes are visual representations of the concepts described by the participants during the interviews. The chart also shows themes that were formed from the codes.

Table 3.1

Visual Codes and Themes

Theme	Visual descriptive codes				
Theme One: NIS Structure					
Description	The support structure or systems of organizing supports and interventions	Referenced previous school years, including support and special education	Means of identifying student needs and strengths	Reference to support, intervention, or identification of student and staff needs	
Theme Two: Roles and Relationships					
Description	Reference to teacher support and staff empowerment	Described roles and responsibility of the intervention team	Unified approaches and teamwork of staff	Relationships between students, teachers, intervention team, and administration	Consistency, reliability, trustworthiness of staff to teachers and students
Theme Three: Theoretical Application					
Description	Products, outcomes, results of teaching and learning	Discussion of learning and conceptual thinking	Reference to memory, learning, and retention	Described theoretical principles of learning, referenced NsLLT	The described use of VLM or time management or other language-based interventions
Theme Four: Student Success					
Description	Referenced students' success when they trust others.	Student independence, individual strengths, and supports	Student empowerment encouragement, professionalism	Reference to all students or any student being successful	

As part of the second cycle coding process theming, I used the Viconic Language Method of flowcharting to thematically (rather than categorically) organize the codes into themes. By visually organizing the theming process, each code was sorted into a theme based on similar contextual features. Each of the themes established provided an interpretation of the interviews that allowed for a robust analysis of the NIS. The artifacts were analyzed and matched to the established theme during the second cycle of the coding process.

The purpose of analyzing staff perceptions on the efficacy of the NIS, including implementation, examples, language-based interventions, and student success as part of the NIS, was to provide a description of the intervention system's design. The purpose of the NIS was established by providing the theoretical alignment to the neuroeducational framework and providing context and description of how the NIS focuses on conceptual learning as a fundamental component of the NIS, different from the other MTSS.

Quantitative Data

Data Collection

The following section addresses the methods for investigating Research Questions 2 through 4. As a single case study, the second source of information used to develop an understanding of the efficacy of the NIS was the student success data collected by the CTE school. According to the MTSS research, student success data is used to evaluate school-wide support systems (Becker & Domitrovich, 2011). For this study, the student success measures are retention, achievement, and behavior, which align with the typical measures addressed in the literature (Bottiani et al., 2018). Descriptive statistics of grades and student attrition (withdraw) data were used to describe program completion to show retention. Descriptive statistics of program-specific certification exams and 21st Century Certification and grades were used to

describe industry certification to show achievement, and descriptive statistics of the number of office discipline referrals were used to describe behavior. All of these institutional data were collected for the 2018-19 school year before the NIS and the 2019-20 school year, the first year of the NIS.

The Research Question 2 is: In what ways did student's program completion (retention) change after the implementation of the NIS, as measured by student attrition data (student withdraw count and reason) and program completion grades? To address this question, retention was measured through school-wide attrition data, which included the number of students withdrawn and the reason for withdrawing provided by the student or counselor along with academic grades. Before the NIS, when students withdrew from the CTE school, the student or counselor was required to provide a reason for the withdrawal; this information was recorded with the school registrar as part of the process for allowing the student to return to the sending school.

As part of the NIS data tracking process, for students to withdraw from the CTE school, each student must meet with an administrator to identify if there were alternatives to withdrawing. Also, students or the administrator who met with the student completed an exit survey that included the reason for withdrawing. Additionally, within the protocols of the NIS, the exit survey included additional questions, and teachers were also given the opportunity to complete a survey identifying why the student withdrew from the program. This study collected both the number of students who withdrew prior to the end of Semester 1 for the 2018-19 and 2019-20 school years and the reasons for returning to the sending schools. The data were collected and recorded by the registrar at the school and were shared with the administration and

the intervention team. The reasons for students withdrawing were coded into themes that represent the top reasons students left the CTE school.

In addition to the number of students who withdrew from the CTE school and the reasons for withdrawing, retention was also measured through program completion. Student success at the CTE school is more than simply maintaining enrollment. It is about successfully completing the program with a passing grade (A, B, or C). At the CTE school, special education students can also receive a P (passing) grade. P grades are given with approval from the sending school and special education team because the student was receiving modifications to the curriculum in line with their IEP. P grades were only given to students receiving Level 3 intervention within the NIS. For program completion, A, B, C, and P grades were considered as completing the program. This study analyzed Semester 1 grades for the 2018-19 and 2019-2020 school years. Semester 1 grades were used to show program completion to maintain consistency of comparison. As a result of COVID-19 and remote learning policies during the 2019-20 school year, students were not allowed to receive a grade lower than what they received at Semester 1. The registrar recorded all of this data, and it was shared with the administration and the intervention team.

The Research Question 3 is: In what ways did student's industry certification (achievement) change after implementation of the NIS, as measured by industry certification exams (program-specific exams and 21st-century precision exams) and college/industry equivalency grades? To address this question, the CTE school collected student achievement data, much like typical MTSS systems, by analyzing standardized test results and grades. The 21st Century Certification is a standardized exam that the CTE school used as a measure of industry certification along with program-specific industry certifications. Students take the 21st-Century Certification at the beginning of the school year and again at the end of the school.

Students who did not receive a certification on the posttest have the option of re-taking the exam an additional time before the end of the school year. Students need a 76% to receive a passing grade and certification. Each program also has industry-specific certifications taken by students. These data were reported to the administration. The registrar also recorded this data. For this research, certification scores from the 2018-19 and 2019-20 school years were used to compare certification as a measure of achievement from prior to the NIS (2018-19) and during the NIS (2019-20) school years. The COVID-19 pandemic placed restrictions on collecting data from 21st-century certification testing at the end of the 2019-20 school year, along with limited testing opportunities for industry-specific exams. The available data were sorted and organized to compare industry certification for students receiving special education support prior to the NIS (equivalent to level two and three intervention), for all students within the school prior to the NIS (equivalent to level one), and for all students within the school after the NIS. This allowed for distinctions between improvement based on the intervention and methods associated with the NIS.

In addition to certification exams, college/industry equivalency grades were used to measure achievement. At the CTE school, B or better grades are required for college/industry equivalency. Therefore, only A and B grades are included for achievement data for the purpose of this research. Semester and final grades were used to show changes in achievement between the 2018-19 and 2019-20 school years to provide additional information about the effectiveness of the NIS on student achievement. COVID-19 grading policies influenced grades but not necessarily college equivalency for the end of the 2019-20 school year.

The Research Question 4 is: In what ways did student behavior change after the implementation of the NIS, as measured by office discipline referrals? Office discipline referrals

collected by the administration at the CTE school were used to address this question. Prior to the NIS, discipline referrals were handled by an administrator or the special education teacher. When the administration was involved in a discipline-related issue, there was a discipline referral form completed; these files were stored with the administrators and were used to count the number of discipline referrals each year. Prior to the NIS, behavior-related issues that did not warrant administrative involvement were handled as part of special education intervention using classroom support strategies. These behavior incidents were recorded using the special education support data tracking procedures (a shared spreadsheet for support and interventions). As part of the NIS, there is a school-wide protocol for referring students to administration for discipline or behavior-related issues. Teachers could fill out a referral sheet and give it to an administrator or, typically, teachers email or call the administrator and explain the situation. The administration records these behavioral referrals through a data tracking spreadsheet. After the implementation of the NIS behavior, each incident was addressed concerning safety, thinking (cognition), and social/interpersonal relationships. Many behavior-related issues were discussed during regular intervention team meetings to establish appropriate support for the students. To report behavioral concerns, teachers could call, email, complete a referral form, complete a support form, or talk to someone on the intervention team to identify behavioral concerns. All concerns were recorded and documented on the intervention team tracking sheet and paper copies of all written discipline referral sheets used by the administration. If the student's behavior violated a safety policy, the student was suspended. However, all other behavior-related referrals were incorporated into the support system, and students were provided appropriate language-based interventions. For the purpose of this study, the number of office discipline referrals was compared for the 2018-19 school year prior to the NIS with the 2019-20 school year that started the NIS. Office discipline

referral data included a comparison of written office discipline referrals using the administration files to mark the reason and the number of discipline referrals, along with discipline and behavioral supports recorded through the special education data tracking protocol, for the 2018-19 school year. Office discipline referrals recorded through the discipline referral protocol recorded by the administration and the Intervention Team were used to mark the reason and number of discipline referrals for the 2019-20 school year.

Data Analysis

The following sections describe the process for analyzing student success factors as part of the rich description of the NIS. The descriptive statistics for program completion, industry certification, and behavior were analyzed in relation to the Review of Literature to address Research Questions 2 through 4.

To manage the data, I used Excel to organize raw data. Student grades were provided as an Excel sheet with categories for student program, semester one grade, semester two grade and special identification code (this included special education, 504, ELL and transition). To organize this data A, B, C, and P grades were counted for student program completion and A and B grades were counted for industry completion. The grade counts included semester one and semester two for both the 2018-19 and 2019-20 school years. Industry certification and 21st certification scores were similarly provided in an Excel sheet. This data was organized by program. A separate special education certification Excel sheet was used as a comparative sheet to establish how many students in each program received industry certification and program certification and how many of those students receiving certification were in special education. Both industry certification and 21st Century certification results were then sorted and counted for the 2018-19 and 2019-20 years and disaggregated by special education. Office disciple referral data for the

2018-19 school year were provided as a list of ODR's and reasons from the administration files. ODR data for the 2019-20 school year were sorted from the NIS Data Tracking Tool (a Google Excel form). The sort included the category of behavior from the intervention type tab. These data were compared to the special education data tracking tool (separate but similar data collection tool) to confirm consistency in behavior related interventions for special education students and general education students. Within the NIS Data Tracking Tool students marked as receiving behavior related support had notes specific to the reason for referral/support, which made the data comparable to the 2018-19 school year.

Comparison of these data illustrated changes in student success after the implementation of the NIS. The data were sorted and organized to compare student retention for students receiving special education support before the NIS, for all students within the school prior to the NIS, and for all students within the school after the NIS. The analysis of this source of information informed the description of the NIS and added valuable context and description of the efficacy of the NIS, especially in relation to student retention within the CTE school.

