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AN EXAMINATION OF NOVICE AND EXPERT TEACHERS' PEDAGOGY IN A
MIXED-REALITY SIMULATED INCLUSIVE SECONDARY CLASSROOM
INCLUDING A STUDENT AVATAR WITH AUTISM SPECTRUM DISORDERS

by

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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the College of Education and Human Performance
at the University of Central Florida
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ABSTRACT

Teachers, special and general educators alike, are required to teach a variety of students including students with ASD. With a rise in the prevalence of autism by 119.4% since 2000 (Centers for Disease Control and Prevention [CDC], 2016) and 39% of students with ASD being served in general education classrooms for over 80% of the school day (U.S. Department of Education, 2015), teachers need to be prepared to effectively teach this population.

To better prepare teachers, the researcher conducted a two-phase study, situated in the framework of the Skill Acquisition Model (Dreyfus & Dreyfus, 1986) to explore the behaviors of novice and expert teachers in a simulated secondary inclusive environment. This classroom included a virtual student with autism. In phase one, the researcher conducted a Delphi Study to determine the best practices, perceived by experts in the field, for teachers who serve students with ASD in inclusive secondary environments. During phase two, the researcher used the list of skills identified as a framework to observe and interview 10 teachers, five novices and five experts, in a simulated secondary inclusive environment.

The researcher identified 11 high leverage simulation practices (HLSP) that expert teachers should use while teaching in a simulated secondary inclusive environment. Observations and reflections of expert and novice teachers were analyzed, finding only 4 HLSP among experts and 5 HLSP among novice teachers. Additional HLSP were seen through the teachers' reflections.

Data were analyzed and discussed in detail. Implications for practice and recommendations for future research in teacher preparation is provided.

This dissertation is dedicated to my husband, Josh, and my sons, Luke and Beau, whose love, patience, encouragement, sacrifices and support have been felt through every step of this journey.

Also to my family, Diana, Andy, Kala, Jennifer, Frank, and Ty, who also have supported me in every adventure in my life.

Finally, to every student I have taught, as you were my true inspiration and education, providing me all my amazing experiences. Without you, I would not have had the love and drive to be where I am right now. You made me love my profession!

In memory of my “Tutu”, Winifred Jane Warden, April 29, 1923 – June 15, 2017

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what amazing adventures are in your future. Thank you for CJ for being a model for our avatar with autism and to Kathleen for your support and guidance in creating “Martin”. We will create better teachers because of your contributions and collaborations.

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LIST OF ABBREVIATIONS

AATCE- American Association of Colleges for Teacher Education

AATC- American Association of Teachers Colleges

ARC- Action Review Cycle

ASD- Autism Spectrum Disorder

APE- Adaptive Physical Education

CDC- Centers for Disease Control and Prevention

CEEDAR- Collaboration for Effective Educator Development, Accountability and Reform

CVR- Content Validity Ratio

DSM- Diagnostic and Statistical Manual of Mental Disorders

DTT- Discrete Trial Training

EBP- Evidenced Based Practices

EHA- Education for All Handicapped Children Act of 1975

ESEA- Elementary and Secondary Education Act

FAPE- Free Appropriate Public Education

HIL- Human in the Loop

HLP- High Leverage Practices

HLSP- High Leverage Simulation Practices

ID- Intellectual Disabilities

IDEA- Individuals with Disabilities Education Act

IEP- Individualized Education Programs

IRB- Institutional Review Board

LRE- Least Restrictive Environment

NBPTS- National Board for Professional Teaching Standards

NCATE- National Council for Accreditation of Teacher Education

NCLB- No Child Left Behind

NCTQ- National Council on Teacher Quality

NIH- National Institutes of Health

NRC- National Research Council

QIASD- Quality Indicators for Classrooms Serving Students with Autism Spectrum

Disorders

PARC- Pennsylvania Association for Retarded Citizens

PICO- Population, Intervention, Comparison, and Outcome

RRB- Restricted & Repetitive Behaviors

SAM- Skill Acquisition Model

TLE- TeachLivE™

UCF- University of Central Florida

CHAPTER ONE: INTRODUCTION

Statement of the Problem

Special and general education teachers alike are expected to be prepared to teach a variety of students in the classroom, including students with autism spectrum disorders (ASD). Currently, pre-service teachers are not adequately prepared to teach students with ASD (Busby, Ingram, Bowron, Oliver, & Lyons, 2012; Coleman, 2000; Hart & More, 2013; Kaufman & Ireland, 2016; Loiacono & Valenti, 2010; Martin & Mulvihill, 2016; National Research Council, 2012). Although a theme for establishing evidenced based practices (EBP) is apparent in the educational research literature, a gap still remains in both research and practice for preparation of teacher candidates to teach students with ASD (Burns & Ysseldyke, 2009; Cook, Tankersley, & Harjusola-Webb, 2008). This lack of an agreed upon knowledge and skill base in both preparation and practice of teachers can be problematic in supporting students with ASD, especially for teachers who are novice or advanced beginners, as defined by Berliner (2004) and Dreyfus and Dreyfus (1986).

High leverage practices can be used in a variety of different classrooms to help influence student learning (McLeskey et al., 2017). However, the challenge is pre-service teachers gaining enough repeated and sustained quality opportunities to practice these high leverage practices. (Ericcson, 2014; McLeskey et al., 2017; McLeskey & Brownell, 2015).

Theoretical Framework

The researcher in this study employed the theoretical framework of the Skill Acquisition Model (SAM) described by Dreyfus and Dreyfus (1986). Researchers using this model document the development of individuals as they gain skills and move from a novice to an expert in any given field. Table 1, *Dreyfus and Dreyfus Skill Acquisition Model*, explains the skill levels teachers progress through in more detail. Due to the lack of literature on the pedagogical practices of teachers who service students with ASD in secondary inclusive classrooms, the researcher identified current practices that experts in ASD and simulation shared could be observed in a secondary inclusive simulated classroom. Next, the researcher explored the behaviors of novice and expert teachers in a simulated classroom. The observed behaviors of novice and expert special education teachers provided beginning patterns for further discussions and research of what skills may need to be researched or honed in by novice teachers to increase learning gains for students with ASD.

Table 1

Dreyfus and Dreyfus Skill Acquisition Model

Skill Level	Summary	Decision Making	Perspective	Commitment
Novice	Uses rules to determine actions.	Analytic	None	Detached
Advanced Beginner	Recognizes new situational aspects based on experiences, starting to connect experiences to actions	Analytic	None	Detached
Competent	Able to adopt a hierarchical procedure of decision-making, deciding what is important to focus on	Analytic	Chosen	Detached understanding and deciding; involved outcome
Proficient	Uses intuition to organize and understands the task, still thinks analytically about what to do	Analytic	Experienced	Involved understanding, detached deciding
Expert	Do what normally works without thought or problem solving, performance is ongoing and nonreflective and relies on intuition	Intuitive	Experienced	Involved

Purpose of the Study

With a lack of literature in pedagogical practices for serving students with ASD in a secondary inclusive classroom, the researcher first sought to determine the most important teacher practices as perceived by national experts in teacher preparation, using a Delphi study. The national experts are in higher education with experience in special education, specifically ASD, and knowledge of simulation. A fourth criteria of experience in secondary education was preferred in selecting the experts. Second, the researcher examined behaviors demonstrated by novice and expert special education

teachers, following the SAM (Berliner, 1988; Dreyfus & Dreyfus, 1986) in a simulated secondary inclusive environment aligned with the results of the Delphi study. The results provide a beginning platform for further research and discussion about best practices for expert teachers and what practices need to be provided in teacher preparation and professional development of novice or beginning teachers.

Research Questions

The research questions for this study are as follows:

1. Presented with 51 practices already cross-validated as critical for teacher performance, what do experts in the field of ASD identify through a Delphi approach as the most important pedagogical skills for expert teachers in a simulated secondary inclusive classroom containing a student with ASD?
2. What are the patterns of pedagogical skills used by expert versus novice teachers in a simulated inclusive secondary classroom containing a virtual student with ASD?
3. What are the themes derived from the reflection of expert versus novice teachers after teaching in a simulated inclusive secondary classroom containing a virtual student with ASD?

Significance of the Study

The researcher investigated the effective pedagogical practices for teachers serving students with ASD because there is a paucity of literature and research about the current pedagogical skills used by teachers, especially in secondary inclusive

environments. In conducting this research, the researcher anticipated the work would: (a) contribute to a scant literature base on pedagogical skills for secondary teachers servicing students with ASD in inclusive classrooms; (b) reveal important pedagogical skills of secondary teachers with students with ASD as determined by experts in the field and through observation in the simulator; and, (c) guide higher education faculty in practices provided to pre-service teachers and in professional development activities.

Organization of the Study

The researcher explored the research questions through an exploratory phenomenological research design. The study was conducted in two phases. The first phase consisted of a Delphi study. The Delphi study was electronically distributed to eight experts in the field. This phase consisted of three rounds of the electronic survey, reviewed by ASD experts in teacher preparation, to determine the top 11 pedagogical skills that most likely would be exhibited by expert teachers in a secondary inclusive simulated virtual environment that includes a virtual student with ASD.

The second phase of this study included observations of novice and expert teachers, exploring and coding their behaviors in the simulated inclusive secondary classroom. The researcher created an observation framework (See Appendix A) from the skills derived from the Delphi study to explore the actual behaviors demonstrated by master and novice teachers working with a virtual student with ASD in a simulated inclusive secondary classroom environment. Ten teachers ($n = 10$), five novice teachers ($n = 5$) and five expert teachers ($n = 5$), were selected to participate in two 7-minute interactions with TeachLivE™ (TLE), a mixed-reality simulator. The simulated

classroom is a high school inclusive class comprised of six avatars, two of which have disabilities, including one with ASD. Teachers were asked to teach a technology lesson in the simulated classroom. Trained observers tagged the use of the pedagogical skills identified from the Delphi study in real time, using computer software. Data were collected through multiple sources, such as observations, personal reflections, and interviews and/or surveys. Data analyses consisted of descriptive and simple parametric statistics for teacher observations. Reflections/interviews followed Creswell's (2013) procedures for phenomenological data analysis. Results of this study are discussed in Chapter 4 and a discussion of findings and results are explored in Chapter 5.

Operational Definitions

Advanced Beginner Teacher: Has difficulty knowing what to do when a student challenges authority or seeks outward attention (Berliner, 2004) and often must think through each decision, resulting in little automaticity and often less efficient classroom processes (Berliner, 1994).

Autism Spectrum Disorders: "Persistent deficits in social communication and social interactions across multiple contexts; restricted, repetitive motor movements, use of objects, or speech; symptoms must be present in early developmental period; symptoms must cause clinically significant impairment in social, occupational, or other important areas of current functioning; disturbances are not better explained by intellectual disability or global developmental delay" (American Psychiatric Association, 2013, pp. 50-51).

Avatar: A perceptible digital representation with behaviors that imitate, typically in real time, a specific human being, and has an entity that facilitates remote presence with an intention to interact with elements in the environment (Nagendran, Pillat, Hughes, & Welch, 2012, p. 135).

Competent Teacher: Make conscious decisions about what they are going to do, and prioritize importance of classroom occurrences while ignoring those of lesser importance or not requiring attention (Berliner, 2004).

Evidenced-Based Practices: "...Practices that have evidence of effectiveness in promoting positive outcomes for learners..." (Wong et al., 2015, p. 3).

Expert Teachers: No longer having to choose what to attend to in the environment; respond to situations without thinking. Continuously monitoring and accessing classroom situations, behavioral and academic, in order to change or respond instantaneously (Ruppar, Roberts, & Olson, 2014; Wolff, Jarodzka, van Den Bogert, & Boshuizen, 2016).

Interactor: A trained professional in acting, improvisation, and human psychology, who controls avatars' movements, actions, and voices (Dieker, Hynes, Hughes, & Smith, 2008; Nagendran et al., 2012).

Mixed Reality: A combination of real world and virtual reality simulation (Bousfield, 2015; Dieker, Rodriguez, Lignugaris/Kraft, Hynes, & Hughes, 2013)

Novice Teachers: Moderately inflexible, rational, and conforms to the rules and procedures as told. Novice teachers typically follow the context-free rules provided (Berliner, 2004).

Pedagogy: The art of teaching (Labaree, 2008).

Proficient: Intuition or instincts become more obvious as teachers are better able to explain their decisions and start to become flexible and fluid, predict what might happen in the class based on similar experiences (Berliner, 2004).

TeachLivETM: A mixed-reality classroom simulation composed of five 3D virtual students, who respond in real time and are known as avatars (Dieker, Hynes, Hughes, Stacey, & Becht, 2015).

CHAPTER TWO: LITERATURE REVIEW

Teachers, university faculty members, and community members in general have seen a 119.4% rise in the prevalence of autism since 2000 (Centers for Disease Control and Prevention [CDC], 2016). This rise of an epidemic proportion has led to a need to solve what is currently an unknown in the field of education as how to best meet this population of students' needs (Knight, Spooner, Browder, Smith, & Wood, 2013). Simply stated, this sharp increase in what some call "neuro-diversity" (Ripamonti, 2016) has led to increasing challenges and unanswered issues in the field of education (Simpson, 2004). One specific challenge is the current lack of preparation of teachers qualified to work with students with autism. Researchers suggest teachers need additional and targeted knowledge, skills, and practices to ensure students with autism reach their educational potential (Busby et al., 2012; Coleman, 2000; Kaufman & Ireland, 2016; Loiacono & Valenti, 2010; Martin & Mulvihill, 2016; National Research Council, 2004). The percentage of students diagnosed with ASD, in general education classrooms served by teachers not prepared for meeting the needs of this population, is also on the rise (Loiacono & Valenti, 2010). This duality of issues (increase in prevalence and a lack of specifically prepared teachers) has created a national crisis (Hart & More, 2013).

Researchers claim this population of students with the most support needs are most likely receiving instruction by those with the least experience: novice or beginning teachers (Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2008; McLeskey & Brownell, 2015). Some researchers stated that 40% of special education teachers leave the field by their fifth year, potentially due to the lack of professional development and preparedness. Teachers cited they are unprepared for the range of learners they are expected to instruct

and lack clear toolkits to address the needs of students with ASD (Boe et al., 2008; Brunsting et al., 2014; Coleman, 2000; Emery & Vandenberg, 2010; Martin & Mulvihill, 2016). In contrast, thirty percent of new general education teachers reportedly leave annually (Carroll & Foster, 2010; Sutchter et al., 2016) and yet no clear and cohesive discussion about their struggles with students with ASD is currently cited in the research, though many students with ASD are placed in the general education setting (Snyder, de Brey, & Dillow, 2016). This newness of the teaching force may mean these teachers have never had the opportunity to reflect and progress from performing like a novice to an expert, especially in working with students with ASD. Berliner (2004) implied that most teachers are novices or, at best, advanced beginners in the first three years of their careers.

The complexity of developing teachers and the needs for better preparation for working with students with autism is the framework for this in-depth review of the literature. The review is grounded in the dual constructs of teachers who are maturing in their expertise but are still ill prepared for meeting the complex needs of students with ASD. The researcher begins with a brief history of the teacher education literature followed by the impacts of select legislation on teacher development and preparation. Next, the process of teachers moving from novices to experts is explored. The researcher discusses the current status of teacher preparation including teacher preparation for instructing students with ASD. Additionally, the limited research on evidence-based practices (EBP) and teacher pedagogy relative to students with ASD is presented. The chapter concludes with a description of a potential technological tool, a mixed reality simulator currently identified in the literature as TLE, for helping teachers gain a better

understanding of evidence-based practices. The potential benefits of TLE's use in teacher preparation are explored. The theoretical framework for this review of the literature is that teachers develop expertise over time (Berliner, 2004), and the use of simulation grounded in the conceptual framework of the Action Review Cycle (ARC) could enrich novice teachers' skills in alignment with the thinking of an expert teacher (Holman, Devane, & Cady, 2007).

Legislative Actions for Educators and Students with Disabilities

Since the 1960s, significant changes and improvements have occurred in both the education and preparation of teachers for improving the educational outcomes for students with disabilities. Before the 1950s, teachers did not teach students with severe disabilities, including intellectual disabilities (ID) and ASD; these populations of students were either asked to stay at home, or if they were served, it was most often in a segregated facility, classroom, or institution. Teachers who were prepared to work with these students were taught they would learn best in smaller classes with individualized instruction (Winzer, 1993). However, teachers who were prepared to work with students with severe disabilities were typically only trained in basic caregiving, as this population of students most often was housed in overcrowded and understaffed institutions, where they were most likely left alone with little instruction or adult interaction (Bleuler & White, 1912). The civil rights movement for this population brought about vocational rehabilitation, numerous education court cases and legislation, and different expectations and requirements for education, inclusivity, and preparation of their teachers (*Education of Mentally Retarded Children*, 1958; Smith & Arkans, 1974).

Today, preparation programs have evolved with the expectation that both general and special education teachers are to the maximum extent appropriate to be prepared to teach students with all ranges of disabilities alongside their non-disabled peers, and to create a plan leading to college and/or career outcomes (Rock et al., 2016; Skaff, Kemp, Sternesky McGovern, & Fantacone, 2016). This change did not come without legislative challenges. The major challenges that emerged through legislative action for students with disabilities are provided.

Brown v Board of Education

Segregation of minorities (i.e., disability, race) was the accepted policy in schools during the early 1950s. In *Brown v. Board of Education of Topeka, Kansas* (1954), lawyers argued that segregated schools were damaging the education of minorities (Neal & Kirp, 1983). The U.S. Supreme Court ruled the principle of “separate but equal” education as unconstitutional. The Supreme Court maintained persons cannot be segregated based upon irreversible characteristics such as race or disability (Yell, Rogers, & Rodgers, 1998). Many teachers now had to be prepared to teach students they had never taught before based on both race and disability.

Following the Brown decision, teachers were required to learn more about working with students with disabilities, due to federal legislation (e.g., Training of Professional Personnel Act of 1959, Captioned Films Acts of 1958, and Teachers of the Deaf Act of 1961). These legislative changes had a direct impact on the colleges that prepared teachers. For example, Dwight Eisenhower signed an act (PL 85-926) for colleges and universities to receive financial support to train college instructors and researchers, who would then in turn teach pre-service teachers about children with mental

retardation (*Education of Mentally Retarded Children*, 1958). By 1968, the federal government supported the preparation of more than 30,000 special education teachers and related services personnel (Office of Special Education and Rehabilitative Services United States Department of Education, 2007). The Brown decision was the beginning of the impetus for change, and was quickly followed by numerous court cases and significant legislation leading to changes in teacher requirements that shaped today's preparation of teachers for working with students with disabilities.

Pennsylvania Association for Retarded Citizens v. Pennsylvania (1972)

One of the cases that specifically changed the education and preparation of teachers for students with moderate to severe disabilities was the *Pennsylvania Association for Retarded Children (PARC) v. Commonwealth of Pennsylvania* (1972). Following the *Brown v. Board of Education* decision, the pressure to educate individuals with disabilities grew across the country, especially with the creation of the 1961 President's panel on mental retardation (Neal & Kirp, 1983). Despite this forward movement in 1970, two million children in America were still deemed "ineducable" or "untrainable" (Neal & Kirp, 1983, p. 12) and were not enrolled in school. In 1971, parents from the Pennsylvania Association for Retarded Citizens (PARC) set out to change that practice by suing the Commonwealth of Pennsylvania (1972) for equal treatment for individuals with ID (Nolan, 2004). In the PARC case, the parents and lawyers argued specifically for educational equality for students with disabilities, and the provision of a free and appropriate public education (Abeson & Bolick, 1974; Neal & Kirp, 1983; Taylor, 2004). This case was at the time—and still is today—considered

paramount in ensuring schools and teachers were prepared and expected to educate all children with intellectual disabilities.

With the PARC case, schools and teachers in Pennsylvania were required to provide all students with disabilities the same education as students without disabilities (Abeson & Bolick, 1974). While the PARC ruling was specific to students with ID, it had implications for students with autism and the entire field of special education, as this court case was one of the first instances of a court declaration that students with disabilities should be served in the least restrictive environment (LRE). This legislative action had major implications for general and special education teachers alike, both of whom now had to consider how to best educate students with more moderate and severe disabilities with the same curriculum and in the same place offered to all students in school settings (Almazan, 2009).

The Education for All Handicapped Children Act of 1975 (EHA)

Shortly after the PARC ruling, congress began to see this legislative action in Pennsylvania as a platform to be addressed nationally. The Rehabilitation Act (Almazan, 2009) was the first step in trying to provide students with disabilities with an education to meet their unique needs. This Act, passed in 1973, intended to stop the discrimination of individuals based on disability (*Education for All Handicapped Children Act of 1975 (EHA)*, 1975). Despite the intention of the law, the denial of basic educational rights of students with disabilities continued to occur across the nation. Only two years later, in 1975, the EHA (PL 94-142) was passed, requiring “all states seeking federal funds provide to all students with disabilities a free appropriate public education [FAPE] in the least restrictive environment [LRE]” (Almazan, 2009, p. 2). In addition to FAPE and

LRE, another critical requirement in this landmark legislation was the requirement of Individualized Education Programs (IEPs), to ensure all students received an education according to their specific needs. This dramatic change once again had implications on teacher preparation to create and implement such individualized programs. Gartner (1987) identified six principles included in EHA that were at the core of the shift and directly impacted the preparation of both general and special education teachers:

(a) the right of access to public education programs, (b) the individualization of services, (c) the principle of LRE, (d) the scope of broadened services to be provided by the schools and a set of procedures for determining them, (e) the general guidelines for identification of disability, and (f) the principle of primary state and local responsibilities. (p. 369)

Following the passage of EHA, states, as well as teachers, were required to educate students with disabilities in the LRE. However, EHA legislation had one major flaw in that it left the provision of educational resources up to the states, where many lacked the expertise to prepare teachers or the resources necessary to serve students with disabilities (National Research Council, 2004).

The Individuals with Disabilities Education Act of 1990

Despite numerous shifts in teacher education after the passage of IDEA in 1973, future revisions of this law have had, and continue to have, direct impact on teacher preparation. The EHA, reauthorized in 1990 and renamed the *Individuals with Disabilities Education Act* (IDEA), required an increased level of accountability for both special education and general education teachers to have pedagogical and content knowledge to improve the outcomes for all students, including students with disabilities

(Cochran, King, & DeRuiter 1991; *Individuals with Disabilities Education Act of 1990 (IDEA)*, 1990). The IDEA required that all students, regardless of severity or type of disability, receive a FAPE according to their individual needs, from a highly-qualified teacher at the student's grade level and content area.

The IDEA of 1990 had an immense impact on how educators looked at students with disabilities, including this new surge in the number of students with ASD entering the school setting. Not only were students with disabilities to be educated in the LRE, but students with ASD were now entitled to educational access in the LRE. Congress, in their revisions of IDEA, followed the lead of the American Psychological Association by identifying ASD as a disability category in its own right (*IDEA*, 1990), and this disability was no longer directly associated with the diagnosis of schizophrenia. With the new definition of ASD, general and special education teachers were challenged to find ways to reach this population of students who presented, in some instances, new behaviors or unique challenges in the classroom settings. The IDEA of 1990 cleared the way for students with ASD to receive services for their unique needs in the LRE.

No Child Left Behind (2001)

This further push for better teacher preparation for serving all students, and for the rights of students with disabilities, was reaffirmed and further shaped with the reauthorization of the *Elementary and Secondary Education Act (ESEA; 1965)* in 2001, renamed *No Child Left Behind (NCLB)*. This revision included a strong focus on student improvement aimed at closing the achievement gap for all students. In order to increase school accountability for student learning, NCLB required teachers to be highly qualified, and promoted the identification and use of EBP (*ESEA, 1965; The No Child Left Behind*

Act of 2001, 2001). Although EBP were identified for general education standards, little information about EBP was identified for students with ASD (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010). Odom et al. (2010) explained the reason behind the lack of EBP for students with ASD at this time was because single subject case research was not accepted as a form of empirical evidence. Therefore, without identified EBP, higher education faculty or classroom teachers did not have the knowledge to fulfill the requirements put upon them specifically in NCLB to use EBP for teaching students with ASD.

Although not a special education law, NCLB required teachers to meet the needs of all students, including those with significant disabilities and autism. No Child Left Behind required all teachers to be *highly qualified*, including special education teachers and teachers of students with ASD. The highly-qualified mandate required that all teachers of students with or without disabilities must be certified in the content area they taught. At the time, most special education teachers were certified to teach all content to students with disabilities without content area certification. After the passage of NCLB, the implication for special education teachers of students with ASD was even greater. In some states, teachers of students with ASD had to earn a specialized certification to continue to be the teacher of record for students with severe disabilities and, at the high school level, had to be certified in all content areas. Lastly, NCLB's legislative mandate on the use of EBP changed the way teachers were to instruct all students (Cook, Tankersley, Cook, & Landrum, 2008; Cook, Tankersley, & Harjusola-Webb, 2008; Reichow, Doehring, Cichetti, & Volkmar, 2014). Despite EBP having been identified for some populations, few if any had been identified for students with ASD, especially at the

secondary level (Wong et al., 2015). The Combating Autism Act in 2006 (*Combating Autism Act of 2006*, 2006), provided \$47.7 million towards efforts to find EBP for academic and behavioral instruction for this population. This legislation, combined with NCLB, greatly impacted the way teachers are prepared to work with students with autism. The Combating Autism Act continues to raise awareness for autism by its “mandates for continuing education curriculum ...and the development and dissemination of guidelines for evidence-based interventions” along with a strategic plan for research (Dillenburger, McKerr, & Jordan, 2014, p. 138).

Least Restrictive Environment and Students with Autisms Spectrum Disorder.

Since the 1975 passage of *Individuals with Disabilities Education Act* (IDEA), LRE has been an ongoing discussion, especially for students with ASD. Least restrictive environment was first defined in legislation in 1975 and has maintained the basic tenets through each subsequent reauthorization:

To the maximum extent appropriate, children with disabilities, including children in public or private institutions or other care facilities, are educated with children who are not disabled, and special classes, separate schooling, or other removal of children with disabilities from the regular educational environment occurs only when the nature or severity of the disability of a child is such that education in regular classes, with the use of supplementary aids and services, cannot be achieved satisfactorily. (*EHA*, 1975; *IDEA*, 1990; *IDEA*, 2004)

In the most recent data from Snyder, de Brey, and Dillow (2016), 33.3% of students with autism were educated in general education classrooms less than 40% of the day, and

39.5% were educated in general education classrooms 80% or more of the day. Students with ASD are the third largest category of students restricted from education with their nondisabled peers. Students with ID are served in the most restricted environments at 48.8% and students with multiple disabilities follow closely at 46.4% being educated with students in the general population less than 40% of the day (Snyder et al., 2016).

The LRE for students with ASD remains under discussion, and even debated in three critical areas: (a) appropriate placement of services for students who require multiple and more intensive supports; (b) lack of general education teacher preparation in autism; and, (c) lack of EBP for students with ASD in the general education classroom. Teacher candidates in special education have identified a lack of preparation in working with students with ASD (Able, Sreckovic, Schultz, Garwood, & Sherman, 2015; Blanton, Pugach, & Florian, 2011). Due to the vast scope of information and disability categories to discuss and experience in teacher preparation, many beginning special education teachers never have the opportunity to instruct students with ASD in their classrooms (Busby et al., 2012; Ergül, Baydik, & Demir, 2013).

Additionally, general education teachers note they are not prepared to teach students with ASD, even though 95% of general education teachers have had or currently have a student with ASD in their classes (Carlson, Brauen, Klein, Schroll, & Willig, 2002; Coleman, 2000; Loiacono & Valenti, 2010; National Research Council, 2004). Busby and colleagues (2012) explain that autism is a challenge for teachers due to the spectrum of characteristics and supports needed. Although general educators are highly qualified in their subject area, they lack the “specialized instructional techniques, unique

curriculum, and coordinated services to successfully serve these students in inclusive settings” (Busby et al., 2012, p. 29).

Autism Spectrum Disorders

Just as teacher preparation and legislation for students with disabilities has changed over time, so has the definition of ASD. In 1980, the DSM III defined Autism for the first time under the schizophrenia umbrella as individuals having “deficits in social-emotional reciprocity, nonverbal communication, developing and maintaining appropriate relationships, restrictive or repetitive patterns of behaviors, fixated interests that are abnormal in intensity, and hyper reactivity to sensory input or unusual interest in sensory aspects of environment” (American Psychiatric Association, 1980). The DSM-V (2013) provided further information to decipher the severity of the support needed for the individual by three levels; Level 1 is requiring support, Level 2 is requiring substantial support, and Level 3 is requiring very substantial support (American Psychiatric Association, 2013, p. 52; See Table 2). General and special education teachers alike are to be prepared to address students at these various levels, as every teacher may have a student with ASD in his or her classroom. Yet a clear path of EBP for each level is yet to emerge. Despite this lack of EBP, teachers need to be prepared to teach to the fullest extent every student, including those with ASD.