Again, these data were sorted and organized to compare student program completion for students receiving special education support prior to the NIS, for all students within the school prior to the NIS, and for all students within the school after the NIS. This allowed for distinctions between improvement based on the intervention and methods associated with the NIS. If the NIS is effective, then retention should improve. If students are conceptually learning at the CTE school, then it is believed that students who think at a higher level will be more likely to maintain at the school and have the language tools to complete the programs. The data were sorted and organized to compare student achievement grades for students receiving special education support prior to the NIS (equivalent to level two and three intervention), for all

students within the school prior to the NIS (equivalent to level one), and for all students within the school after the NIS. If the NIS is effective, achievement improves, both in grades and the number of students who receive industry certifications.

The office discipline data were analyzed to measure changes inappropriate behavior. The number of office discipline referrals were compared for the 2018-19 and 2019-20 school years. Additionally, the reason for the ODR or behavior-focused intervention was sorted and coded to analyze changes in the types of behavior that was considered inappropriate. If the NIS is effective, there should be a decrease in inappropriate behavior as marked by office discipline referrals.

Research Standards

To ensure my role as participant in this research did not bias the collection or analysis of data the following section explains the research standards implemented. According to Lincoln & Guba (1985), in qualitative research trustworthiness is when the findings are "worth paying attention to" which is enhanced with triangulation of data sources, member checks and credibility. The data collection and analysis were designed to provide multiple measures of data within a theoretical framework so as to create a robust and thorough description of the case. The triangulation of data included administrative perspectives, teacher perspectives, paraeducator perspectives, and institutional data. As part of the process of analyzing the data the coding and theme process was conducted using visual descriptions to accurately organize participant responses by cartooning statements, conceptually coding and theming using flowcharts. There was corroboration in the process of coding and theming through discussions with a group of doctoral students who have expertise in VLM's and coding methods. When the interviews were transcribed the participants were offered the opportunity to member check the transcript. Another

aspect of trustworthiness is based on the credibility of the researcher, as a member of the intervention team I have worked closely with the participants for many years and this provided me extended periods of engagement and observations of the participants (Lincoln & Guba, 1985) which allowed me to analyze the interview responses by describing what was said with an understanding of the context, without a biased interpretation of the responses. The data analysis process was very close to verbatim descriptions, both in the qualitative and quantitative analysis of the measures within the case (Saldaña, 2013). The essence of the study was to measure the ways in which the NIS was effective given the assumption that implementing a schoolwide intervention would have some effect on student success, especially given the trends of student success within special education at the CTE school. This purpose of this study was not to compare systems or evaluate a program therefore the data was analyzed and reported with as much alignment directly to participant responses as possible, which further separated any potential researcher bias from the analysis of the data. Furthermore, the deductively acquired themes were connected to research-based themes again providing a level of separation to address researcher bias.

Conclusion

The problem that this research is addressing is that typical MTSS focus on behavior rather than conceptual learning. In light of the theoretical difference regarding student learning, the CTE school established an intervention system that addressed how students learn to enable inclusive learning environments where conceptual learning was the focus of the school. As an alternative to typical MTSS, the NIS focused on conceptual learning using language-based interventions to support students in inclusive meaningful learning environments. The literature review showed that the theoretical foundation of the NIS provides intervention strategies that

enable students' conceptual language acquisition. Conceptual learning changes the focus of student intervention from reducing unwanted behaviors using associative memory and behavioral modification methods to using language-based tools and strategies, which access long-term memory systems to improve student success factors. The difference in methods, the efficacy of implementation, and perceived changes in student success were addressed through the Research Question 1. Additionally, the differences between the NIS and typical MTSS in terms of the theoretical foundation should result in improved measures of student success (retention, achievement, and behavior) as a school-wide system, similarly to the growth that was present in the special education supports that led to the development of the NIS. The following chapter explains the results of the multiple sources of information analyzed, including staff perceptions, program completion, industry certification, and appropriate behavior to establish a rich description of the NIS, to evaluate in what ways the NIS is effective.

Chapter 4: The Results

This chapter provides the outcomes of the research study. The purpose of this study was to investigate in what ways the Neuroeducation Intervention System (NIS), a school-wide intervention system that focuses on conceptual learning, is effective, as indicated by multiple measures, including staff perceptions, program completion (retention), industry certification (achievement) and appropriate behavior (referrals). To address this purpose, the researcher analyzed multiple sources of data from within the NIS at the CTE school and established themes that are aligned to the review of literature to address the primary research question: In what ways is the NIS effective based on perceptions of staff along with measurements of retention, achievement, and behavior referrals? The results for the following questions are presented in this chapter: Is the NIS effective?

1. What are the perceptions of the staff (intervention team and teachers piloting language-based interventions), as indicated by virtual one-on-one interviews and supported by their shared evidence of what they did with the language strategies through shared artifact exhibits?
2. In what ways did the students' program completion (retention) change after the implementation of the NIS, as measured by student attrition data (student withdraw count and reason) and program completion grades?
3. In what ways did students' industry certification (achievement) change after implementation of the NIS, as measured by industry certification exams (program-specific exams and 21st-Century certification) and college/industry equivalency grades?
4. In what ways did student behavior change after the implementation of the NIS, as measured by office discipline referrals?

The following analysis was organized into four sections, each aligned with a research question. The research outcomes are presented for each research question, through a rich description of the Neuroeducation Intervention System, including quotes from the staff interviews, artifacts from the NIS, and institutional data.

Research Question 1 Outcomes

What are the perceptions of the staff (intervention team and teachers piloting language-based interventions), as measured by virtual one-on-one interviews, and supported by their shared evidence of what they did with the language strategies through shared artifacts exhibits? The interview questions are referenced as IQ1 thru IQ6, with responses associated with specific follow-up questions are noted.

Theme One: The NIS Structure

Through the process of coding the interviews and artifacts referenced, one of the themes derived was the effectiveness of the support structure. All of the participants described the structure of the NIS as more organized, intentional, and inclusive than previous years. Although the teachers interviewed perceived the special education supports (of previous years) as effective, they all commented on the universal support and overall inclusivity of the NIS, as one teacher said the NIS "was organized in a way that addressed all students". All of the participants interviewed commented on the effectiveness of identifying students' needs and strengths. Regarding the process of identifying student needs, participant T3 explained:

We are capturing [identifying and providing support for] kids fast. Really fast like they are not getting more than a week behind, and we are figuring out who, what, when, where, why, and how we are going to capture [support] them. (CTE teacher, Fall 2020, IQ5)

Similarly, participant A3 explained the unique effectiveness of the NIS as a structure and process of helping students learn both individually and within the classroom:

[In the 2019-20 school year, the CTE school] slowly acquired new processes [school-wide support survey] and procedures [school-wide progress monitoring program] to help figure out what students need and how to help them, both from a learning support piece also from a classroom teacher perspective. (CTE administrator, Fall 2020, IQ1).

The school-wide support survey referenced by participant A3 was a Google survey sent to all students at the beginning of the year. The survey asked various questions to identify student strengths for learning, students' needs for social, emotional, or academic areas, and why they attend the CTE school. This survey and staff referrals are the basis for identifying students in need of level two or three interventions. Table 4.1 is an example of the student support survey with an example of the types of response students provide. This support survey is an example of one of the key components of the NIS that make it different from typical MTSS, which is the system of identifying student needs. The structure of the NIS allows for the identification of student needs before the risk of failure, through this survey.

Table 4.1

Artifact 1: Student Support Survey

Student survey questions	Randomly selected student response*
What do you do on a typical day?	On a typical day, I usually am working on the grand opening, learning about how to look, dress, act, move and be professional. Working on the silent auction because I had an internship at Simple Pleasure Events where, all we did is work on silent auction.
If you have an hour to work independently on a project/assignment, what does that look like?	Quiet and simple to do and if someone is loud and not making it easy for you to be focus, the teacher, Mrs. B., will get them to be quiet.
How will the program you have chosen help you reach your future goals?	I am want to become working on a cruise ship, that goes out into the Caribbean from Florida.
What do you need help with?	Time Management
What are your coping strategies (strengths)?	Focus, music, and a space to work where there's no one around me.
How well do you learn from lectures? 1: Not at all 2: OK 3: Very well	3

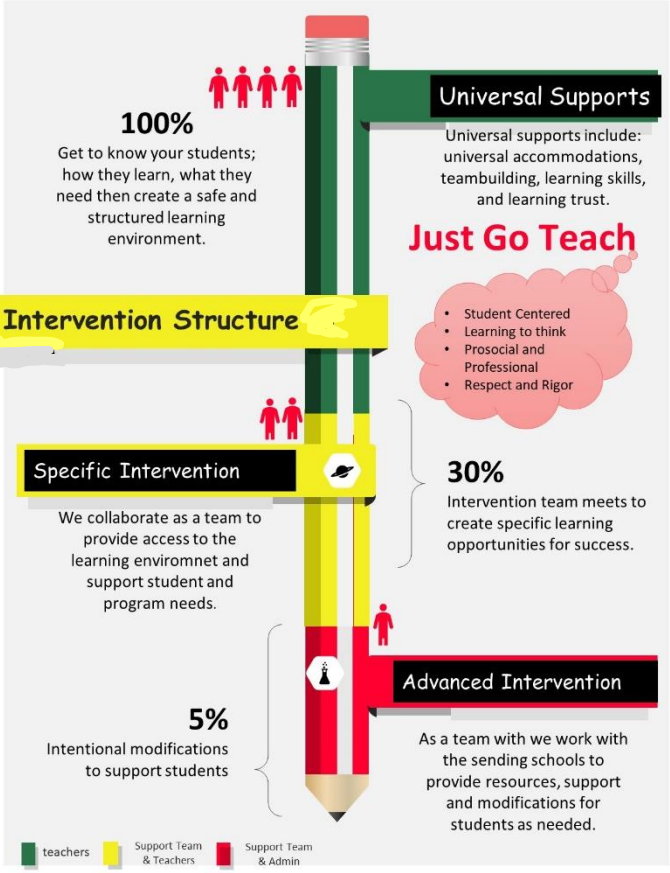
*note. The student response was selected using a random number generator, the number corresponded to a line on the Excel Student Survey Sheet.