Table 2

Levels of Severity for Autism Spectrum Disorder

Severity Level for ASD	Social Communication	Restricted & Repetitive Behaviors (RRB's)
Level 3 'Requiring very substantial support'	Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning; very limited initiation of social interactions and minimal response to social overtures from others.	Preoccupations, fixated rituals and/or repetitive behaviors markedly interfere with functioning in all spheres. Marked distress when rituals or routines are interrupted; very difficult to redirect from fixated interests or returns to it quickly.
Level 2 'Requiring substantial support'	Marked deficits in verbal and nonverbal social communications skills; social impairments apparent even with supports in place; limited initiation of social interactions and reduced or abnormal response to social overtures from others.	RRBs and/or preoccupations or fixated interests appear frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress or frustration is apparent when RRB's are interrupted; difficult to redirect from fixated interest.
Level 1 'Requiring support'	Without supports in place, deficits in social communication cause noticeable impairments. Has difficulty initiating social interactions and demonstrates clear examples of atypical or unsuccessful responses to social overtures of others. May appear to have decreased interest in social interactions.	RRB's cause significant interference with functioning in one or more contexts. Resists attempts by others to interrupt RRB's or to be redirected from fixated interest.

Note: Adapted from Diagnostic and Statistical Manual of Mental Disorders : DSM-5. Copyright 2013 by American Psychiatric Association.

Teacher Development from Novice to Expert

The historical journeys for both students with disabilities and teacher preparation have been long and ever-changing. Today's practices for teacher preparation have moved beyond simple moral education to high-stakes and high levels of accountability for both teacher practice and, most importantly, student learning (Kaufman & Ireland, 2016). The difference today is that the learning provided by a novice teacher is not just to an upper-class elite student (Boyd et al., 2008; Headden, 2014; McLeskey & Brownell, 2015) but to an array of students with diverse learning and behavioral needs (Kaufman & Ireland, 2016). Pre-service teachers in today's preparation programs have approximately two years of course work and typically about 1.5 semesters before they have classrooms on their own (Ericsson, 2014). Ericsson (2014) emphasizes this two-year apprenticeship model is insufficient for teachers to gain knowledge and develop expertise. In special education, only 52% of new teachers are fully prepared (Martin & Mulvihill, 2016). Therefore, novice teachers typically gain their practical knowledge through on-the-job experiences. While the degree of knowledge acquisition varies for each teacher, those who achieve the highest levels of expertise are noted to typically do so after about seven years of teaching (Berliner, 2001, 2004). Dreyfus and Dreyfus (1986) explain that this SAM occurs over five stages of development. Dreyfus and Dreyfus' stages from novice to expert are framed in the concepts presented from the work of Berliner on expert teacher practices and stages of teacher development. These stages are described as they provide the theoretical framework for this research study.

Novice

Real-life experiences in teaching are critical building blocks for novice teachers (Berliner, 2004). A novice teacher is described by Berliner (2004) as being moderately inflexible, rational, and conforms to the rules and procedures as told. Novice teachers typically follow the context-free rules provided to them through textbook learning and the rules given in their preparation programs, such as “Wait 3 seconds after asking a higher order question,” and “Never personally criticize a student” (p. 206). Additionally, novices are typically anxious over behavioral management issues, have difficulty looking beyond the surface of behavioral problems, and typically focus only on the problem (Berliner, 2001). In regards to behavior management, Van den Bogert, van Bruggen, Kostons, & Jochems (2014) observed novice teachers with eye tracking to determine where their attention focused when behaviors occurred. Findings revealed novice teachers focused all attention to the problem in the classroom; if the novice teacher noticed the behavioral issue at all, then he or she typically ignored the rest of the classroom. As novices gained experience, Berliner (2004) noted they typically then progressed to advanced beginners, shifting from rigidity in the rule structures to contextualizing and individualizing their thinking.

Advanced Beginner

At this stage, novice teachers begin to use their experiences to deal with challenges or issues. They learn to distinguish similarities across contexts and to extend their knowledge and thinking to new situations. Advanced beginning teachers may still struggle with what to do when a student challenges authority or seeks outward attention (Berliner, 2004) and often must think through each decision, resulting in little

automaticity and often less efficient classroom processes (Berliner, 1994). Wolff, Jarodzka, van Den Bogert, and Boshuizen (2016) found that beginning teachers do not scan the room nearly as often as expert teachers. Additionally, the researchers observed that beginning teachers skip areas of interests and often focus on student inactivity (Wolff et al., 2016). If the teacher can persist past this level of automaticity, typically the next stage of development is a level of competence.

Competent

Not all teachers progress to this competent level as some continue throughout their careers as advanced beginners. However, those who do become competent typically do so within three to five years, through a motivation to learn and increase in experience. Berliner (2004) found two unique characteristics in teachers who advance to this stage. First, competent teachers make conscious decisions about what they are going to do. Second, they determine and prioritize importance of classroom occurrences and are able to ignore those of less importance or that do not require attention. Wolff and colleagues (2016) confirmed that experts can pass over irrelevant information in the classroom and focus more on informative areas that require more attention. Additionally, competent teachers are able to make reasonable curriculum decisions, such as when to spend more or less time on a particular lesson or concept. Competent teachers, though, typically lack behaviors in speed, flexibility, and fluidity of decisions found in both proficient and expert teachers (Berliner, 2004).

Proficient

Teachers who progress beyond the competent stage typically achieve proficiency in three to five years. Berliner (2004) suggests that proficient teachers' intuition or instincts become more obvious as they are better able to explain their decisions and become flexible and fluid. Ruppert, Roberts, and Olson (2014) similarly found that expert special education teachers for students with severe disabilities were automatic in decision-making and flexible across content. Teachers at this level take a holistic view of the vast experiences they have accumulated and recognize similarities in events. Proficient teachers can typically predict what might happen in the class based on similar experiences (i.e., when a child is about to misbehave, when the class is bored, or when a lesson is not meeting the learner's needs; Berliner, 1988; Berliner, 1994; Berliner, 2004; Wolff et al., 2016). Although teachers in the proficient stage are more intuitive, they are still analytical and cautious about their decisions. After a few more years in this stage, Berliner (1994, 2004) describes how some teachers reach the level of expert.

Expert

Although many teachers never reach this level, expert teachers act effortlessly and fluidly, making unconscious decisions. Berliner (1994) states, "If we think of a novice as rigid in action, if we think of the advanced beginner as gaining insight, the competent performer as rational, and the proficient performer as intuitive, we might think of the expert as being *arational*" (p. 18). At the expert level, teachers no longer have to choose what to attend to in the environment; they have had enough experience to respond to situations without thinking. Expert teachers are continuously monitoring and accessing classroom situations, behavioral and academic, in order to change or respond

instantaneously (Ruppar et al., 2014; Wolff et al., 2016). Expert teachers, Berliner (2004) adds, tend to do what works, without having to problem solve, as they “go with the flow” (p. 208). Researchers also have identified similarities in the practices of experts in the use of instructional strategies and pedagogy in the classroom (Berliner, 2001; McLeskey & Ziegler, 2015; TeachingWorks, 2016).

Instructional Pedagogy of Experts

As experts are observed, researchers have identified instructional strategies that expert teachers perform for the best student outcomes (Berliner, 2001; McLeskey & Ziegler, 2015; TeachingWorks, 2016). Discussed below are different ideas of instructional practices and strategies identified in the performances of experts. Although a portion of the strategies discussed are intended for general education teachers, the field of special education is currently identifying and adapting pedagogical strategies, such as the high leverage practices (HLP) for special education teachers (McLeskey & Brownell, 2015; McLeskey & Ziegler, 2015). See Figure 1 *Target For All Instructional Pedagogical Practices*. See Appendix B for the complete crosswalk, conducted by the researcher, of selected pedagogical instructional strategies currently identified for special and general educators.

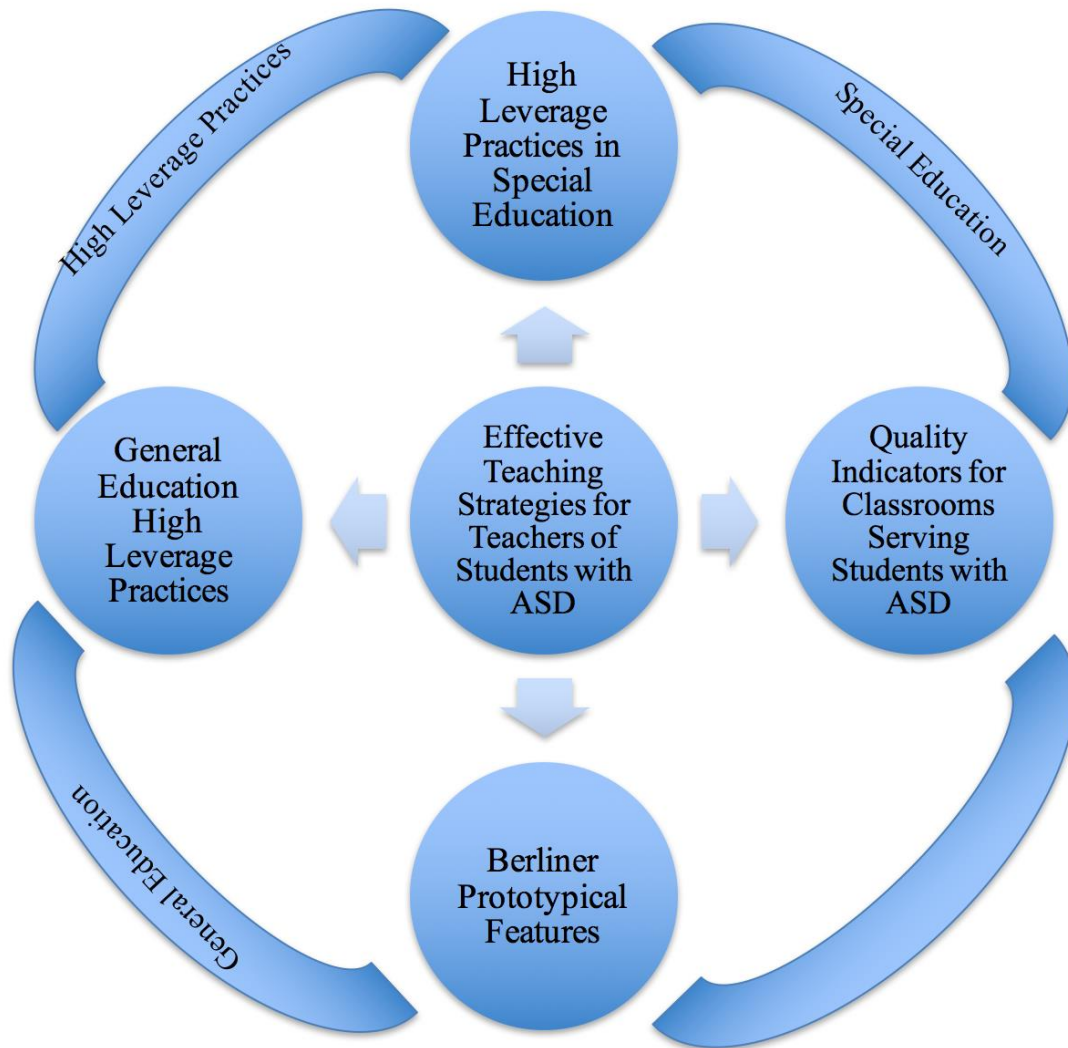


Figure 1 Target For All Instructional Pedagogical Practices

Prototypical Features and National Board for Professional Teaching Standards

Berliner (2001) identified 13 prototypical features of experts, or “accomplished teachers” (National Board for Professional Teaching Standards [NBPTS], 2010, p. 10), through research of Board Certified teachers. See Table 3 for the 13 prototypical features identified by Berliner (2001).

Table 3

Prototypical Features of Experts

Prototypical Features of Experts (Berliner, 2001)
Extensive pedagogical content knowledge including subject matter
Better problem solving skills
Better adaption and modification of goals for diverse learners, better skills for improvisation
Better decision making
More challenging objectives
Better classroom environment
Better perception of classroom events
Greater sensitivity to context
Better monitoring of learning and providing feedback
More frequent testing of hypotheses
Greater respect for students
Display of passion for teaching

These prototypical features drove the qualifications for teachers to become nationally board certified across content areas, age groups, and now special education classrooms. Although Berliner's prototypical features were founded in general education, the NBPTS used this foundational research to create standards for special education. The special needs standards described by the NBPTS fall under three main categories: (a) Foundations for effective practices, (b) Student learning and development, and (c) Roles and practices in the learning community. The exceptional needs standards (pp. 15-16) are described in Table 4.

Table 4

National Board for Professional Exceptional Needs Teaching Standards

Standard	Description
Knowledge of Students	Use their knowledge of human development and learning and their skills as careful observers of students to help develop students' knowledge, aptitudes, skills, interests, aspirations, and values.
Knowledge of Philosophy, History, and Law	Understand how philosophical, historical, and legal foundations of their field inform the development of effective practice. They draw on this knowledge to organize and design appropriate practices and to ensure that students' rights are protected and respected.
Diversity	Create an environment in which equitable treatment, fairness, and respect for diversity are modeled, taught, and practiced by all, and they take steps to ensure access to quality learning opportunities for all students
Family Partnerships	Work collaboratively with parents, guardians, and other caregivers to promote understanding of the student and to achieve educational goals.
Assessment	Design, select, and use a variety of assessments to obtain accurate, useful, and timely information about student learning and development and to help students reflect on their own progress.
Communication	Recognize the critical nature of communication for students with exceptional needs. They develop and foster communication skills that enable students to access, comprehend, and apply information; acquire knowledge; and develop and maintain interpersonal relationships.
Social Development and Behavior	Cultivate a sense of efficacy in their students as they develop each student's personal responsibility and independence, civic and social responsibility, respect for diverse individuals and groups, and ability to work constructively and collaboratively with others.
Curriculum and Instruction	Command a core body of knowledge of the disciplines and of specialized curriculum for students with exceptional needs. They draw on this knowledge to establish curricular goals, design instruction, facilitate student learning, and assess student progress.
Learning Environment	Establish a caring, stimulating, and safe community for learning in which democratic values are fostered and students assume responsibility for learning, show willingness to take intellectual risks, develop self-confidence, and learn to work independently and collaboratively.
Instructional Resources	Select, adapt, create, and use rich, unique, and varied resources, both human and material, to promote individual student learning.
Contributing to the Profession and to Education through Collaboration	Provide leadership through collaboration to improve teaching and learning for students with exceptional needs and to advance knowledge, policy, and practice.
Reflective Practice	Regularly analyze, evaluate, and synthesize their practice to strengthen its quality.

Note. Adapted from Exceptional Needs Standards, Second Edition. Copyright 2010 by National Board for Professional Teaching Standards.

High Leverage Practices

In addition to prototypes of experts and the NBPTS for exceptional educators, researchers at TeachingWorks (2016) identified HLPs for general education teachers that are crucial to students' understanding and advancement. Although the HLPs are geared towards general education teachers, the Collaboration for Effective Educator Development, Accountability and Reform (CEEDAR) Center has completed their work on adapting the HLPs to special educators (McLeskey et al., 2017). The 22 HLPs for special education teachers are broken up into four parts: (a) collaboration, (b) assessment, (c) social/emotional/behavioral practices, and (d) instruction. For the purpose of this research, the researcher focused on instructional practices only. McLeskey and Brownell (2015) stated that, while there is some overlap in the HLPs for expert general and special educators, adaption is still needed for the field of special education. The 19 HLPs identified by TeachingWorks (2016) are provided in Table 5 and the 22 HLPs for special education (McLeskey et al., 2017) are provided in Table 6.

Table 5

High leverage practices

TeachingWorks High Leverage Practices
Leading a group discussion;
Explaining and modeling content, practices, and strategies;
Soliciting and interpreting individual students' thinking;
Diagnosing particular common patterns of student thinking and development;
Implementing norms and routines for classroom discourse and work;
Coordinating and adjusting instruction during a lesson;
Specifying and reinforcing productive student behavior;
Implementing organizational routines;
Setting up and managing small group work;
Building respectful relationships with students;
Talking about a student with parents or other caregivers;
Learning about students' cultural, religious, family, intellectual, and personal experiences into resources for use and instruction;
Setting long- and short- term learning goals for students;
Designing single lessons and sequences of lessons;
Checking student understanding during and at the conclusion of lessons;
Selecting and designing formal assessment of student learning;
Interpreting the results of student work including routine assessments, quizzes, tests, and standardized assessments;
Providing oral and written feedback to students; and
Analyzing instruction for the purpose of improving it.

Note. Adapted from www.TeachingWorks.com. Copyright 2016 by TeachingWorks.

Table 6

High Leverage Practices for Special Education Teachers

High Leverage Practices for Special Educators
Collaborate with professionals to increase student success;
Organize and facilitate effective meetings with professionals and families;
Collaborate with families to support student learning and secure needed service;
Use multiple sources of information to develop a comprehensive understanding of a student's strengths and needs;
Interpret and communicate assessment information with stakeholders to collaboratively design and implement educational programs;
Use student assessment data, analyze instructional practices, and make necessary adjustments that improve student outcomes;
Establish a consistent, organized, and respectful learning environment;
Provide positive and constructive feedback to guide students' learning and behavior;
Teach social behaviors;
Conduct functional behavioral assessments to develop individual student behavior support plans;
Identify and prioritize long- and short-term learning goals;
Systematically design instruction toward a specific learning goal;
Setting long – and short– term learning goals for students;
Adapt curriculum tasks and materials for specific learning goals;
Teach cognitive and metacognitive strategies to support learning and independence;
Provide scaffolded supports;
Use explicit instruction;
Use flexible grouping;
Use strategies to promote active student engagement;
Use assistive and instructional technologies;
Provided intensive instruction;
Teach students to maintain and generalize new learning across time and settings; and
Provide positive and constructive feedback to guide students' learning and behavior.

Note. Adapted from *High Leverage Practices in Special Education (McLeskey et al., 2017)*.

Quality Indicators for Classroom Serving Students with Autism Spectrum Disorders

The alignment of this array of practices with the use of EBP by expert teachers for students with ASD is still emerging. The Quality Indicators for Classrooms Serving Students with ASD (QIASD; Daly, DeCatre, Pearl, & Gourwitz, n.d.) was developed to guide classroom observations for teachers of students with ASD to provide strength and

consistency with specific indicators of quality. The QIASD in 2015 was revised to reflect quality indicators based on field testing and alignment with the Council for Exceptional Education Initial Special Education Developmental Disabilities and Autism Specialty Set Standards (Council for Exceptional Children, 2015). The observation tool consists of 52 quality indicators in seven areas: (a) learner development and individual learning differences, (b) learning environments, (c) instruction curricular content knowledge, (d) assessment, (e) instructional planning and strategies, (f) professional learning and practice, and (g) collaboration. Content validity was conducted for the 52 quality indicators by topic experts in the field ($n = 103$) using two methods. The first method was using a form of averages, with an *a priori* threshold for determination of acceptability. The results showed an overall average for every indicator above a mean of 4.5. The second method of content validity was found by a content validity ratio (CVR) with a threshold set at 0.33. When looking at the overall sample, all the items exceeded the threshold. The results through the two methods confirmed a strong content validity for all indicators (Pearl et al., n.d.). For the purposes of this study, the researcher focused on instructional planning and strategies from the QIASD provided in Table 7. The full QIASD tool can be found in Appendix C.

Table 7

QIASD Instructional Planning and Strategies

CEC standard 5.0- Beginning special education professionals select, adapt, and use a repertoire of evidenced-based instructional strategies to advance learning of individuals with exceptionalities

Quality Classroom Indicator:

- a. Instruction is systematic and based on learner characteristics, interests, and ongoing assessments.
 - b. Students remain actively engaged learning opportunities throughout observation, with no more than two minutes down time.
 - c. During five-minute observation, staff interacts with each student at least once to teach or promote learning. Excluding students who are engaged in independent work.
 - d. Instructional pace promotes high rates of correct responding, correct responses, are reinforced or promoting/error correction is provided as needed.
 - e. Skills are taught in the context of naturally occurring activities and daily routines. There is no down time for teaching.
 - f. Communication directed to students is clear, relevant appropriate to language ability, and grammatically correct.
 - g. Communication directed to students presents opportunities for dialogue (rather than being largely directive).
 - h. Communication directed to students consists of largely instructive/ positive comments in comparison to corrective comments.
 - i. Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement.
 - j. Instructional methods are grounded in evidenced-based practices.
 - k. Staff created opportunities for spontaneous use of communication skills including student-to-student interactions.
 - l. Students without verbal communication have AAC and actively use across activities.
 - m. Technologies are employed to support instructional assessment, planning, and delivery for individuals with exceptionalities.
-

Note. Retrieved from Quality Indicators for Classroom Serving Students with ASD
Reproduced with permission (Daly, DeCatre, Pearl, & Gourwitz, n.d.)

Current Special Education Preparation

The current consensus by many in the field is that teacher preparation programs are (a) not adequately preparing teachers to meet the needs of students with ASD (Lloyd & Lloyd, 2015; National Research Council, 2004) and, (b) schools assessed by the National

Council on Teacher Quality (NCTQ) report only four percent of universities offer a special education K-12 teacher preparation program with requirements for content that approach adequacy to teach students with ASD. Additionally, no special education PK-12 teacher preparation programs were able to approach adequacy for content preparation for this population. Furthermore, about half of the universities' special education programs were offering inadequate preparation in instructional design in special education (Greenberg, McKee, & Walsh, 2013). A possible reason for inadequate preparation is the lack of consensus to define the most effective practices (Heflin & Simpson, 1998). Undergraduate programs are not preparing teachers in specific methods for students with ASD due to the difficulty in pinpointing the most effective methods for meeting the students' educational and behavioral needs (Simpson, 2004).

Teacher preparation in special education has shifted into non-categorical and cross-categorical programs, where teachers are not prepared with expertise in one specific disability category but in multiple categories. Due to this shift, the focus of many programs is on high incidence disabilities with minimal time spent on ASD (Simpson, Mundschenk, & Heflin, 2011).

Simpson and colleagues (2011) explain that general education teachers are also receiving little to no instruction on how to most effectively teach students with ASD, despite this population of students being served at least 40% of the time in the general education setting. In addition, general education teachers are not required to have a preservice experience with students with ASD. Therefore, despite the increase of students with ASD in the general education classrooms, newly minted teachers with this

population most likely have been void in preparation or in practice (Simpson et al., 2011).

In a recent study of pre-service teachers ($n = 160$), 15% of teacher candidates and 11% of students who graduated from a special education program felt they were not prepared to teach students with ASD (Ergül et al., 2013). Those teacher candidates felt as if the program lacked preparation and information on educating students with autism. The participants also expressed a desire for an extended practicum experience and course that was more applicable to students with ASD. The surveyed teachers suggested additional field experience with behavior, classroom management, and instruction of academic skills to improve the undergraduate programs. This need for higher level and extended preparation is reflected in retention of teachers. Special education teachers who said they had an exceptional pre-service preparation program felt they were more successful in their overall classroom teaching (Carlson et al., 2002).

Teacher Attrition

Teacher attrition is considered one of the most problematic concerns in special education (Haberman, 2012; Haynes et al., 2014; Kennedy, 2015; Martin & Mulvihill, 2016; Mitchell & Arnold, 2004; Podolsky et al., 2016; Rock et al., 2016; Snyder & Dillow, 2015; Sutchter et al., 2016; Van den Bogert et al., 2014). An estimated 40-50% of new teachers leave the teaching profession after only five years (Haynes et al., 2014). Mitchell and Arnold (2004) state special education teachers are twice as likely to leave compared to their general education counterparts. In fact, six percent of special education teachers want to leave the profession as soon as possible (Carlson et al., 2002). Teachers who left the profession noted a lack of preparedness and professional development as

reasons for their decisions (Emery & Vandenberg, 2010). The national average cost of teacher attrition is estimated as a \$8.7 billion a year problem (Podolsky et al., 2016; Sutcher et al., 2016). Better preparing teachers could reduce attrition and allow teachers to progress further to the expert level of teaching, while saving money and positively impacting more students.

Teacher Use of Pedagogy and Evidence-Based Practices

One way to potentially create more expert teachers and reduce teacher attrition would be for preparation and licensure programs to ensure teachers leave with a clear set of tools grounded in EBP. Although there is a plethora of research on EBP as teachers progress through the five stages of development (Guckert, Mastropieri, & Scruggs, 2016), a dearth of literature exists on teaching methods used by novice or expert teachers of students with disabilities, especially students with ASD. It takes more than just the knowledge of EBP to make gains in students with ASD (Burns & Ysseldyke, 2009; Cook, Tankersley, Cook, & Landrum, 2008). Teachers still need the “nonresearch knowledge—tacit or accumulated knowledge gained largely through experience (i.e., professional wisdom)” to be an effective teacher (Cook, Tankersley, & Harjusola-Webb, 2008, p. 106).

In 2001, NCLB mandated the use of evidenced-based instruction with students with disabilities. A recent systematic review of research from 1990-2011, by Wong and colleagues (2015), revealed 27 EBP. Wong and colleagues (2015) identified additional EBP, raising the original count of 24, from previous reviews, to 27. See Table 8 for the full list of the EBP and definitions identified by Wong and colleagues (2015). Most of

these practices were studied only in separate special education classrooms, leaving the question as to whether the same practices would be effective or even conducive for the general education classroom setting (Friden, 2004; Garland, Vasquez, & Pearl, 2012). Many EBP, such as discrete trial training and video modeling, utilize instructional and behavioral strategies often implemented in one-to-one settings (Cihak, Kildare, Smith, McMahon, & Quinn-Brown, 2012; Garland et al., 2012; Scattone, 2008). Although the use of EBPs are mandated by NCLB, practicing special and general education teachers have not explicitly been taught these practices due to the large scope of instruction (Busby et al., 2012; National Research Council, 2004). Although EBP are mandated, a gap exists between research and actual practice (Burns & Ysseldyke, 2009; Cook, Tankersley, & Harjusola-Webb, 2008; Reichow et al., 2014). Morrier, Hess, and Heflin (2011) reported that less than 5% of teachers self-reported use of best practices that were scientifically tailored for students with autism according to Simpson and colleagues (2005). Even with the push for EBP, however, teachers still need to learn the wisdom and expertise necessary in the classroom (Cook, Tankersley, & Webb-Harjusola, 2008). Additionally, EBP do not take into account the different characteristics of individual students with ASD or the expertise of the teacher implementing them (Lubas, Mitchell, & De Leo, 2015). General and special education teachers need to be better prepared to teach students with ASD through explicit instruction on how to implement EBPs in teacher preparation programs and professional development activities, potentially through the use of simulation.

Table 8

Evidence Based Practices

Current Review from 1990-2011	Definition
Antecedent – based interventions	Arrangement of events or circumstances that precede the occurrence of an interfering behavior.
Cognitive behavior intervention**	Construction management for control of cognitive processes that lead to changes in overt behavior.
Differential reinforcement of other behaviors	Provisions of positive/desirable consequences for behaviors for their actions that reduce the occurrence of an undesirable behavior. Reinforcement provided: a) when the learner engages in a specific desired behavior other than the inappropriate behavior (DRA), b) when the learner engages in a behavior he or she is physically unable to do well while engaging in the inappropriate behavior (DRI), c) when the learner is not engaging in the interfering behavior (DRO).
Discrete trial training	Instructional process usually involving one teacher/service provider and one student/client, designed to teach appropriate behavior or skills. Instruction usually involves masses trials. Each trial consists of the teacher’s instruction/presentation, the child’s response, a carefully planned consequence, and a pause prior to the next instruction.
Exercise**	Increase in physical exertion as a means of reducing problem behaviors.
Extinction	Withdrawal for removal of reinforcements of interfering behavior in order to reduce the occurrence of that behavior. Although sometimes used as a single intervention practice, extinction often occurs in combination with functional behavior assessment, functional communication training, and differential reinforcement.
Functional behavior assessment	Systematic collection of information about interfering behavior designed to identify functional contingencies that support behavior. FBA consists of describing the interfering for problem behavior, identifying antecedents or consequent events that control the behavior, developing a hypothesis of the function of behavior and/or for testing the hypothesis.

Current Review from 1990-2011	Definition
Functional communication training Modeling**	Replacement of interfering behavior with more appropriate communication that accomplishes the same function. FCT usually includes A, DRA, and/ or EX. Demonstration of a desired target behavior that results in imitation of behavior by the learner and the acquisition of the imitative behavior. This EBP is often combined with other strategies such as prompting in reinforcement.
Naturalistic Intervention	Intervention strategies that occurred within a typical setting/activity/routine of the learner. Teachers/service providers establish the learner’s interest in the event through its arrangement, provide necessary support for the learner to engage in the targeted behavior, elaborate on the behavior when it occurs, and/or arrange natural consequences for the targeted behavior or skills.
Parent – Implemented Intervention	Parents provide individual intervention necessary for their child to improve/increase a wide variety of skills and/or to reduce interfering behaviors. Parents learn to deliver interventions in their homes and/or community through a structured parent training program.
PECS	Learners are initially taught to give a picture of a desired item to partners in exchange for desired item. PECS consists of six phases: (1) “ how” to communicate, (2) distance and persistence, (3) picture discrimination, (4) sentence structure, (5) responsive requesting, and (6) commenting.
Peer-Mediated Instruction in Intervention	Typically developing peers interact with and/or help children and youth with ASD to acquire new behavior, communication, and social skills by increasing social and learning opportunities within natural environments. Teachers/service providers systematically teach peers strategies for engaging children with ASD in positive and extended social interactions in both teacher-directed and learner–initiated activities.
Pivotal Response Training	Pivotal learning variables (i.e., motivation, responding to multiple cues, self-management, and self-initiation), guided intervention practices implemented in settings that build on learner interest and initiative.
Prompting	Verbal, gestural, or physical assistance to help learners acquire or engaging in a targeted behavior or skill. Prompts are generally given by an adult or peer before or during the learner’s attempt to use the skill.
Reinforcement	An event, activity, or other circumstance occurring after a learner in engages any desired behavior, leading to the increased occurrence of said behavior in the future.
Response Interruption/Redirection	Introduction of a prompt, comment, or other distractors and interfering behavior, designed to divert the learner’s attention away from the interfering behavior and resulting in its reduction.