The classroom teacher perception of the NIS focused on the level one classroom supports, and the observation that interventions were implemented more universally with the start of the NIS. Although the administrators interviewed observed that the implementation of the NIS was still in process, two of the three teachers referenced the NIS tiered system visual (Artifact 2, a visual aide to help teachers learn the structure and purpose of the NIS) as evidence of the efficacy of the implementation. In response to IQ1, participant T3 shared, "[The NIS] seemed more universal and it did seem more organized… it was easier to identify who really, really needs help and then moving down the colors to who just generally needs help vs. someone

who is in the red zone [Artifact 2: NIS Structure].” Figure 4.1 shows the similarities between the NIS and typical MTSS in terms of the levels of intervention. However, the strength-based conceptual learning focus of the NIS was evident.

Figure 4.1

Artifact 2: NIS Structure



At the beginning of the 2019-20 school year, Artifact 2 had been shared with the CTE school staff. The school’s administration defined and described each tier of intervention. The visual was designed through a collaboration among the instructional coach, special education liaison, and the student success advocate. The levels of intervention are very similar to typically MTSS tiers as designated by the public health model. The administration wrote the descriptions

of each tier to focus on conceptual learning. Most of the participants (7 of 8) referenced the tiered system of intervention or referenced this artifact as a means of understanding the leveled approach to interventions.

Two of the administrators referenced professional development training for the staff that explained Artifact 2 in terms of the NIS structure. The administration asserted that the structure of the NIS empowered teachers to focus on conceptual learning so that students could be successful in each program. One administrator explained that teachers were empowered to ask "Why [the] student wasn't being successful?... and then look they look at students that are struggling in a new way". One teacher agreed with this function of the NIS:

> The NIS worked by creating that school-wide all-inclusive safety net, as far as the strategies you guys [the intervention team through professional development] teach… because I was able to, not that I wasn't able to before, but I felt very free in telling people [students], hey if you don't understand this or if you feel like you don't get something I can connect you with a teacher and a team that would be able to really help you with strategies or just come in and check on you to make sure you are still doing ok. So, they didn't feel like they were just left out. (Participant T2, CTE teacher, Fall 2020, IQ5)

Both the administrators (2 of 3) and teachers (2 of 3) expressed that the structure of the NIS supported teacher knowledge of what interventions were available for students. The reference to strategies for supports may confirm that the emphasis on conceptual learning within each tier of intervention. Again, the structure of the NIS as a system to support teachers was explained by participant A4, in response to IQ2 (instructional coach, Fall 2020) illustrated the essence of the NIS as a systematic structure that empowers teachers to create meaningful learning environments so that all children can learn to think when she referenced professional development training that

started with the implementation of the NIS: “I think we were just starting to get the message across that the daily language intervention [VLM strategies and tools] are really what you could do in your classroom to support the majority of your students and I think there were people who learned from the experiences and implemented it [level one classroom VLM strategies] in a consistent way.” Professional development and support through the structure of the NIS allowed teachers to use VLMs to create inclusive, supportive classrooms.

Summary. The interviews with the staff at the CTE school provided context for the effectiveness of the NIS through discussion on the structures of the NIS. The staff perceptions included the belief that the NIS was more effective than the system in place before implementation in the 2019-20 school year (8 of 8 participants mentioned the NIS was “better” or “more intentional” than previous years in response to IQ1). However, the shift to remote learning in March due to COVID-19 limited the full implementation of the intervention system. The interviews showed that the staffs’ perception of the NIS was that it was an effective structure and system for allowing the intervention team and teachers to identify the needs of students and provide appropriate interventions so that all students had the opportunity and ability to think and learn.

Theme Two: Roles and Relationships

All participants shared that the NIS was effective because it empowered the intervention team and the staff to work as a team. The participants also mentioned that the focus of the intervention team and teachers on the relationships with students enabled students to be successful. Nearly all of the participants talked about how the structure of the NIS enabled the intervention team to support the teachers so that the teachers could support the students. Similarly, these participants also shared that the NIS as a system worked because it built on the

intervention team's strengths and teachers' strengths. The NIS's effectiveness was related to the emphasis on creating inclusive learning environments through meaningful relationships and student supports.

One attribute of the NIS is that the teachers and staff are as equally supported as the students. In response to IQ3, participant T3 described the NIS as "two different pieces, even though it's not. I feel like it's the pieces that I use to help my students versus the bigger shelter piece that are there to support me and the students." All of the teachers interviewed shared the idea that the NIS effectively provided support to the teachers and the students. Participant T1 summarized the importance of the consistent relationship-building aspect of the NIS:

> There was a consistency of the same person, which helped build that relationship with the students so that connection was there, they get to know who that student is and how the student's function so they can, again, give them the best service for them [the student] to be successful in their educational class. (Participant T1, Fall 2020, IQ5)

The NIS was seen to be effective not only because of the consistent relationships with the students, but also because of the intervention team's clear roles. Participant A5 articulated this best:

> I felt like we know who we can go to, and the staff know who we can go to and then the kids also knew. They all knew, the staff knew, and we were able to serve the kids better. And then as far as retention, we were able to actually help keep some of those kids because they felt they had a place to go to, they had someone they could talk to, there were resources available for them. It was just they felt better supported and they were like, I'm going to stay here and get help. You know they are going to help me through this. I don't have to just give up. (Participant A5, Fall 2020, IQ2)

Whereas a typical high school MTSS structure has an intervention team where support is provided only by specific employees (teachers, counselors, or behavior intervention specialists) (Goodman-Scott & Grothaus, 2017), the NIS intervention team meets weekly to discuss the students who are (or should be) receiving level two or three interventions and provides support to students based on matching students with staff. At these weekly meetings, a team member is chosen to work with the student based on the strengths of the staff member and the student's strengths to build the most beneficial relationships.

The administrators all referenced the NIS data tracking tool as a key attribute of what made the NIS effective. The NIS data tracking tool was used at the weekly intervention team meetings to identify who would support the student. In response to IQ2, participant A1 described it as "a way to make those interventions, track the success and really track the kids to make thoughtful interactions with students or interventions with students and be able to monitor their progress." The data tracking tool was also used to communicate and build stronger relationships between the intervention team and teachers. Participant T3, in response to IQ2, referencing the data tracking tool, explained that the relationship between the intervention team and the teachers was key to the success of the NIS, "[The NIS data tracking tool] gave us a way of collecting the information, getting the appropriate people to help and then being able to actually help the student without the entirety of it being on my shoulders as a teacher." Table 4.2 is an example of the NIS Data Tracking (Artifact 3). It illustrates the categories of information collected and tracked as part of the intervention system and an example of the type of information collected.

The NIS data tracking tool allowed the intervention team to comment on student learning as a conceptual process rather than limit the data collection to descriptions of behaviors, either desired or undesired. Students were identified based on an area of need established by teacher

input, staff observations, or student self-identification. If students were not making progress, then the intervention methods were adjusted individually. This progress monitoring system allowed the intervention team to shift support to different team members based on the student's needs and the team member's strengths rather than just assigning a team member to help a student.

Table 4.2

Artifact 3: NIS Data Tracking Tool

NIS data tracking categories	Example
Student name	Student
Program	Diesel
Session	AM
Level of intervention	1 2 3
Identification / label	No label
Area of need	Learning
Notes	Comment
Pretest	6/10
Posttest	8/10
Language sample	Restricted
Support survey area of need	Notes, learning anxiety
Staff point person	B.C.
Next steps	Weekly check-in
Intervention	Notes/time/VLM

Tracking, monitoring, and student success became a team responsibility (which included the teachers). This process of monitoring student progress to build meaningful relationships with students was best articulated by participant A2:

> I guess it [the NIS] enabled them [students] to know that they're in a process. Part of that process that they had to work through with other folks [intervention team] to get the achievement that they wanted, and I suppose that could affect retention and that personal contemplation, you know, just giving up. They [students] realize, hey well there are some

> strategies that I am part of that could be exciting for them, and they would want to stay. (Participant A2, Fall 2020, IQ2)

The relationships that the intervention team and teachers developed with the student were seen by study participants as the key to the successful implementation of the NIS.

Summary. The interviews with staff added to the rich description of the NIS by providing the teacher and administrative perspectives on how consistent relationships in inclusive learning environments allowed for (the perception of) improved student success factors, including achievement and retention. The inclusive learning environments allowed for all students to learn in the context of the program (Adolphs, 2009; Casale-Giannola, 2020; Daniels & Gamer, 2013). Teacher and administrator perspectives also indicated that the support system's structure, including the individualized learning-based approach to interventions, was effective.

Theme Three: Theoretical Application

The third theme in the interviews was that teachers and staff believed the NIS provided a systematic way of ensuring effective, individualized, conceptual-learning-based interventions. The implementation of the NIS included expanding the use of language-based interventions as level one interventions for inclusive classroom instructional practices. Each participant shared examples and/or artifacts related to the use of language-based interventions in response to various interview questions. The third theme includes references to specific strategies and tools and references to the NsLLT theory and conceptual learning.