Current Review from 1990-2011	Definition
Scripting**	A verbal and/or written description about a specific skill or situation that serves as a model for the learner. Scripts are usually practiced repeatedly before the skill is used in the actual situation.
Self-Management	Instruction focused on discriminating between appropriate and inappropriate behaviors, and learners accurately monitoring and recording their own behaviors and rewarding themselves for behaving appropriately.
Social Narrative	Narratives that describe social situations in some detail by highlighting relevant cues and offering examples of appropriate responses. Social narratives are individualized according to learner needs and are typically quite short, perhaps including pictures or other visual aids.
Social Skills Training	Group or individual instruction designed to teach learners with autism spectrum disorders (ASD) ways to appropriately interact with peers, adults, and other individuals. Most social skill meetings included instruction on basic concepts, role-playing or practice, and feedback to help learners with ASD acquire and practice communication, play, or social skills to promote positive interactions with peers.
Structured Play Group**	Small group activities characterized by their occurrences in a defined area with a defined activity; specific selection of typically developing peers to be in the group; a clear delineation of theme and roles by adult leading, prompting, or scaffolding as needed to support students' attainment of the activity's goals.
Task Analysis	A process in which an activity or behavior is divided into small, manageable steps in order to assess and teach the skill. Other practices, such as reinforcement, video modeling, or time delay, are often used to facilitate acquisition of the smaller steps.
Technology – Aided instruction and intervention**	Instruction or interventions in which technology is the central feature supporting the acquisition of a goal for the learner. Technology is defined as “any electronic item/equipment/application/ or virtual network used intentionally to increase/maintain and/or improve daily living, work/productivity, and recreation/leisure capabilities of adolescents with autism spectrum disorders (Odom et al., 2015, p. 3806).
Time Delay	In a setting or activity in which a learner should engage any behavior or skill, a brief delay occurs between the opportunity to use the skills and any additional instructions or prompts. The purpose of the time delay is to allow the learner to respond without having to receive a prompt and thus focus on fading the use of prompts during instructional activities.
Video Modeling	A visual model of the targeted behavior or skill (typically in the behavior, communication, play, or social domains), provided via video recording and display equipment to assist a desired behavior or skill.

Current Review from 1990-2011	Definition
Visual Support	Any visual display that supports the learner engaging in a desired behavior or skills independent of prompts. Examples of visual supports include pictures, written words, objects within the environment, arrangement of the environment or visual boundaries, schedules, maps, labels, organization systems, and timelines.

Note. *Table was adapted from Wong et al., 2013, p. 20-23, 28. ** = New addition for EBP searched from 1990-2011.

Therefore, a systematic review was conducted to seek answers to the following research questions:

1. What are the effective teaching practices (pedagogy) of expert special education teachers (defined as having at least 2 years of experience) with students with ASD?
2. What are the effective teaching practices (pedagogy) of novice special education teachers (defined as having less than 2 years of experience) with students with ASD?

Definitions of expert and novice, for this systematic literature review only, are based on the education literature in EBSCO host in order to expand the field of search.

Methods

The goal of this systematic review is to identify effective teaching methods or pedagogy used by teachers with students with ASD. Figure 2 is a flow chart outlining the key components of the process used to search for peer-reviewed articles on teacher pedagogy for students with ASD.

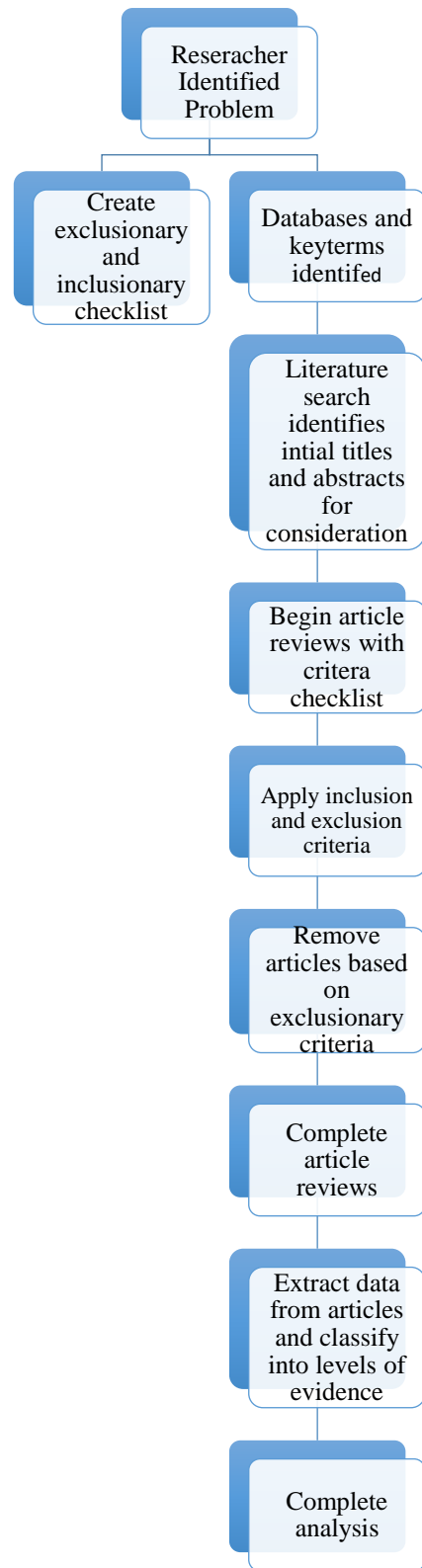


Figure 2 Systematic Review Methods Flow Chart

Identification of Studies

Multiple databases from 1991-2015 were used in the search. The researcher focused on education, psychology, and professional development databases. The databases used in the study included:

1. ERIC EBSCOhost
2. Teacher Reference Center
3. Professional Development Collection Education
4. PsycInfo
5. Academic Search Premier
6. Cochran Database of Systematic Reviews

A population, intervention, comparison, and outcome (PICO) chart (see Figure 3) was created to determine key words for each research question. Synonyms were found using the thesaurus in the ERIC EBSCOhost database and added to the PICO charts. The key terms used in the search for research question one included: (a) experienced special education teacher, (b) experienced teachers, (c) expertise, (d) teaching experience, (e) teacher qualifications, (f) knowledge level, (g) autism, (h) autism spectrum disorders, (i) pervasive developmental disorders, (j) intellectual disability, (k) mental retardation, (l) moderate mental retardation, (m) severe mental retardation, (n) mild mental retardation, (o) teaching practices, (p) teaching methods, (q) classroom technique, (r) pedagogical knowledge, (s) pedagogy, (t) instructional effectiveness, (u) teacher effectiveness, and (v) teacher behavior. In addition, the terms (a) technology, and (b) evidence-based practices, were used as exclusionary terms with the word 'not'. Exclusionary terms were decided based on the focus of pedagogical

skills that teachers perform without the use of technology and going beyond EBP. The key terms used in the search for research question two included: (a) novice, (b) beginning, (c) teacher experience, (d) teacher qualifications, (e) knowledge level, (f) novice teacher, (g) beginning teachers, (h) autism, (i) autism spectrum disorders, (j) pervasive developmental disorders, (k) intellectual disability, (l) mental retardation, (m) severe mental retardation, (n) mild mental retardation, (o) teaching practices, (p) teaching methods, (q) classroom technique, (r) pedagogical knowledge, (s) pedagogy, (t) instructional effectiveness, (u) teacher effectiveness, and (v) teacher behavior. In addition, the terms (a) technology, and (b) evidence-based practices, were used as exclusionary terms with the word 'not'. Technology and evidence-based practices were excluded to focus solely on teacher pedagogical behavior.

RQ 1: What are the effective teaching practices of expert special education teachers defined as, at least 2 years of experience, with students with autism spectrum disorder?

P (population) <i>Expert Special Education Teachers</i>	AND I (Intervention/Exposure) <i>Students with ASD</i>	AND C (comparative Intervention)	AND O (Outcomes) <i>Effective Teaching Practices</i>	NOT
1. Experienced Special Education Teachers 2. Experienced Teachers 3. Expertise 4. Teaching Experience 5. Teacher Qualifications 6. Knowledge Level	7. Autism 8. Autism spectrum disorders 9. Pervasive developmental disorders 10. Intellectual disability 11. Mental retardation 12. Moderate mental retardation 13. Severe Mental Retardation 14. Mild mental retardation	N/A	15. Teaching practices 16. Teaching methods 17. Classroom Techniques 18. Pedagogical knowledge 19. Pedagogy 20. <i>Instructional effectiveness</i> 21. <i>Teacher Effectiveness</i> 21. <i>Teacher Behavior</i>	22. Technology 23. Evidence based practices
Combine 1-6 using OR	Combine 7-14 using OR		Combine 15-21 using	Combine with 22-

RQ 2: What are the effective teaching practices of novice special education teachers defined as, less than 2 years of experience, with students with autism spectrum disorder

P (population) <i>Novice Special Education Teachers</i>	AND I (Intervention/Exposure) <i>Students with ASD</i>	AND C (comparative Intervention)	AND O (Outcomes) <i>Effective Teaching Practices</i>	NOT
1. Novice 2. Beginning 3. Teaching Experience 4. Teacher Qualifications 5. Knowledge Level 6. Novice Teacher 7. Beginning teacher	8. Autism 9. Autism spectrum disorders 10. Pervasive developmental disorders 11. Intellectual disability 12. Mental retardation 13. Moderate mental retardation 14. Severe Mental Retardation 15. Mild mental retardation	N/A	16. Teaching practices 17. Teaching methods 18. Classroom Techniques 19. <i>Instructional effectiveness</i> 20. <i>Teacher Effectiveness</i> 21. <i>Teacher Behavior</i> 22. Pedagogical knowledge	23. Technology 24. Evidence based practices
Combine 1-7 using OR	Combine 8-15 using OR		Combine 16-22 using OR	Combine with 23-24 using AND

Figure 3 PICO Chart for Systematic Review Research Questions

Study Selection

This systematic review focused on the teaching methods, or pedagogy, of teachers with students with ASD. Due to a dearth of literature, articles that included ID were added to the search since many students with ASD have a comorbid diagnosis of an ID (Matson & Shoemaker, 2009). The emphasis was on teacher behaviors that would, in turn, lead to positive student outcomes. If a teacher's behavior changed and positive student outcomes increased, then the article was included. The articles that focused on the teacher, rather than on the student, were included. In addition, the researcher was looking for studies that took place in educational settings from grades kindergarten to 12th grade. Articles were included if ASD and/or ID was the primary disability of the study. Finally, only peer-reviewed articles published between 1991-2015 were accepted.

Articles were excluded from this study if the main focus was on EBP. However, if the article talked about teaching methods or pedagogy, then it was still included in the review. If the focus of the practice was behavioral and not academic, the article was excluded from the review to focus on the academic instruction of teachers.

A flowchart of the study selection is shown in Figure 4. The total articles identified for research question one were 36 ($N = 36$) and for research question two were 35 ($N = 35$); however, after removing duplicates from research question one, the total was 21 ($N = 21$). After multiple screenings of identified articles and the use of the criteria checklist, the final number of articles used for research question one equaled three ($n = 3$) and, for research question two, equaled zero ($n = 0$).

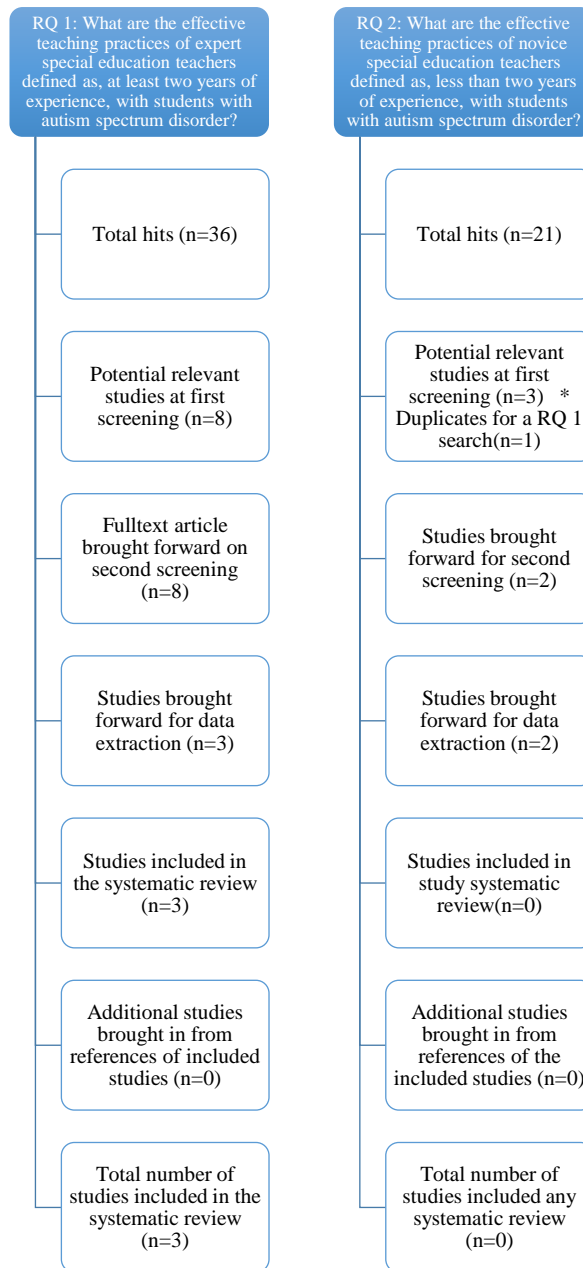


Figure 4 Study Selection Flow Chart

The criteria checklist (Figure 5), created by the researcher, aided in inclusionary and exclusionary criteria but also allowed for data extraction.

Author(s):
Date:
Journal:
Participants & Setting:
Type of Research:
Study Limitations:

Article Criteria	YES	NO
1. Is the article focused on <i>teachers</i> of students with <i>ASD</i> ?		
2. Does the study take place in an in an educational setting? (not residential)		
3. Is <i>ASD</i> the primary disability being researched?		
4. Does the author talk about <i>teaching practices/methods</i> to use with students with <i>ASD</i> ?		
5. Are the students/teachers practicing or in training for grades <i>K-12</i> ?		

If yes to all the above, complete the following:

Key Findings/Studies Used:

Other Studies/References to Look at:

Figure 5 Criteria Checklist

Data to be extracted from the articles included items such as study design, setting and population studied, the effective teaching practices, limitations, key findings, and levels of evidence. The researcher followed the levels of evidence as presented by the U.S. Department of Education, 1 being the highest level of evidence and 6 being the lowest:

1. Randomized trial (true experiment)
2. Comparison groups (quasi-experimental)
3. Pre-Post comparison
4. Correlational studies
5. Case Studies
6. Anecdotes

Results

The initial search identified a total of 36 ($N = 36$) unfiltered results for research question one and 21 ($N = 21$) – unfiltered and with duplicates removed – results for research question two. After the initial screening of all titles and abstracts, the results decreased to eight ($n = 8$) for research question one and three ($n = 3$) for research question two. Removing any duplicates from research question one, two articles that met the inclusionary criteria ($n = 2$) remained. After the last screening of the full articles, two remained relevant for research question one ($n = 2$), and zero ($n = 0$) remained for research question two. See Table 9 for a summary of the results.

Although two articles met the criteria, both focused on EBP and not on actual pedagogy. Gülec-Aslan (2013) studied one teacher with a student with ASD. In this qualitative study, the researcher found that properly teaching Discrete Trial Training (DTT) to the teacher increased the teacher's fidelity of implementation, increased student participation, and decreased the students' problem behavior. It is important to note that before DTT was taught to the teacher, the researcher found the teacher was unable to use certain teaching techniques. The teacher was unable to use a systematic method of teaching skills or a brief and clear manner for presenting material, and had difficulty responding appropriately to the students' responses (Güleç-Aslan, 2013). These researchers demonstrated the need for research on preparing teachers to work with students with ASD. Morrier, Hess, and Heflin (2010) conducted a survey ($N = 234$) to determine what EBP teachers used and compared those to teacher characteristics (e.g., age, level of education, years of experience). Results from the survey showed that many

teachers did not use EBP with their students with ASD. In fact, teacher characteristics (e.g., age, level of education, years of experience) were found to affect the awareness of and willingness to employ EBP and did not make a difference in what curricular choices the teachers made. In addition, the research tested the hypothesis that the number of years of experience was related to use of EBP by conducting an independent *t*-test. The results were not significant for skill-based strategies used, $t(50) = -1.765, p = .08$; cognitive strategies, $t(41) = -1.569, p = .12$; physiological, biological, and neurological strategies, $t(23) = -0.678, p = .50$; or other strategies, $t(20) = 0.839, p = .41$. Interpersonal skill strategies used by teachers in the classroom were not significant, due to the limited reported use (Morrier et al., 2011).

The lack of research in pedagogical knowledge of novices and experts who teach students with ASD in K-12 settings should prompt researchers to consider the pedagogical practices of these teachers, married with the stages of progression from novice to expert teachers specific to this population of students with ASD. The use of simulation is an emerging tool to consider for teacher preparation in general, but specifically for working with students with disabilities, including those with ASD.

Table 9

Systematic Literature Review Summary of Findings: Teacher Pedagogy for Students with Autism

Study	Design	Setting & Population	Effective Teaching Practice	Key Findings	Limitations	Level of Evidence 1=highest 6=lowest
Güleç-Aslan, 2013	Qualitative	<p>Special education center for children with developmental disabilities.</p> <p>The manager of the special education center, a teacher working with a student with ASD, a student with ASD and the student's mother</p>	Discrete Trial Training	<p>Found teacher was unable to:</p> <ul style="list-style-type: none"> Use a specific teaching method in a systematic and correct way during skill teaching. Respond appropriately to the students' responses. Present material in a brief and clear manner. <p>After proper training, the teacher implemented DTT and maintained the fidelity and the student increased participation and decreased behavior problems.</p>	<p>Small sample.</p> <p>Student outputs not measured quantitatively.</p> <p>Quantitative measurements for pre-post-DTT training skills by the teacher only took place on two skills.</p> <p>□□□□□□□</p> <p>No cause-effect relationship available for the changes in the participants.</p> <p>No results on long-term effect of training</p>	5

Study	Design	Setting & Population	Effective Teaching Practice	Key Findings	Limitations	Level of Evidence 1=highest 6=lowest
Morrier, Hess, & Heflin, 2011	Descriptive, Quantitative Survey	Special education directors and autism specialists or autism consultants (<i>N</i> = 249) to forward to teachers with children with ASD in their district classrooms. A total of 234 teachers completed the ATS during the 3-month data collection period	Evidence-Based Practices	<p>The characteristics of teachers (e.g., level of teachers' education, length of their teaching experience) using evidence-based practices were compared to the characteristics of those who were not using evidence-based practices.</p> <p>Teachers using evidence-based practices do not differ statistically from those who are not using evidence-based practices. Individual characteristics that might influence awareness of and willingness to employ best practice strategies (e.g., teacher education level, age, etc.) do not seem to affect curricular choices teachers make</p>	<p>Small population size</p> <p>Only one state</p> <p>Because the directors gave out the surveys it could have led to bias when reporting.</p> <p>Teachers could not have chosen more than one option on the survey.</p>	4

Study	Design	Setting & Population	Effective Teaching Practice	Key Findings	Limitations	Level of Evidence 1=highest 6=lowest
				<p>An independent-samples <i>t</i> test was conducted to evaluate this hypothesis that years of experience were related to the use of evidence-based practices for students with ASD. Interpersonal strategies were not significant because teachers reported limited use of these strategies.</p> <p>The test was not significant for skill-based strategies used, $t(50) = -1.765, p = .08$; cognitive strategies, $t(41) = -1.569, p = .12$; physiological, biological, and neurological strategies, $t(23) = -0.678, p = .50$; or other strategies, $t(20) = 0.839, p = .41$.</p>		

Teacher Preparation in Simulation

Simulations have been a part of training in many fields, including medical, aviation, and engineering. Simulations provide a targeted experience for someone in a productive (i.e., less than 10 minutes) and controlled environment (Dieker, Straub, Hughes, Hynes, & Hardin, 2014; Shaw, 2004). Simulations come in different styles, such as (a) live simulations, (b) virtual simulations, and (c) constructive simulations (“Just what is ‘simulation’ anyway?,” 2014). Live simulations occur in natural settings with humans and/or the equipment appropriate for the environment (i.e., role play). Virtual simulations with humans and/or equipment in a computer-controlled environment might involve a human-in-the-loop (i.e., flight simulator). Finally, constructed simulations do not involve humans, but rather are driven by proper sequencing of events (i.e., nature based) (“Just what is ‘simulation’ anyway?,” 2014)

Teacher preparation programs have used simulation, typically live simulation or role play, since 1967 (Twelker, 1967). Twelker describes using simulation to help teachers with cue discrimination, decision-making, and behavior modification. Simulations can occur using actual physical humans as well as web-based virtual worlds. These web-based virtual worlds have become a familiar tool in teacher preparation (i.e., SecondLife, SimSchools; Alrayes & Sutcliffe, 2011; Tyler-Wood, Estes, Christensen, Knexek, & David, 2015). A third tool that uses virtual mixed-reality simulation is known as TLE, where virtual properties are blended with real properties. This tool in teacher preparation has shown innovative, immersive, and compact results in the simulator and translation of these skills to practice (Dieker, Rodriguez, Lignugaris/Kraft, Hynes, &

Hughes, 2013; Dieker et al., 2014; Dieker, Hynes, Hughes, Stacey, & Becht, 2015; Straub, Dieker, Hynes, & Hughes, 2015). This tool could provide a way to observe the practices of expert or novice teachers related to virtual characters in the environment, including characters with disabilities.

TLE TeachLivE™

TLE TeachLivE™ is a mixed-reality classroom simulation composed of five 3D virtual students, known as avatars, who respond in real time. The avatars are cognitively and behaviorally modeled after adolescent psychologist William A. Long, M.D.'s categorization of adolescent personalities (Long, 1989). Therefore, the avatars portray personalities that have a combination of passive or aggressive and independent or dependent traits. In addition, two secondary-level avatars, each with a disability, have been added to the TLE repertoire: one male avatar, Martin, with ASD, and one female, Bailey, with intellectual disabilities. Both avatars were developed with input from individuals with disabilities and their families, along with focus groups of experts in the field (Bousfield & Swan, 2014). Martin exhibits behaviors that align with ASD as defined in the DSM-V (See Figure 6; Bousfield, 2015).

The TLE is a fully immersive simulation environment where participants are able to walk about the simulated classroom to gain proximity with each virtual student. Within about 10 seconds of initiating interaction in the TLE environment, participants experience what is known as a “suspension of disbelief” (Hayes, Hardin, & Hughes, 2013, p. 144).

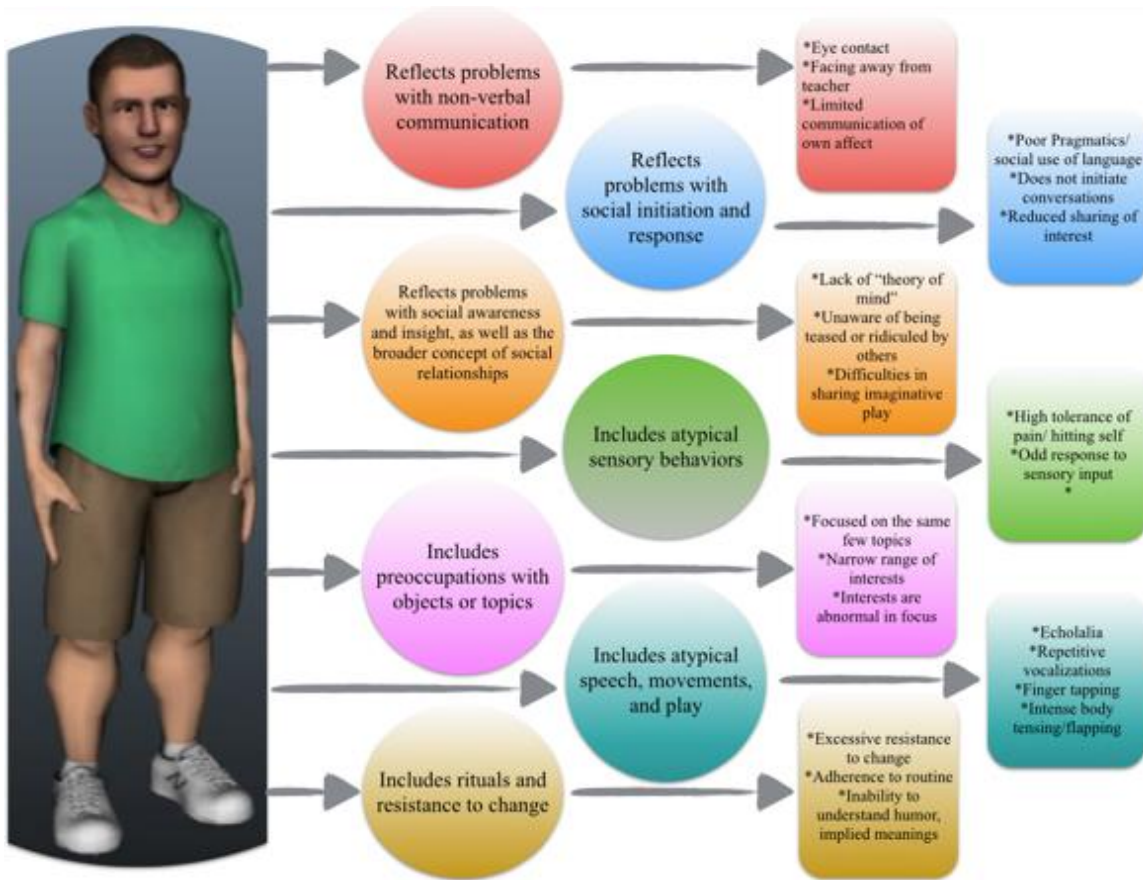


Figure 6 DMS-5 Autism Characteristics in TeachLivE Avatar, Martin

TeachLivE™ allows for individualized learning. In the world of simulation an effective simulator allows the participant to suspend their belief they are in a virtual environment, and they begin to act like they would in the “real” world. The suspension of disbelief has been validated in past research to occur in TLE and is defined as “the phenomenon in which a participant is able to overlook and even forget the fact that the environment is not natural, but constructed and contrived, in order to enhance engagement, presence, and belief of the experience” (Hayes et al., 2013, p. 144).

Participants, before they are immersed in the simulation experience, are able to set goals for themselves and even bring in individualized lessons to practice in the system. Participants can pause the classroom and resume at any time. Furthermore, participants

are able to repeat their sessions as part of virtual rehearsal.

In order for immersion and individualized learning, the virtual students respond verbally and physically in real time with the help of an interactor, or the Human in the Loop (HIL). An interactor is a person “trained in acting, improvisation, and human psychology” (Dieker et al., 2008, p. 11). Interactors control the voice and movements of all the virtual students in real time. Training for each character is a strenuous process to ensure fidelity. For the avatars with disabilities, the interactors worked closely with individuals with disabilities and experts in the field to gain feedback regarding the avatars’ behaviors and personalities. Additionally, the feedback enabled interactors to portray individuals with disabilities accurately in an attempt to avoid personal stereotypes (Bousfield, 2015). The interactors in this simulation experience are vital to the immersive and individualized learning experience and allow for targeted practice of teachers in critical skill areas (e.g., HLP; TeachingWorks, 2016).

During the TLE classroom sessions, observation and feedback are provided through an ARC. Used by the military for over 30 years (Holman et al., 2007), research on ARC has focused on “an interactive discussion . . . [to] decide what happened, why it happened, and how to improve or sustain collective performance in future exercises” (Morrison & Meliza, 1999). Using this model, teachers are able to reflect on what just occurred in the system, make suggestions and/or collaborate on how to do better, and repeat the session with those changes.

TeachLivE includes another tool that can be used to provide immediate feedback in the TLE classroom. Participants are recorded and specific behaviors of choice tagged (Straub et al., 2015). The behaviors can be tagged live, during a session, or later, during

review of the recording. Charts and graphs are subsequently produced to share with the participant or for research purposes. The participant may receive coaching and set new goals for their next session, or review for comparisons across participants.