One aspect of the NIS that the participants consistently discussed was the application of theoretical, conceptual learning principles into classroom instruction and student interventions, which included references to how students neurobiologically learn. In response to IQ4,

participant A4 explained, “The other thing I am thinking of is just being impressed with the visual cues that I saw in the teachers’ classrooms, who were consistently using the strategies [Viconic Language Methods].” All of the teachers shared stories about how they incorporated language-based interventions into classroom instruction. Participant T2 told this story:

> One of the things that I told them [students] was that when they were doing their draw and writes [VLM strategy] was to really make sure they were drawing and writing the way they remember, making those connections. In fact, I just did that this week with a couple of my students. I gave them the example of the ball, what do they think of? [What picture do you see in your head when you think of the idea BALL?]. Everybody had a different ball. So, we went through why learning the way you can interpret is better for long-term memory is because you are associating things with how you can remember them. (Participant T2, Fall 2020, IQ4)

As part of the implementation of the NIS, the intervention team helped teachers understand how conceptual learning and the visual metacognition of most students related to long-term memory, learning, social/emotional development, and professionalism. Participant T3 explained her understanding and application of conceptual learning with the following story:

> I recall many times in the classroom when [student A] would be just shut down. Like something discouraged him and just totally shut down and couldn’t move forward. And how we consistently were supporting him and saying you’re not stupid. You know it’s okay if you’re frustrated. It’s ok if you don’t understand. Let’s figure out a different way to help you understand. (Participant T3, IQ4)

All of the teachers referenced the importance of understanding how a student learns best so that accommodations, supports, and interventions can build on the students’ strengths.

In addition to the stories shared by teachers about the use of language-based interventions, the administrators interviewed discussed their perception of the language assessment tool used as part of the progress monitoring process. Participant A2 explained the importance of language assessment tool as follows:

> I do know that the language assessment is way different than any interventions we did before because you kind of create a baseline right, which we never really had before and you would come up with all kinds of just guesses of why a student wasn't being successful and really not have anything to really measure it against. You know there was not standards that enabled you to say this is the kind of intervention the student needs because you were just guessing. (Participant A2, Fall 2020, IQ5)

The language assessment tool is part of the student support survey discussed above (Artifact 1). It is a formalized question that allows for analysis of the language function components of the speaker. The question asked in the student survey is "What do you do on a typical day?" This question is then analyzed as restricted or age-appropriate based on the following language function components: displacement, semanticity, productivity, flexibility, efficiency, and shared meaning (Arwood & Beggs, 1992). This analysis helps the intervention team identify if the student has a visual learning system. Language analysis also is used to identify if the student was processing concepts at a pre-operational stage, concrete, or formal cognitive developmental level, and if the student was processing social concepts at a pre-operational stage, concrete, or formal developmental level (Arwood et al., 2015). All of these factors helped the intervention team decide how to begin interventions. As participant A2 explained, the language assessment (Arwood & Beggs, 1992) also works to assess if the student's language and thinking are changing due to the interventions provided. Table 4.3 shows the question prompts used to

analyze the language sample (Analysis prompt), along with a randomly selected sample of a student response collected during the 2019-20 school year.

Table 4.3

Artifact 4: Language Assessment Tool (Arwood & Beggs, 1992)

Student sample response to "What do you do on a typical day?":

> "Go to school, get home eat and head to work until 6:30. After work i head to soccer practice and get home at 9. Eat dinner, shower, and do homework and go sleep and repeat the next day."

Analysis prompt	Analysis of student sample
Does the listener have to interpret the meaning?	Yes
Does the student address others and expect others to respond?	No
Is the response appropriate for the context?	Yes
Is the use of displacement in the here-and-now?	No
Does the response share the meaning and use consistent age-appropriate forms?	No
Is it semantically accurate?	Yes
Succinct or redundant	S

The application of neuroeducational principles to an intervention system to promote conceptual learning is the core of what made the NIS different than typical MTSS systems. For the staff perceptions to confirm the application of language-based interventions and discuss the effectiveness of individualized learning-focused interventions confirms that the NIS was theoretically and in practice different than typical MTSS structures.

Participant A3 summarized the effect of the neuroeducational principles on individual student success when he shared, "I think there is the data that we have that shows different kids that have been helped and supported by the different strategies that have been there" (Fall 2020,

IQ6). The NIS was viewed not only as a system where the intervention team was empowered to use language-based tools for interventions; but, also as a system where teachers were supported in their application of these tools to support students in their use of strength-based metacognitive strategies.

The empowerment of teachers to use language-based strategies is best exemplified by a story and artifact shared by participant A4:

> The rubric [a language-based pre-post assessment and/or standard-based grading rubric (Artifact 5)] provided the criteria for instance in helping teachers to evaluate the language production of their students. Initially, that was really scary for our instructors, to you know, for the diesel teacher to think about evaluating language components. I think over the course of the 2019-20 school year, that became less scary. (Participant A4, Fall 2020, IQ6)

As part of the NIS implementation, the school leadership's goal was to implement a school-wide conceptual learning assessment to measure student learning in terms of program concepts and industry language. Implementing a school-wide pre-assessment and post-assessment was postponed with the onset of COVID-19 and remote learning, but some teachers still engaged in the process, at least in the pre-assessment. Some teachers gave their students a written assessment, and others assessed student learning using a rubric based on classroom participation, assignments, and other learning opportunities. Table 4.4 provides a random sample from the diesel program's learning rubric, as referenced by participant A4.

Artifact 5 is an example of the diesel program's use of the language-based rubric for assessing student language function and conceptual learning as a pre-post assessment of student learning growth. This assessment was conducted during a discussion between a member of the

intervention team and the diesel program instructor. The instructor was able to look through assignments, projects, and student work to base his assessment of the student.

With some guidance about conceptual learning verse task completion and literacy components, the instructor evaluated each student individually based on their conceptual learning and language function. Initially, the diesel instructor was meeting with the intervention team and using the pre/post rubric to assess student learning. However, he soon no longer needed support to complete the assessment.

Table 4.4

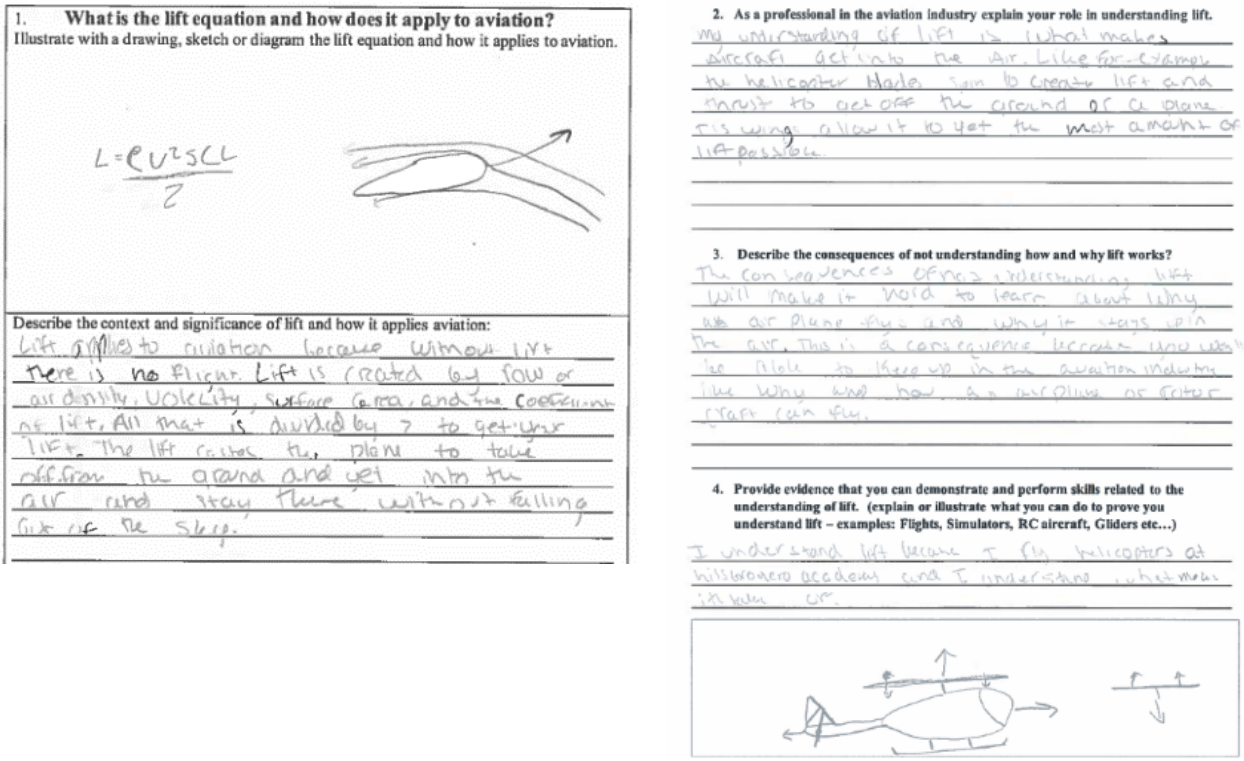
Artifact 5: Diesel Program Learning Rubric

Random sample of diesel rubric	Student A	Student B	Student C	Student D
Standard 1: Student can read and write to gain and demonstrate knowledge of engine basics	2	1	2	4
Standard 2: Student can explain in writing and with visual representation his/her understanding of engine basics	2	1	1	3
Standard 3: Student can speak and explain his/her thinking about engine basics	2	1	2	4
Standard 4: Student can demonstrate skills related to engine basics	4	4	2	3

Other instructors were assigning the pre/post assessment to the class and evaluating student language and thinking without additional intervention team support, demonstrating the application of concepts and skills acquired from professional development. Artifact 6 is a randomly selected example of the language-based pre/post assessment used in the aviation program. In the aviation program, students whose language and conceptual understanding were identified as restricted to received additional support, and students who showed advanced conceptualization were provided more challenging and in-depth learning opportunities.

Figure 4.2

Artifact 6: Pre and Post-Conceptual Assessments



1. **What is the lift equation and how does it apply to aviation?**
Illustrate with a drawing, sketch or diagram the lift equation and how it applies to aviation.

$L = \frac{\rho v^2 S C_L}{2}$

Describe the context and significance of lift and how it applies aviation:
Lift applies to aviation because without lift there is no flight. Lift is created by flow or air density, velocity, surface area, and the coefficient of lift. All that is divided by 2 to get your lift. The lift raises the plane to take off from the ground and get into the air and stay there without falling out of the sky.

2. **As a professional in the aviation industry explain your role in understanding lift.**
My understanding of lift is what makes aircraft get into the air. Like for example the helicopter blade spin to create lift and thrust to get off the ground or a plane its wing allow it to get the most amount of lift possible.

3. **Describe the consequences of not understanding how and why lift works?**
The consequences of not understanding lift will make it hard to learn about why and how planes fly and why it stays up in the air. This is a consequence because you won't be able to keep up in the aviation industry like why and how a airplane or other craft can fly.

4. **Provide evidence that you can demonstrate and perform skills related to the understanding of lift. (explain or illustrate what you can do to prove you understand lift – examples: Flights, Simulators, RC aircraft, Gliders etc…)**
I understand lift because I fly helicopters at Hillsborough Academy and I understand what makes it work or.

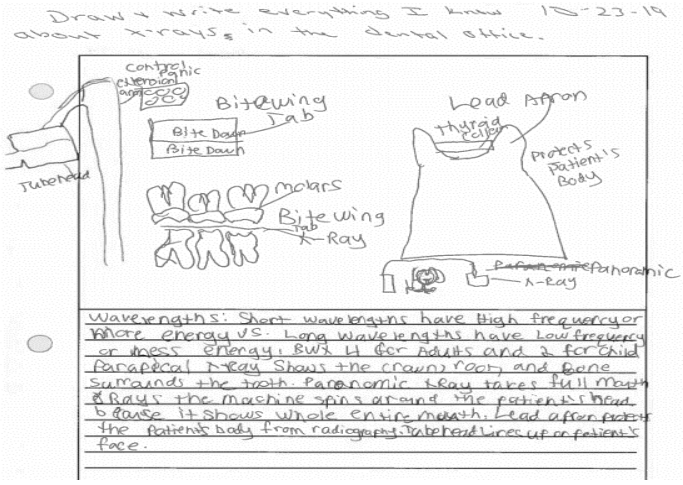
Note. This pre-assessment was given to students after an introductory lesson on the component of lift in October 2019. Students were assessed on the functional accuracy of their industry language. The teacher used each of these pre-assessments to assess students' conceptual and language learning using the same criteria as the rubric.

Both Artifact 5 and Artifact 6 illustrate the application of neuroeducational conceptual learning principles within the NIS as a school-wide policy. Both the conceptual assessments and the learning rubric are designed to measure student's functional use of industry language through literacy components of writing, drawing, reading, thinking, and speaking. The fact that they were used on a school-wide level (at least for pretest) shows the systematic effectiveness of professional development on how to assess and evaluate student language and conceptual learning. Unfortunately, however, the posttest was not administered due to constraints of remote learning due to COVID-19.

In addition to the schoolwide systematic application of the Neurosemantic Language Learning Theory (NsLLT) as demonstrated by the language assessment tools, many teachers also implemented Viconic Language Methods (VLMs) or other language-based support strategies as part of the classroom instruction. All of the administrators interviewed and the teachers who were interviewed referenced teacher application of VLMs. Many participants referenced a variety of teachers incorporating draw and write strategies (a VLM), which are used both by the intervention team individually with students and within classroom instruction by many or most students. Artifact 7 is a student example of the draw and write intervention strategy for classroom learning used within the program. The student was supported through this learning process by both teachers and the intervention team. Both the student work samples and commentary notes on the intervention were recorded in the NIS data tracking tool and filed with the Intervention team.

Figure 4.3

Artifact 7: Draw and Write VLM



Note. A member of the Intervention Team noted that the support she received included helping the student learn to draw what she saw/did in class. By November, the student could independently use this strategy to organize her thinking and language.

A note in the student file referenced that the dental program teacher had begun using this learning strategy with any student who wanted/needed to refine their use of dental industry language. This student began the school year receiving level 2 and level 3 intervention. By the time of this sample, the student was fully participating in class without any additional individual support.

Summary. The implementation of the NIS, as a school-wide system, began at the fall of the 2019-20 school year. Before then, there was no systematic way of providing school-wide interventions and support. Despite the limitations of COVID-19 and remote learning in March of 2020, both teachers and administrators shared stories of how language-based conceptual learning interventions improved classroom instruction or student success. The artifacts referenced within this theme help provide context about the variations of language-based conceptual learning supports. As successful as the use of language-based interventions was on a school-wide level, the NIS's impact on student success was described as equally successful.

Theme Four: Student Success

The final theme established in the coding process was student success —conceptual learning and the incorporation of VLMs rather than the products of learning. In a typical MTSS, student success is measured by student achievement (passing the class or completing an assignment), student retention in school, or reducing unwanted behavior (Bohanon et al., 2016; Flannery et al., 2009; George et al., 2003). Within the NIS, the CTE school staff viewed student success as the ability to use industry language and pro-socially and professionally demonstrate concepts and skills acquired from learning. All of the participants commented on all four of the codes in very similar ways. All the participants agreed that the NIS effectively supported student success. All of the participants discussed empowerment, independence, and agency as an

extension of the power of relationships. Empowerment was a concept that all participants referenced as a key factor in the effectiveness of the NIS. In response to IQ3, participant A2 explained student success concerning student empowerment and independence:

> I think that the students that were being affected by the system learn to be more of their own problem-solvers. They knew where they were at in the process rather than just things done to them randomly based on their behavior… I think because they [students] start to understand their own behavior and start to understand, in terms of why they are acting the way they are acting. (Participant A2, Fall 2020, IQ3)

The role and relationship theme identified the significance of empowering the staff to focus on conceptual learning. The student success theme addresses the significance of empowering students to learn. Participant A4 explained the effect of the NIS in terms of the support system providing teachers with the theoretical foundation to foster student learning, thereby creating student success through student empowerment:

> I am looking mostly at what the teachers are doing. And so those things [referencing language-based conceptual learning strategies], certainly in the classrooms with the teacher who were consistently applying them to help students to see more clearly what concepts their teachers were trying to get across to them. I think it's also pretty empowering too because it wasn't about – let me give you the information. It was a bit more exploratory; you know 'what does this concept mean to you' or 'show me what this concept is.' And once the students started using it [language-based conceptual learning strategies], it was more empowering than us just telling them, 'well, this strategy will help you, or that type of thing. (Participant A4, Fall 2020, IQ2)

The theoretical application theme addressed how the application of language-based interventions impacted student success. Participant A4 articulately made the connection between student empowerment, conceptual learning, and student success. Similarly, Participant A5 shared a story illustrating the effectiveness of the NIS in terms of achievement and retention through the application of individualized interventions for time management that included conceptually based learning strategies:

> Last year, I was working with a student. She came in, and she was crying. She thought she was going to have to leave the program and go back to her sending school because her dad was moving, and she was way behind in all of her schoolwork, here and at her sending school. So, I sat down with her and asked her, "What do you want?" And she said, "I want to keep going here, and I want to keep going to my sending school." And so, I said, "Ok, then bring me your work, show me what you have and what you need to get accomplished." So, she brought in all of her homework, and she brought in all of this stuff, all her progress reports. So, we sat down with a calendar, and we wrote in the calendar. I had her write it down. I had her choose the times because it was her schedule. If she made it, then she would stick to it. I have them [student A and other students] write things down, and when it's their time, it's their schedule, it's their idea, and then they are all in. (Participant A5, Fall 2020, IQ4)

This story illustrates the use of brain-based learning strategies, understanding that as a visual learner, this student does not process time, so by allowing the student to create a visual calendar, she could then see what she needed to do. This story also illustrates the benefit of empowering students to use their neurobiological strengths (writing) to succeed. In this example, success was

managing the time elements of school, the result was turning in assignments and missing work, but the success advocate's goal was to help the student learn how to manage her life.

All participants shared that the NIS effectively provided a support structure and resource of strategies and support people that enabled teachers to ensure *all* students had the opportunity and individualized support needed to be successful.

Summary. Theme four provides a rich description of student success in terms of the systemization of supports that encourage student success. The staff interviews and stories of student success show the importance of contextual, inclusive learning environments that empower students to learn. This approach to intervention is different from typical MTSS, where the focus is on the product rather than the process of learning (Hadie et al., 2018; Lalley & Gentile, 2009; Sink, 2016). By empowering students, developing independent learning skills, and promoting pro-social agency, the NIS provided a structure and systematic way of enabling all/any students to be successful, which then resulted (according to staff perceptions) in an improvement in achievement, behavior, and retention.

Research Question 2 Results

The following section presents the results of data collection and analysis for Research Question 2: In what ways did student's program completion (retention) change after the implementation of the NIS, as measured by student attrition data (student withdraw count and reason) and program completion grades?

Student Retention

Improved student retention is a goal of the administration at the CTE school. It is also a typical measure of the effectiveness of most school-wide intervention systems. The number of students who withdrew from each program before the start of the second semester for the 2018-

19 and 2019-20 school years was analyzed to show any changes in retention. Since the only conceptual learning support provided before the NIS was through special education supports, the student attrition data were analyzed to compare overall enrollment with special education enrollment changes. Table 4.5 shows a reduction in the number of students who withdrew from the CTE school before the second semester.

Table 4.5

Student Attrition Prior to Semester 2

School year	Total number of students withdrawn before Semester 2	% of total enrollment	Number of special education students withdrawn before Semester 2	% of special education enrollment
18-19	50	5	15	8
19-20	37	4	8	4

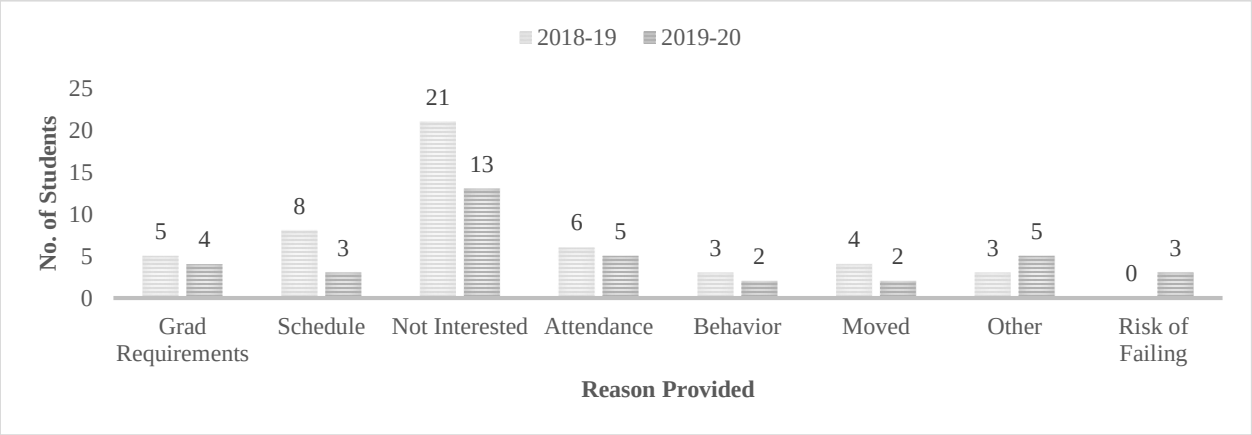
Although two years do not establish a trend, the drop in attrition for special education students during the implementation of the NIS suggests that the school-wide systemization of support may have effectively resulted in more special education students remaining in the CTE programs. It is more likely that students will remain in school when included in inclusive meaningful learning environments (Hehir et al., 2016). The effect of inclusive learning opportunities on retention during the first semester of the school year could prove to be a significant factor in the intervention system's effectiveness if it were to continue.