Benefits of TLE TeachLivE™

A safe practice environment with readily available virtual students is an important aspect of TLE. Instead of pre-service teachers practicing on real students for their first attempts, they are able to use the virtual student avatars for initial practice or observations. Teachers are able to pause the classroom, reflect, receive coaching, and try again (Dieker et al., 2014). Pre-service teachers also have the ability to practice on the same virtual students, creating a common language amongst their peers and allowing for conversations without speaking poorly of a real student. Teachers can have access to a diverse group of virtual students, including virtual students with disabilities, regardless of their physical location, reducing the amount of travel time to gain a meaningful preservice training or professional development experience.

Pre-service or in-service teachers may identify a specific objective for practice, in a short period of time. Within 10 minutes, teachers can separate content and pedagogy, honing in on specific skills. After four sessions, teachers can change that specific behavior (i.e., open-ended questions) and take the new and improved behavior back with them into the real classroom (Dieker et al., 2014; Straub et al., 2015). This ability to observe, direct, and even gather information on teacher practice has potential research implications in better understanding the performance of expert and novice teachers in general, now with the possibility of gathering pilot data of EBP attempted by teachers for the prototype virtual student with ASD.

Summary

Fully preparing teachers is a consistent challenge to provide the best and most effective instruction for students with ASD (Morrier et al., 2011; Simpson, 2004). The stages in which special education teachers develop in general is unknown, but is believed to follow stages similar to those described by Berliner. The specific stages for teachers who work with students with ASD is even more of a mystery to the field (Lubas et al., 2015). The uncertainty of what constitutes crucial instruction for pre-service teachers for this population remains in question (Heflin & Simpson, 1998). Although 27 EBP are identified for use with students with ASD by Wong and colleagues (2015), only 5% of teachers report using those practices with students with ASD (Morrier et al., 2011). Researchers have pointed out the research-to-classroom gap, and recognize that in order for teachers of students with ASD to be effective, they need practice and mastery of EBP rather than EBP knowledge only (Cook, et al., 2008). Furthermore, as teachers progress and become effective teachers, they reflect and grow from a novice to expert teacher (Berliner, 2004). Some teachers will never make it past the advanced beginner stage and those teachers (i.e., novice) are typically the ones assigned to the students with the greatest needs (Boyd et al., 2008; McLeskey & Brownell, 2015). How teachers develop, in general or special education, in working with students with ASD, is not clear in the current research literature (Blanton et al., 2011; Guckert et al., 2016; Ruppert et al., 2014). Teacher education programs, like the medical and military fields, are incorporating simulation into their preparation efforts (Dieker et al., 2014; Twelker, 1967), but how to better prepare or shape experiences for working with students with ASD is not clear from the current research or in practice. The researcher in this study explored through a Delphi

study what experts in ASD believe are the most critical skills to be taught in simulation. Then expert and novice teachers were observed in a simulator to look at the processes and pedagogical practices they use from the outcomes of the Delphi study. This combined Delphi study and pilot study in observing novice and expert teachers of students with ASD was being conducted to create a beginning platform and potential hypothesis for future research. The Delphi study builds upon the combined instructional practices of effective general and special education teachers found in the current literature (see Figure 1). Building upon this crosswalk of the array of practices in the field (Appendix B) novice and expert teachers of students with ASD were observed in the simulated environment to gain further knowledge on what skills emerged in their initial approach to a standardized virtual student avatar with ASD. The purpose of this study is to examine potential patterns of these teachers' approaches to the same virtual student to create a foundation for future research.

CHAPTER THREE: METHODOLOGY

In this chapter, the researcher provides a summary of the methodology of a two-phase investigation of the pedagogical skills teachers demonstrated in working with students with (ASD). First, the researcher conducted a Delphi study to determine the practices experts in the field believe will increase learning outcomes for students with ASD that can be observed in a simulated inclusive secondary classroom. The researcher then created an observation framework (See Appendix A) from the skills derived from the Delphi study to explore the actual behaviors demonstrated by master and novice teachers in working with a virtual student with ASD in the TLE simulated inclusive secondary classroom environment.

The researcher provides in this chapter a purpose statement for the study, the research questions, and a brief explanation of the characteristics of a phenomenological research design. The theoretical framework of skill acquisition used to ground this study is described (Dreyfus & Dreyfus, 1986). The chapter concludes with a summary of each component of the two-phase investigation.

Purpose of the Study

The purpose of this exploratory phenomenological research study is to identify the best practices perceived by the field for supporting secondary students with ASD and exploring the pedagogical skills used by the master and novice teachers who instruct them. Experts in the field of ASD, through a Delphi study, vetted the pedagogical skills derived from the extensive review of literature. These behaviors identified in the Delphi

study provided a beginning framework for the observations of master and novice teachers of students with ASD in the TLE inclusive secondary simulated classroom.

Research Questions

The following research questions guided the research study. The research questions were as follows:

For Phase One:

1. Presented with 51 practices already cross-validated as critical for teacher performance, what do experts in the field of ASD identify through a Delphi approach as the most important pedagogical skills for expert teachers in a simulated secondary inclusive classroom containing a student with ASD?

For Phase Two:

2. What are the patterns of pedagogical skills used by expert versus novice teachers in a simulated inclusive secondary classroom containing a virtual student with ASD?
3. What are the themes derived from the reflection of expert versus novice teachers after teaching in a simulated inclusive secondary classroom containing a virtual student with ASD?

Research Design

An exploratory phenomenological research design was used to examine the experience and patterns of master and novice secondary teachers as they engaged with a virtual student with ASD in a classroom simulator and their reflections after each

interaction. The phenomenological design was selected to “describe a common meaning for several individuals of their lived experiences of a concept or a phenomenon” (Creswell, 2013, p. 76). Although researchers have looked into novice to expert teachers for general education (i.e., Berliner, 1994; Dreyfus & Dreyfus, 1986; Hunt, 2008; Schempp, Tan, & McCullick, 2002; Wolff, Jarodzka, van Den Bogert, & Boshuizen, 2016), researchers have not yet indicated the perceived effective practices for secondary special education teachers for students with ASD.

Theoretical Framework

The know-how of any profession or field is gained through experience, knowledge, and practice (Dreyfus & Dreyfus, 1986). The theoretical framework the researcher used as a foundation for this study is the skill acquisition model proposed by Dreyfus and Dreyfus (1986). The skill acquisition model (SAM) is a process in which individuals progress from a novice to an expert.

The SAM is a construct theory intended to improve artificial intelligence (Dreyfus, 2004; Hunt, 2008). In the process of studying human behavior, a five-stage process explains the human development of skill acquisition including: novice, advanced beginner, competent, proficient, and expert (Dreyfus & Dreyfus, 1986). Table 1 summarizes the stages adapted from Dreyfus and Dreyfus (1986; 2004). Each stage of skill acquisition demonstrates the individual’s process of decision making, perspective, and commitment.

Table 1

Dreyfus and Dreyfus Skill Acquisition Model

Skill Level	Summary	Decision Making	Perspective	Commitment
Novice	Uses rules to determine actions.	Analytic	None	Detached
Advanced Beginner	Recognizes new situational aspects based on experiences. Starting to connect experiences to actions.	Analytic	None	Detached
Competent	Able to adopt a hierarchical procedure of decision-making, deciding what is important to focus on.	Analytic	Chosen	Detached understanding and deciding; involved outcome
Proficient	Uses intuition to organize and, understands the task, still thinks analytically about what to do.	Analytic	Experienced	Involved understanding, detached deciding
Expert	Does what normally works without thought or problem solving. Performance is ongoing and nonreflective and relies on intuition.	Intuitive	Experienced	Involved

Since the SAM portrays how individuals progress from novice to expert, the researcher provided a platform for initial discussion in the field as to how teachers at expert and novice levels perform in a secondary inclusive simulated environment including a student with ASD. In addition, learning how expert versus novice teachers in a simulated environment with a secondary student with ASD perform could help provide information for further research and discussions in both teacher preparation and teacher professional development.

Research Method

Phase One-Delphi Study

Delphi Technique

The Delphi method is used to gain a consensus of an opinion of a specific topic from area experts. Hsu and Sandford (2007) state the Delphi method “attempts to address “what could/should be”, unlike a typical survey that “identifies what is” (p. 1). Due to the dilemma of limited information on pedagogical skills for secondary teachers of students with ASD, the Delphi method was deemed suitable to complete and explore this phenomenon.

The Delphi occurs over four distinct features: (a) anonymity, (b) iteration, (c) controlled feedback, and (d) statistical aggregation of group response (Skulmoski & Hartman, 2007). Additionally, the number of iterations or rounds used in a Delphi study is not fixed. However, a typical Delphi study has about three rounds sent to the participants (Day & Bobeva, 2005; Hsu & Sandford, 2007; Skulmoski & Hartman, 2007).

Participants

Ten expert participants were selected based upon expertise and field of personal research and knowledge of education simulators. The researcher had 20% attrition and eight experts completed the Delphi study. The researcher invited the involvement of current TLE partners and other experts in the field that have expertise in the area. The participants are those in higher education or institutions who have made contributions to the field through peer-reviewed journals or other pertinent work in ASD, teacher education, and simulation. Participants were located across the country at various higher

education institutions and organizations. Participant demographic data were gathered. See Table 10 for demographic descriptions.

Table 10

Phase-One Participant Demographics

Participant Code	Age	Gender	Total Years of experience	Years of Experience teaching students with ASD	Years of Experience in Secondary Education	Years of Experience in Higher Education
1TS	41-45	F	16-20	1-5	11-15	6-10
2F	61+	M	30+	25+	1-5	20+
3MR	61+	M	30+	1-5	1-5	20+
4S	41-45	F	11-15	1-5	0	1-5
5T	36-40	F	16-20	16-20	1-5	6-10
6M	36-40	F	11-15	1-5	1-5	6-10
7B	61+	F	30+	1-5	0	20+
8K	41-45	F	5-10	11-15	1-5	1-5

Eight experts in the field of special education participated in the Delphi Study. Two participants were male (25%) and six were female (75%). Ages ranged from 36-41 years (25%), 41-45 years of age (37.5%), and 61 or more years of age (37.5%). The total teaching experience of participants from Kindergarten-College ranged from over 30 years (37.5%) of experience in education, 16-20 years (25%), 11-15 years (25%), and 1-5 years of experience (25%). Within these years of experience, one participant (12.5%) had over 25 years of experience with students with ASD, one (12.5%) had 16-20 years, one

(12.5%) had 11-15 years, and five (62.5%) had 1-5 years of experience with students with ASD. As for experience in teaching in secondary classrooms, 12.5% of participants had 11-15 years of experience, 62.5% had 1-5 years, and 25% taught elementary only. Finally, three participants (37.5%) had over 20 years of experience in higher education, three (37.5%) had 6-10 years of experience, and two (25%) had 1-5 years of higher education experience.

Procedures

After approval by the Institutional Review Board (IRB; See Appendix D for IRB consent), the Delphi phase of the study, comprised of three rounds and was conducted over 10 weeks. The development of procedures were generated in alignment with other Delphi studies (Hsu & Sandford, 2007; Skulmoski & Hartman, 2007).

After a review of literature of teacher pedagogy (i.e., Berliner, 2001; McLeskey et al., 2017; Daly et al., n.d.) and a cross walk of teacher pedagogical practices (see Appendix B), the first round of the Delphi study included an initial list of all related skills identified in the literature to potentially support students with ASD (duplications of ideas were identified and removed). A Qualtrics online survey was created for digital dissemination to experts in the field. Before initial dissemination, a pilot round was conducted to validate the items included in the survey for clarity and to gain feedback. Once the pilot was conducted, changes were made as necessary and round one was initiated.

Delphi Study: Round One

Each expert initially received an email invitation to participate in the three rounds, including the link for the round one online Qualtrics survey. In the first round, 10 experts were asked to identify, in their opinions, the top 15 most important teacher practices out of the list of 51 for expert teachers of students with autism at the secondary level in a simulator (i.e., TLE). The order of the skills was randomized in the first round. Demographic data were added to the end of the survey. An email reminder was sent out one week after the initial invitation.

Once all surveys were returned, or the deadline was reached, the researcher analyzed the data and planned to gather the top 30 pedagogical skills considered the most important by the experts. However, due to a natural cutoff, the researcher used the top 27 skills. These skills were reproduced into the next Qualtrics online survey for round two.

Delphi Study: Round Two

In round two, the experts were assigned a participant code and were asked to select the top 10 most important skills out of the list of 27. Each expert received a second email including the link to the Qualtrics survey for round two. A reminder email was sent out one week after the initial round two email.

Once all surveys were completed, or the deadline was reached, the data were analyzed. The top 20 pedagogical skills were used for the third and final round.

Delphi Study: Round Three

In the third and final round, experts were asked to select the top 5 most important skills out of the list of 20. The experts, again, received an email with a Qualtrics online survey. A reminder email was sent out one week after the initial round three email. Once all surveys were completed, or the deadline was reached, the data were analyzed. The top 11 skills were used in the teacher observations in TLE.

Phase Two- Teacher Observation

Phase two of the study built upon the results of the Delphi study and was a qualitative study of expert and novice teachers' performances in the TLE simulator. This phase was considered a pilot study to observe if the practices defined in Phase One were used at all or with any consistency by the expert or novice teachers in the simulator.

Researcher as Instrument

Due to the qualitative nature of Phase-two of this research study, it is important to understand the lens of the researcher regarding teacher practice and students with ASD. I was born and raised in Orlando, Florida with two sisters and loving parents. I am now a wife and mother to two boys. I was fortunate to go to a private Christian school for the majority of my education. At an early age, I wanted to be a teacher. I would play school with my sister, myself, or stuffed animals any time I could. Throughout my schooling, I would often have days off but my aunt, an adaptive physical education (APE) teacher for a local school district, would still have school. I would ask to accompany her to her classes to help teach students PE and participate in the games. My aunt also was county coordinator for Special Olympics; I volunteered in those events throughout my childhood

and even played on unified teams. I slowly realized my passion was being with individuals with disabilities.

I went to the University of Mississippi for my bachelor's degree. My field of study was an easy choice, special education. I received a well-rounded education and certification to teach special education specializing in mild/moderate and severe/profound disabilities, and spent time with a variety of individuals including those with severe and profound disabilities. After graduating, I had many amazing teaching experiences where I taught a variety of students (i.e., specific learning disabilities, intellectual disabilities, emotional behavioral disabilities, autism) at all levels of school (i.e., elementary, middle, and high school). Although I had a great 4-year education, I quickly noticed certain aspects that I never had a chance to experience or learn about in my teaching. In my fifth year of teaching, I opened a unit for students with ASD at a local high school. I did not feel that I had adequate training and experience for this position. Therefore, I chose to enroll and receive an ASD professional certificate and master's degree at the University of Central Florida. In this program, I gained additional knowledge in areas where I was lacking, and personal experience in the field.