In addition to the number of students who withdrew from CTE programs, Research Question 2 was also addressed by analyzing the changes in why students left CTE programs. The registrar and administration collected this data through student exit interviews conducted as part

of the CTE school's withdraw process. Figure 4.4 shows that with the implementation of the NIS, the number of students leaving the CTE school decreased in each of the reason categories except *other* and *risk of failing*. The category of other includes students who moved, did not respond, or responded with "other" and did not provide an explanation.

Figure 4.4

Frequency of Reason for Withdrawing



The data does not provide details about whether these five students who withdrew due to risk of failure were receiving support through the NIS. The dramatic decline in the number of students not interested in the program may attest to the intervention team's effectiveness in creating contextual learning environments that met the needs of students.

At the CTE school, student success is measured through program completion. Although retention is a significant component of program completion, the number of students passing in each program is also needed to evaluate program completion. Only A, B, C, and P (passing but not meeting all standards) grades are considered for program completion at the CTE school. Semester 1 grades and Semester 2 grades were analyzed to show changes during the implementation of the NIS to address Research Question 2. Semester 1 grades were included for a more uniform comparison. Since remote learning grading policy changes took effect in March

of 2020, students could not receive a grade lower than they had at Semester 1. Therefore, some of the Semester 2 grades for the 2019-20 school year are not consistently comparable. Program completion at the CTE school was very high in the 2018-19 school year, especially within the special education program. Program completion in both special education and general education was over 80% prior to the implementation of the NIS. However, despite the already high level of program completion, there an additional increase with the implementation of the NIS in general education from 84% to 90% and within special education from 81% to 86%. Although the increase from 81% to 90% between Semester 1 and Semester 2 during the 2019-20 school year could be a result of the COVID-19 grading policy. The change between Semester 1 and Semester 2 was not as significant during the 2018-19 school year, which is either a reflection of Covid-19 grading or that students were not receiving appropriate support to maintain a passing grade.

Table 4.6

Frequency of Retained Student Grades

	A grade Semester 1	A grade Semester 2	B grade Semester 1	B grade Semester 2	C grade Semester 1	C grade Semester 2	P grade Semester 1	P grade Semester 2	% of total for Sem. 1	% of total for Sem. 2
2018-19 General Ed	361	311	393	409	158	167	0	0	84	84
2019-20 General Ed	361	722	372	143	118	59	0	0	81	90
2018-19 SPED	28	30	82	64	35	41	2	3	83	81
2019-20 SPED	35	35	76	76	42	49	3	0	84	86

Summary. The effectiveness of the NIS is addressed both through retention and through students passing the program. Table 4.6 and Figure 4.3 addressed the students who did not maintain enrollment at the school. In contrast, Table 4.6 illustrated that the special education students who remained at the school were much more successful during the school year with the NIS.

Research Question 3 Results

The following section provides the results of the data collected in response to Research Question 3: In what ways did student's industry certification (achievement) change after implementation of the NIS, as measured by industry certification exams (program-specific exams and 21st-century precision exams) and college/industry equivalency grades?

Student Achievement

Unlike a comprehensive high school where achievement is measured through state or standardized testing, the CTE school measures student achievement on a school-wide level through 21st-Century Certification and on a program level with program-specific industry certifications. Many of the industry certifications exams provided outside the school to qualify the student (any person) to work in the industry. One example is the medical science program gives students practice version of the state certified nursing assistant exam near the end of the school year and students have the option of taking the official state exam in May and June. Passing scores on the practice version of the test and the official exam are recorded as successfully completing industry certification. It is necessary to understand the changes in industry certification that occurred with the implementation of the NIS to evaluate the efficacy of the NIS as a systematic support system that focuses on conceptual learning to improve student achievement. Table 4.7 shows the percentage of students who passed the program-specific

industry certification. The chart shows the changes in industry certification comparing general education students and special education students. Table 4.7 shows that there was either a decrease or no change in industry certification due to the implementation of the NIS. This impact of remote learning and COVID-19 may have affected these results. For general education students, industry certification decreased by 5% and special education students' industry certifications decreased by 2%. The decline in industry certification during the 2019-20 school year could result from COVID-19 and remote learning since many of the program's certifications required a demonstration of skills. The results are separated between special education and general education because before the implementation of the NIS, language-based interventions were used only within special education supports.

Table 4.7

Industry Certification Trends

	No. students passing certification exams	% of total enrollment
2018-19 Industry certification: General Ed	712	73
2019-20 Industry certification: General Ed (Level 1)	635	68
2018-19 Industry certification: Level 2 & 3 (SPED only)	89	52
2019-20 Industry certification: Level 2 & 3 intervention (SPED and General Ed)	125	50

The consistency of special education industry certification 52% and 50% despite the effects of COVID-19 suggests that the use of language-based interventions to promote conceptual learning may improve student achievement. It is important to note that even with limited testing due to COVID-19 approximately 50% of special education students were certified and approximately

70% of general education students which confirms the high level of student achievement at the CTE school.

Along with the industry-specific exams, there is a school-wide assessment of students' professionalism and 21st-century readiness. The 21st-Century certification is administered as a pretest and posttest; the posttest exam completion results are included in Table 4.8. Again, the decrease in the number of certifications as a school-wide assessment by 8% is likely a result of COVID-19 affecting in-person testing. Approximately 425 students had the opportunity to take the 21st Century certification exam before the March shift to remote learning, but many program instructors did not intend to administer the exam until June.

Table 4.8

21st Century Precision Exam Certification Trends

	No. students passing certification exams	% of total enrollment
2018-19 21st Century: General Ed	433	45
2019-20 21st Century: General Ed (Level 1)	251	27
2018-19 21st Century: Level 2 & 3 (SPED only)	29	17
2019-20 21st Century: Level 2 & 3 intervention (SPED and General Ed)	46	18

Again, the consistency for special education students between 2018-19 and 2019-20 may reflect that the support structure and language-based interventions were already in place for special education students during the 2018-19 school year. The consistency within special education suggests that with time and a situation not impacted by remote learning, student achievement as a whole could mirror those of in special education because support for the acquisition of professional language became accessible to all students with the implementation of the NIS.

Student grades also measured student achievement. In the CTE school case, each program has college or trade school equivalency credits that students receive if they get a B or better in the program and meet specific standards. Table 4.9 shows the changes in equivalency grades as a measure of student achievement. Both general education students and special education students improved by 8% and 3% respectively, during the 2019-20 school year with the implementation of the NIS. Since college equivalency standards were not affected by COVID-19 grading, these results indicate the efficacy of the NIS.

Table 4.9

College/Industry Equivalency Grades

	A grade Semester 2	B grade Semester 2	% of the total for Semester 2
2018-19 General Ed (Level 1)	300	409	65
2019-20 General Ed (Level 1)	696	118	83
2018-19 Level 2 & 3 (SPED only)	41	64	59
2019-20 Level 2 & 3 intervention (SPED and General ed)	61	101	62

Since the focus of instruction during the 2019-20 school year was to develop conceptual learning and support students based on their neurobiological strengths, more students could achieve A and B grades.

Summary. After the implementation of the NIS, student achievement improved most notably for special education students. COVID-19 and remote learning's impact limited the accessibility of industry certification, and precision exams alter student achievement results. However, despite these limitations, students at the CTE school had high achievement during the first year of implementing the NIS.

Research Question 4 Results

The efficacy of a typical MTSS is measured by reducing unwanted behaviors because the theoretical foundation of the interventions, usually schoolwide positive behavior interventions and supports (SWPBIS), is based on behaviorism. The design of SWPBIS is to reward desired behavior and discourage or teach alternatives for unwanted behavior (Bradshaw et al., 2010; Debnam et al., 2012; Freeman et al., 2016). Alternatively, the NIS provides supports that develop conceptual learning and socio-cognitive development through meaningful classroom interventions and inclusive teaching practices. Rather than explicitly instituting punishments for unwanted behaviors. The following section provides the results from Research Question 4: In what ways did student behavior change after the implementation of the NIS, as measured by office discipline referrals?

Student Behavior

The primary data analyzed to measure student behavior is office discipline referrals. Table 4.10 compares the number of office discipline referrals during the 2018-19 school year with the 2019-20 school year referrals.

Table 4.10

Behavior-Related Interventions and ODRs

	Total number of ODRs	Number of students receiving ODRs	Number of students receiving Level 2 or 3 language-based interventions identified as behavior-related concerns
2018-19 General Ed	6	6	NA
2019-20 General Ed (Level 1)	1	1	6
2018-19 SPED	8	5	7
2019-20 SPED (Level 2 & 3)	0	0	3

The table also separates general education students from special education students to account for language-based interventions for special education students before implementing the NIS. The implementation of the NIS resulted in a dramatic decrease in the number of office discipline referrals. The NIS's effectiveness is illustrated by the number of general education students receiving interventions (6) that matched the previous years' number ODR (6). Instead of disciplinary action at an administrative level, students received support with conceptual language-based strategies that promote pro-social learning within the classroom. Also, the decrease in the number of special education students receiving behavior-related interventions from 5 to 0, attests to the NIS's effectiveness in identifying the students' actual needs rather than labeling a learning or social struggle as a behavior or participation issue. This decrease in special education ODRs may also reflect the effectiveness of the NIS as a system where teachers implement language-based supports into classroom practices to create meaningful and inclusive learning environments. To add to the NIS description, Table 4.11 shows why students received a referral or support related to behavior concerns.

Table 4.11

Reason for ODR and Intervention

	Violence and threat policy	Professional standard policy	Drug/alcohol policy	Participation/ attendance policy
2018-19 school year	2	5	7	0
2019-20 school year	0	4	0	5

Table 4.11 provides an exciting context that resulted from implementing the NIS potentially related to the school-wide focus on learning in an inclusive environment, which resulted in a noticeable decrease in anti-social behaviors. Discipline referrals related to violence policies and

drug/alcohol policies are examples of anti-social behaviors. Whereas professional standards policies (like uniforms) and participation/attendance policies are not necessarily reflective of anti-social thinking or behaviors. The decrease in anti-social behaviors was clear (both violence and drug/alcohol referrals were 0) since the only behavior-related interventions and referrals during the 2019-20 school year were related to learning and attendance. The improvement in behavior is related to the importance of the intervention team's roles and responsibilities in creating an inclusive culture for success in each program.

Conclusion

The purpose of this section was to provide the context and description of the effectiveness of the NIS. The outcomes of Research Question 1 describe how the staff viewed the NIS structure and implementation. This section also provided artifacts from the NIS that illustrated the CTE school's focus on conceptual learning through language-based interventions. The analysis of Research Questions 2, 3, and 4 illustrated the NIS's effectiveness in student success factors, including retention, achievement, and behavior. Although COVID-19 may have impacted some of the achievement results, there is nothing from Research Questions 2, 3, and 4 that would suggest the NIS is not effective concerning student success factors. It is also evident from the staff interviews that the NIS is perceived as effective in supporting teachers, applying theoretical learning principles, and improving student success.

Chapter 5: Discussion

Introduction

There is an increasing demand for tiered intervention systems in high schools. However, the nature of high schools presents a challenge for implementing a typical MTSS. In this case study, the administration at the CTE was aware that typical MTSS focused on reducing unwanted behavior through SWPBIS, SEL, or RtI models. Neither SWPBIS, SEL, nor RtI incorporates language-based interventions that promote conceptual learning. The CTE school administration created the NIS to address student success through inclusive teaching practices, language-based interventions, and strength-based student identification. The purpose of this research study was to investigate in what ways the Neuroeducation Intervention System (NIS), a school-wide intervention system that focuses on conceptual learning, is effective, as indicated by multiple measures, including staff perceptions, program completion (retention), industry certification (achievement) and appropriate behavior (discipline referrals). The significance of this research is that it provides a theoretical foundation for a school-wide intervention system that implements interventions and classroom supports based on the students' neurobiological strengths in inclusive meaningful classrooms.

The literature review provided evidence for the importance of inclusive, pro-social learning environments on student success. The literature review also showed that by integrating research from the fields of cognitive psychology, neuroscience, and language, the Neurosemantic Language Learning Theory (NsLLT) provides a theoretical foundation for conceptual learning. The instructional approach to conceptual learning differs from traditional teaching and learning pedagogy because conceptual learning is based on a four-tier understanding of learning rather than the two-tier approach in the traditional teaching and learning paradigm (Robb, 2016).

Likewise, intervention strategies and tools that focus on conceptual learning are based on Viconic Language Methods (VLMs), as opposed to behavioral, social-emotional, or academic interventions used in typical MTSS structures that rely on rote memory, learned skills, and practiced behaviors. The literature review also established that most students have a visual metacognition. Therefore, learning environments to be neurobiologically meaningful where classroom instructions should be highly contextual, incorporate literacy, and develop pro-social relationships. The administration at the CTE school created a school-wide system, the Neuroeducation Intervention System (NIS), based on the conceptual learning principles of the NsLLT: 1) all children learn to think, 2) all learning is brain-based, 3) all children learn to be pro-social, and 4) all children learn through context. The NIS intervention team provided professional development on conceptual learning, used language function to assess student strengths and needs, tracked and monitored student success, and provided language-based interventions through a tiered school-wide support structure.

This study was a single bounded case study (Creswell & Poth, 2018) to investigate in what ways the Neuroeducation Intervention System (NIS), a school-wide intervention system that focuses on conceptual learning, is effective, as indicated by multiple measures, including staff perceptions, program completion (retention), industry certification (achievement), and appropriate behavior (discipline referrals). Multiple sources of data were collected to address each of the research questions in this study. The data collected in response to the research questions were analyzed to create a rich description of the NIS to evaluate the ways in which it is effective. Based on staff perceptions, program completion, industry certification, and appropriate behavior, the data presented in Chapter 4 suggests that the NIS is effective in implementation, structured support of teachers and students, implementation of language-based strategies for

instruction and intervention. Evidence from Chapter 4 also suggests that the NIS may have impacted student success factors. The following section will review the themes established from the results in Chapter 4 and provided interpretation of the results aligned with the Arwood Neuroeducational Model (ANM) theoretical framework to provide a theoretical analysis for conceptual learning as part of the NIS. There are four conceptual learning principles that are derived directly from the Neuro-Viconic Education System (Arwood & Rostamizadeh, 2018); they are 1) all learning is brain-based, 2) all children learn to think, 3) all children learn to be pro-social, and 4) all children learn through context.

Results in Context of the Review of Literature

The staff responses were thematically organized into four themes: The NIS Structure, Roles and Relationships, Theoretical Application, Student Success. These four themes correspond to the four key principles established by the ANM framework: all children learn to think, all students learn to be pro-social, learning is brain-based, and all children learn in context, respectively. Additional conclusions based on the results of this study will be explained in context of the review of literature to provide a complete interpretation of the results of this study.

Theme One: The NIS Structure

The literature review provided research to support a distinction between behavior-focused pattern-based interventions and conceptual language-based interventions. Chapter 4 results showed that the participants viewed the NIS as an effective system in providing conceptual language-based interventions. The NIS also provided a systematic way of empowering teachers and students through pro-social relationships, neurobiologically meaningful learning environments, and accurate identification of student needs. The tiered structure of the NIS mirrors that of typical MTSS structures, specifically the three levels of

intervention based on the public health models used by MTSS programs (Adelman & Taylor, 2002; Bradshaw & Pas, 2011). However, Artifact 2 and the staff interviews suggest that the structure of the NIS provided teacher support for creating meaningful and inclusive learning environments. One tenet of conceptual learning from the ANM is that all children learn to think. Learning to think is a neurobiological process based on how individuals process sensory input into meaningful conceptual ideas. The structure of the NIS enables the intervention team to support teachers in creating meaningful level one learning environments, and it enables the intervention team to individually identify and support students' needs (level two and three) so that all students at the CTE school have the opportunity and ability to learn (Radford et al., 2015). The NIS structure and systemization are similar to typical MTSS systems (Adelman & Taylor, 2002; Atkins et al., 2010). The staff's perceptions confirmed that the structure of the NIS allowed the intervention team and the teacher to operate collaboratively to meet the students' needs.

Theme Two: Roles and Relationships

The literature review suggests that an intervention specialist's role must change for an intervention system to be effective (Nind, 2011; Wigle & Wilcox, 2003). The NIS was effective because the intervention team was successful in establishing inclusive roles within each program. According to the ANM, another tenet of conceptual learning is that all children learn to be pro-social (Arwood & Rostamizadeh, 2018). The data provided through the interviews and artifacts suggested that NIS supported both teachers and the intervention team to build positive pro-social relationships with each other and with students (Acosta et al., 2019; Green-Mitchell, 2016; Pirttimaa & Hirvonen, 2014). It was clear from a few (3 of 8) of the participants that student retention was linked to the systematic process of building pro-social relationships with students.

To systematically develop these relationships within the NIS, the intervention team relied on the NIS Data Tracking Tool to monitor students and communicate supports with teachers. The focus on roles and relationships resulted in the NIS effectively systematically promoting conceptual learning through pro-social relationships. The collaborative role of staff is essential in developing an effective intervention system (Pirttimaa & Hirvonen, 2014; Radford et al., 2015; Wigle & Wilcox, 2003). The NIS is different from many MTSS structures because the intervention team's roles are not necessarily based on the staff member's job position, but rather the roles are based on the staff's strengths and skills.

Theme Three: Theoretical Application

In addition to the effectiveness of the structure of the NIS, the staff also agreed that the application of language-based interventions was effective. The application of theoretical principles within the NIS is very different from typical MTSS. The NIS description in Chapter 4 illustrated the use of VLMs to build from the students' neurobiological strengths (Arwood & Robb, 2008; Spencer, 2017). There was also evidence of teachers promoting conceptual learning through literacy and student-centered learning (Brown, 2003; Robb, 2016). Another conceptual learning tenet of the ANM is that all learning is brain-based. The artifacts and staff interviews showed that the CTE school's goal to implement a school-wide intervention system focused on conceptual learning was achieved (or at least initiated). Concept-based learning strategies were implemented as individual supports for students receiving level two and three interventions, but teachers also began to incorporate strategies and brain-based learning theory into classroom instruction (Arwood et al., 2015; Arwood & Robb, 2008; Spencer, 2017; Tommerdahl, 2010). The emphasis on conceptual learning within the NIS promoted inclusive teaching practices that

were meaningful and practical. Inclusive learning environments promote pro-social, meaningful learning for all students (Casale-Giannola, 2020; Daniels & Gamer, 2013; Hehir et al., 2016).

Theme Four: Student Success

Researchers emphasize empowering students for success (Hadie et al., 2018; Knowles, 1984), staff perception, and program competition data show the effectiveness of the NIS to empower student success. The CTE school provides a highly contextual learning environment, where students can directly apply the concepts and skills acquired from each program. In light of this, the CTE leadership defined student success in terms of achievement, retention, appropriate behavior, and conceptual learning of industry language and professional skills. The NIS design required inclusive, highly contextual, meaningful, relevant, and practical learning environments to create an environment where students could succeed. This aligns with the final tenet of conceptual learning from the ANM that all learning is contextual. The teachers and the Intervention Team focused on personalizing and contextualizing learning for each student so that students at the CTE school was empowered, encouraged, and supported to be successful.

Connections to Research

The support that enables students to maintain enrollment and school participation is necessary for student success (Horner & Macaya, 2018). The results from Research Question 2 evaluating student retention through program completion provided evidence of the effectiveness of the NIS in promoting student retention. Typical MTSS efficacy is measured through student achievement (Keller-Margulis, 2012; McIntosh et al., 2014). The NIS effectively promoted student achievement in standard measures of grades (Benner et al., 2013; Lalley & Gentile, 2009) and standardized testing (Flannery et al., 2009; Wiliam, 2010). The NIS was also effective in promoting pro-social learning and development (Arwood & Young, 2000; Green-Mitchell,

2016), which may have improved student achievement and behavior. Research also suggests that punishment-driven discipline is not pro-social, effective, or inclusive (Noltemeyer et al., 2019; Skedgell & Kearney, 2018; Vincent et al., 2011). Focusing on conceptual learning, the CTE school decreased the number of disciplinary referrals.

The triangulation of research from the fields of neuroscience, literature, and cognitive psychology provided a theoretical foundation for conceptual learning that incorporates the four levels of learning postulated by the NsLLT and the four tenets of learning from the ANM. Conceptual learning provided the foundation for the NIS.

Limitation of the Study

One of the major limitations of this study was COVID-19 and remote learning on the CTE school in this case study. Remote learning changed the means of administering support to students. Policies and procedures resulting from remote learning changed grading, standardized testing, industry certifications, attendance, and participation. Another limitation of this study was that it was a single case study within a CTE school. The CTE school's unique attributes may limit this study's generalizability, but the CTE school shares the same silo nature of comprehensive high schools (Green-Mitchell, 2016; Kalke et al., 2007). Another limitation of this study was my positionality as the researcher, special education teacher at the CTE school, and as one of the primary creators of the NIS. My position within this research study may have influenced the participation and responses in the interview portion of this study. Interview question 6 was a leading question that may have prompted biased responses. As the researcher investigating the effectiveness of the NIS, I was aware of my bias. I strove to remain neutral but additional studies regarding the NIS from researchers outside the CTE school would be beneficial. Another limitation of this study was that although the literature review compared the

theoretical foundation of the NIS to MTSS systems, the study did not compare the effectiveness of the NIS to MTSS. This research assumes that if the NIS is effective, it can be as effective as an MTSS, but additional research comparing student success factors is needed.

Implications

This research provides CTE schools with a theoretical model for a highly contextual and adjustable school-wide intervention system that allows schools to focus on learning rather than behavior. This is especially significant since other CTE schools are potentially faced with the same issue faced in this study, namely, that unwanted behavior was not a common problem. However, even in an elective school, students may struggle to be successful.

This study also confirmed that implementation of school-wide intervention systems requires time and teacher buy-in. Most significantly, the implication of this study for high schools is that when teachers understand the role of conceptual learning and language-based interventions in creating inclusive learning environments that improve student success, a school-wide intervention system can be established with only a small number of staff on the intervention team. As I engaged in the coding process of the staff interview response, I was surprised to notice the thorough extent to which the intervention team and teachers had conceptually incorporated neuroeducational principles of learning. The neuroeducational principles of learning were implemented at the CTE school over time, starting with special education support then as a school-wide system with the NIS. The gradual implementation may have impacted teachers' ability to buy into the system and conceptually learn how to support students. This format of implementation could provide a means for comprehensive high schools to incorporate neuroeducational principles of conceptual learning into systematic intervention system.

This system can address the individual needs of all students in a moderately sized high school. The implications of focusing on conceptual learning rather than behavioral modifications means that systems can more efficiently and systematically support students by accurately identifying needs. An instructional and intervention focus on conceptual learning enables teachers to create inclusive learning environments based on teamwork and appropriate roles and responsibilities. Finally, when intervention methods are tailored to the student's neurobiological needs, students are more successful. Research supports the use of language assessments as a measure of cognitive and social thinking, the staff perceptions in this study indicated that language assessments also work as a systematic means of identifying student needs and strengths (Arwood & Beggs, 1992; Debreczeny, 2019).

Next Steps

This study illustrated that a school-wide focus on conceptual learning might positively impact student success. To fully understand the NIS's effectiveness as a tiered intervention system focused on conceptual learning, further research from a third party and a longitudinal study are necessary. As high schools and CTE schools continue to search for intervention systems that address student learning, principles of learning and principles from the NIS can be adopted by other schools providing additional settings for researching the effectiveness of concept-based neuroeducational intervention systems. Personally, I hope to work with comprehensive high schools to implement neuroeducational principles of learning and the NsLLT as a theoretical approach to interventions and instruction. Through collaboration and professional development, the goal is to implement the NsLLT and the principles of the NIS within special education programs with the intention spreading intervention and inclusive teaching strategies to the whole school over time. Additionally, I hope my next step for research

regarding the NIS is comparing student success factors within the NIS, comprehensive high schools, and other CTE high schools. Despite the limitations of this study, the results provide a glimpse into a school-wide support system that can effectively address all students' success by focusing on conceptual learning rather than undesired behavior.

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Appendix A: Human Subjects Approval

University of Portland

Memorandum

To: Katelyn Blake
From: John Orr, Ph.D.
Date: 8/26/2020
RE: IRB Notification of University of Portland Project #2020113

Dear Katelyn Blake:

On behalf of the University of Portland's federally registered Institutional Review Board (IRB00006544), a member of the Board has reviewed your research proposal, titled "Neuroeducation Intervention System." The IRB concludes that the project satisfies all IRB-related issues involving human subjects research under the "Exempt" classification. A printout of this memorandum should serve as written authorization from IRB to proceed with your research.

Projects classified as exempt based on Title 45, Part 46.104 of the Code of Federal Regulations do not require further review by University of Portland's Institutional Review Board unless you modify some portion of your project. If the study is modified, you must submit a Continued Review Form (located on the IRB website) for continuing review before continuing with your project.

Please note that you are required to abide by all requirements as outlined by the Institutional Review Board.

A copy of this memorandum, along with your Request for Review and its documentation, will be stored in the IRB Committee files for three years from the completion of your project, as mandated by federal law. If you have any questions, please contact me at irb@up.edu.

Respectfully,

John C. Orr, Ph.D.
Assistant Provost
Chair, Institutional Review Board
Professor of English

INSTITUTIONAL REVIEW BOARD
5000 N. Willamette Blvd., Portland, OR 97203-5798 T 503.943.8264 irb@up.edu up.edu

Appendix B: Interview Protocol

Participant Check-In

- The interview will take approximately 30-45 minutes.
- All interviews will be video, and audio recorded for later transcription.
- Participation is voluntary and confidential – do you still want to participate in the interview?
- Do you have any questions before we begin?

Research Question	Target Data
What are the perceptions of the staff (intervention team and teachers piloting language-based interventions), as measured by virtual one on one interviews, and supported by their shared evidence of what they did with the language strategies through shared artifacts exhibits?	**Participant views and shared artifacts regarding the Neuroeducation Intervention System**

Introduction: Purpose

- The purpose of this study was to investigate in what ways the Neuroeducation Intervention System (NIS), a school-wide intervention system that focuses on conceptual learning, is effective, as indicated by multiple measures, including staff perceptions, program completion (retention), industry certification (achievement) and appropriate behavior (referrals)
- During this reflective interview process, participants can share individual perceptions of the implementation of the NIS, the stories and examples of student supports and interventions, the use of language-based interventions, and their perceptions of student success.

Neuroeducational Intervention System defined: the NIS is the school-wide intervention system, focused on conceptual learning, that was implemented at the beginning of the 2019-20 school year.

Follow up prompts to be used as needed:

- How did you feel about this?
- Was this what you expected?
- Would you tell me more about that?
- Tell me more about that.

Open-Ended Questions: Easing the participants into the interview process

With Covid-19 preventing whole school gatherings, the full and proper implementation of the school-wide intervention system has been affected. This interview is designed to address your perceptions about the effectiveness of the intervention system and your hopes for school-wide support when school returns in person.

In this study, I am interested in finding out your view on the implementation of the NIS, the stories you can provide of student support and interventions, and your perception of the use of

language-based interventions and student success. So, the questions I will be asking are specific to you and your role and experience within the NIS. There are no right or wrong answers; I just want to know your perceptions.
As we begin, please share an about what it was like to transition to the NIS.

- Based on your role within the school, how do you think the NIS has affected students in terms of learning, behavior, achievement, or retention?

More Targeted Questions

Now, I am going to ask some questions that address what you have seen regarding student learning.

Thinking back to the 19-20 school year when students were on campus (pre-Covid), tell me about what you saw from students, in terms of learning, as a result, or part of the school-wide intervention supports.
Follow up Q:

- Why do you think this occurred?
- What contributed to these outcomes?
- Do you believe that this was a result of specific interventions provided to the student?

Please share any stories, examples, or artifacts that relate to your understanding of language-based interventions to support student success.
Follow up Q:

- Why do you think this occurred?
- What contributed to these outcomes?
- Do you believe that this was a result of specific interventions provided to the student?

Final Questions

How do you think the NIS is the same and different from the supports or interventions provided prior to the 2019-20 school year?
Follow up Q:

- Please share what you think contributes most to this difference?
- What would you like the school-wide intervention system to look like when we return to school in person?
- What could be improved?
- What barriers are there to implementation?

Can you share any additional artifacts or stories that you think highlight the effectiveness of the NIS?

Exiting the Interview

- Thank the participant for their time and participation.
- Provide information about the next steps: transcription and member check process.

- Ask if they would like to be contacted with the results of the study; or if they would like a copy of the study once it is completed.