As a special educator serving students from various low incidence populations, I am passionate about every student receiving the best education from the most prepared teachers possible. With eight years of experience in teaching and working with students with low incidence disabilities, including ASD, I have learned what it takes to be a successful teacher. I understand that preparation and professional development is the key to success for special and general education teachers. Therefore, as I started my journey in my doctoral program, I focused on teacher preparation, especially for teachers who

will support the learning of students with ASD. I feel it is important to identify skills that expert teachers are using in order to inform higher education as to what pre-service teachers should learn in order to be better prepared to serve all students, including students with ASD.

Setting

Phase one of this study took place online and phase two occurred in a simulated virtual classroom created and patented by the University of Central Florida (U.S. Patent No 9,381,426, 2016). The TLE lab is a windowless room with three beige walls and one chroma key green wall. In the center of the room is an 80” television (TV) connected to an X-box Kinect, external speakers, webcam, and a desktop computer. The avatars from the simulator appear on the TV screen. The computer is housed to the left of the TV at a station that allows for a TLE facilitator to run the simulation program and assist with any technical issues during the session. The avatars were created using a technique that allows a human, called an interactor, to puppeteer each of the avatars to blend both human and automated voice and behaviors during a simulation session. A webcam is mounted to the top of the TV so the TLE interactor can see the participants. As the participant walks in front of the TV, the Kinect sends infrared signals that, through invisible projection of rays, attaches to the participant’s collarbone. Once the signal is attached, the participant is tracked as he or she moves around the classroom with proximity control as if he or she were in a real classroom. Below the TV are two external speakers to allow for a better quality of sound for the avatars’ responses and interactions. In addition, the participant wears a high-definition microphone, so the human-in-the-loop, the interactor, can hear the participant clearly. Real time communication occurs

between the interactor (personified as the avatars) and the participant via Skype, allowing for fluid—and what appears as seamless—communication between the participant and the avatars.

During the interactions in this study, the trained interactor controlled the behaviors of six avatars, three females and three males. One of the male student avatars, Martin, represented an individual with ASD based on the DSM-5. See Figure 6 for the specific behaviors exhibited by Martin, the avatar with ASD. The interactor was trained by the researcher in Martin's behaviors and provided an auditory signal for when the specific behaviors were to occur in the simulator to ensure consistent patterns of behaviors for each participant in this pilot study.

Participants

In phenomenological studies, the sample size does not need to be large, but can be managed by the procedures involved (Dukes, 1984). Participants for this study were a total of ten ($n = 10$) master and novice teachers. Five ($n = 5$) expert teachers were selected and defined as expert teachers based upon four or more years of teaching experience, holding a master's or doctorate degree in special education with an ASD or severe and profound disabilities (SPD) professional certification. Five novice teachers ($n = 5$) were defined as pre-service teachers currently enrolled in an undergraduate education program.

Demographic data were gathered. See Table 11 for demographics of Phase Two participants. Four out of the five expert teachers are currently in the classroom. However, one expert teacher is not in the classroom, but is serving as a technology resource

specialist serving multiple school districts. Additionally, four of the five experts current or last teaching positions were in a self-contained classroom for students with ASD.

Table 11

Phase-Two Participant Demographics

Participant Code	Certification area	Grade Levels Taught	Highest academic level and area	Years of experience	Age	Gender	Ethnicity	Sibling or family member with a
E-1	Special Education K-12; SPD Graduate Certification; PreK/Primary Ed	6-8	Doctorate education	5-10	50+	F	W	N/A
E-2	Special Education K-12; Elementary; ASD Graduate Certification; Pre-K ESE endorsement	K-5; 9-12	Masters LD/EH	5-10	40-49	F	Other	Family Member
E-3	Special Education K-12; SPD endorsement; Elementary; Educational Leadership,	K-5, 9-12	Masters Educational Leadership	10+	30-39	F	W	N/A
E-4	Special Education K-12; Middle Grades; ASD Graduate Certification	K-5; 6-8	Masters Special Education/ ASD	10+	30-39	F	W	N/A
E-5	Special Education K-12; Middle Grades; ASD Graduate	6-8	Masters Special Education	4	40-49	F	W	Family Member

N-1	N/A	N/A	Education Major	U	18-29	F	W	Family Member
Participant Code	Certification area	Grade Levels Taught	Highest academic level and area	Years of experience	Age	Gender	Ethnicity	Sibling or family member with a
N-2	N/A	N/A	Education Major	U	18-29	F	W	Sibling
N-3	N/A	N/A	Education Major	U	18-29	F	W	N/A
N-4	N/A	N/A	Education Major	U	18-29	F	AI	Family Member
N-5	N/A	N/A	Education Major	U	18-29	M	B	Sibling

Note: W = White; AI = American Indian; B = Black; E = Experts; N = Novice

Purposeful sampling was used to select the participants for this phase of the study, as the goal was to select participants that would most likely be “information rich” (Gall, Gall, & Borg, 2007, p. 178). The researcher sought out undergraduate education major students. In addition, master level teachers were sought out, by contacting those who graduated from an Office of Special Education Programs funded project in the areas of ASD or severe profound disabilities and who were or have taught students with ASD.

Instrumentation

Due to the nature of a qualitative study, all instruments and data gathering were created and interpreted by the researcher (Creswell, 2013). The researcher’s recordings occurred through TeachLive™ and reflection protocols were based upon the behaviors that originated from the Delphi study in phase one. All observations were video and audio recorded. In addition, reflections on the teachers’ experiences in the simulator were written by the participant on an electronic device provided by the researcher.

TeachLivE™ Classroom Behaviors

The TLE inclusive simulation used for this study included six virtual students, two of which have disabilities. The focus of this study was on Martin, the virtual student with ASD in the simulator. The researcher along with the TLE interactor team, and in conjunction with a student with ASD and his mother, created Martin’s behaviors. Figure 7 displays behaviors exhibited by Martin in the simulator. See Appendix E for a more detailed description of Martin’s personality, characteristics, and background information.

Martin High School Behaviors

Martin High School Group Behavior Chart

Behavior
Class hand raise
Bored loop
Pair-and-share
Writing
Martin sits at desk
Martin stands at board

Martin High School Individual Automated Behavior Chart

Student	Behavior
Martin	Table tapping (no audio)
	Paper flipping
	Slapping and hitting
	Object throw (no visible object)

Figure 7 Martin Behavior Characteristics

National Institutes of Health Lesson Plan

All teachers taught the same lesson plan in the simulator. The selected lesson was already used in a nationally validated study on TLE and was selected due to the interdisciplinary nature of the content. The National Institutes of Health (NIH) created this supplemental lesson that focuses on basic discussions around science, mathematics and technology for the high school level. The topic used for this research was “Using Technology to Study Cellular and Molecular Biology” lesson 1, “What is Technology” (National Institutes of Health, 2005). The lesson is based on the National Science Education Standards and the 5E Instructional model (e.g., Engage, Explore, Explain, Elaborate, and Evaluate). Lesson 1, “What is Technology”, is focused on the engage, explore, and explain of the 5E model (NIH, 2005). This lesson was selected because it did not present a barrier to teachers with limited content knowledge, as it focuses on an array of questions and discussions regarding the use of technology in the students’ daily lives. For the purpose of the study, the participants only worked on the first half of this lesson, through steps 8. See Appendix F for the lesson in its entirety.

TeachLivE™ Observation Tool

The TeachLivE observation tool was utilized to record and tag teacher behaviors in the simulator. The tool is a video tagging software that has been integrated in the TLE classrooms (Straub et al., 2015), and it allows for the sessions to be video- and audio-recorded with the participant and the avatars on the same screen. In addition, the researcher tagged specific behaviors in real time, with a time stamp of the tagged behavior on the recording. Figure 8 shows a live session with tagging capabilities.

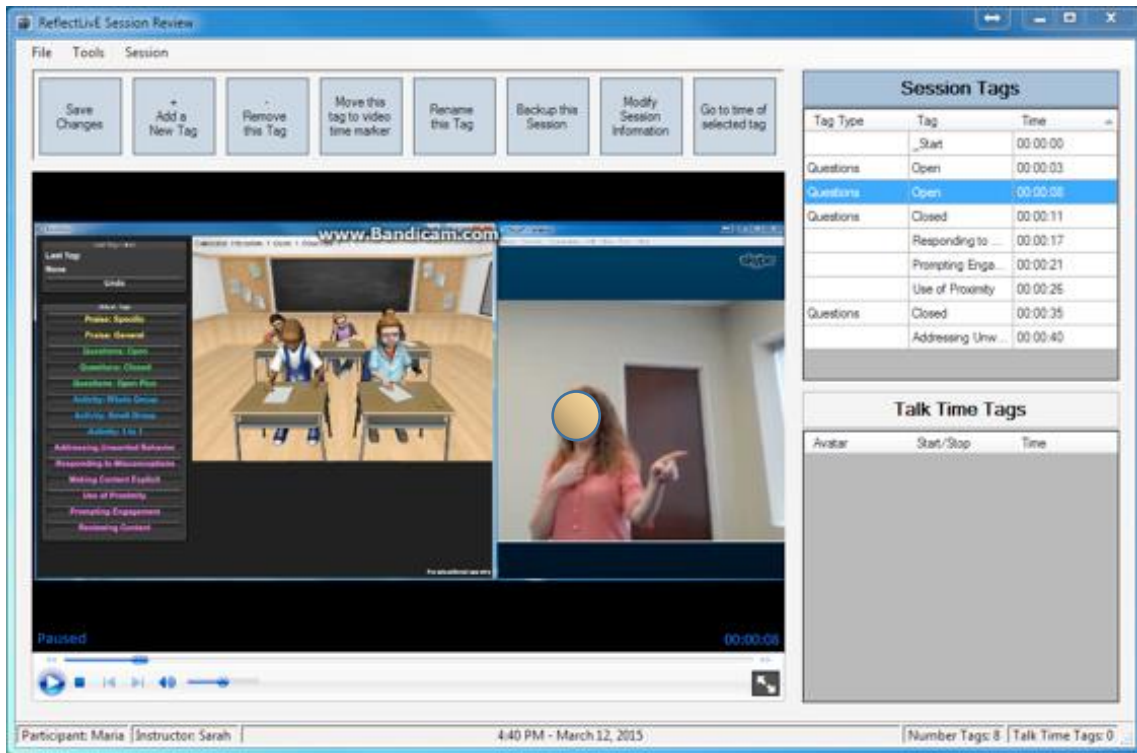


Figure 8 Participant in with Tagging of Behaviors

Additional observers are able to watch and tag simultaneously using the observation tool. A graph can be generated after one or multiple sessions. See Figure 9 for a sample graph after multiple sessions using the tool.

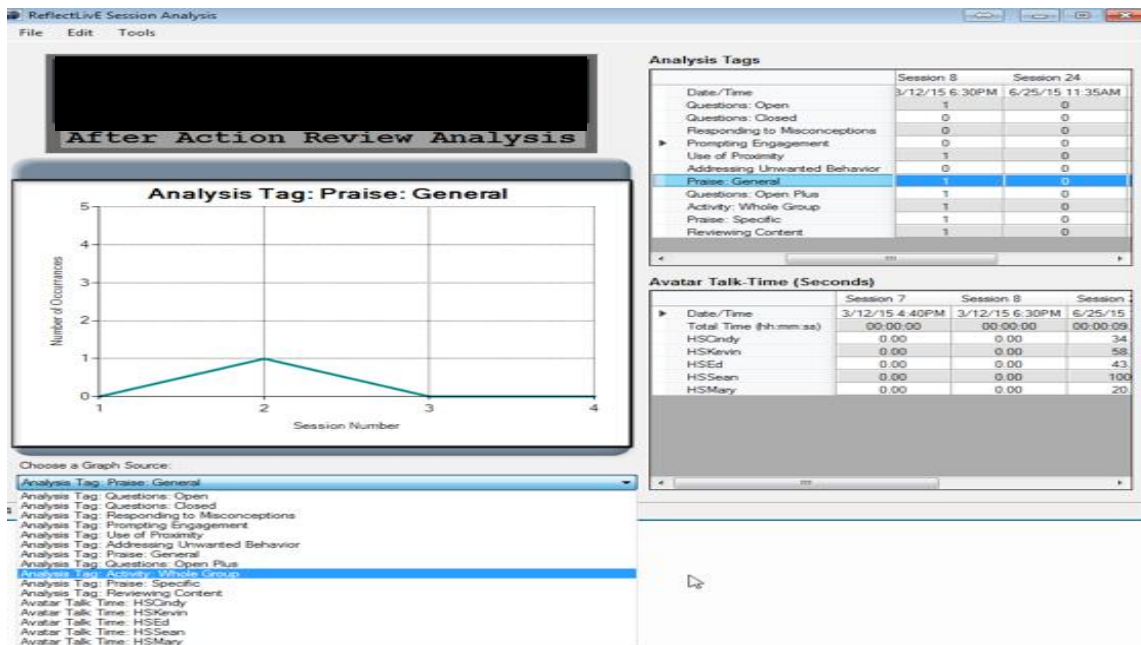


Figure 9 Graph Produced by TeachLive™ Observation Tool

In addition, student and teacher talk time were automatically recorded (Straub et al., 2015). The researcher coded the recorded sessions of the expert and novice teachers to collect data on their teaching performances. Tagged behaviors emerged from the results of the Delphi study conducted prior to observations, during phase one.

Reflection survey

The participants completed a written reflection about their experiences, guided by the researcher's digital interview (See Appendix G). The participants, immediately following a simulation session, completed the digital interview and a post digital survey following their last interaction (See Appendix H), asking them to reflect on their performance and write what they felt they did well and/or what they wanted to improve for the next time. In addition, questions about their overall experiences in the simulator were included.

Trustworthiness/Validity

Creswell (2013) suggests using two methods to determine the validity of a research study. For this study, the researcher used triangulation, member checking, and peer review of the simulation data that was gathered. Expert validity was the primary measure in phase one of the Delphi study, along with content validity, as the measures included emerged from the literature noted in Chapter 2.

Triangulation occurred from performance in the TLE simulator by gathering multiple data sources to document any themes or concepts that emerged (Creswell, 2013). The researcher triangulated information by analyzing data from recorded observations data, participants' reflections, and expert versus novice patterns. By locating evidence from multiple sources, the researcher reported emerging themes across these sources.

Member checking was utilized to solicit the views of the participants for the credibility of the findings (Creswell, 2013). Each participant was emailed their written reflection with the researchers' interpretations of emerged themes. Each participant was asked to clarify any misrepresented comments or to add any additional information.

The researcher allowed for an external review of the process by using a peer reviewer as a research associate (Creswell, 2103). Peer review was conducted to gain reliability of coded behaviors in the simulator and emerged themes through participant written interviews. Inter-rater reliability was found for both video observations and coding of themes through the written reflections. The peer reviewer coded thirty percent of recorded behavior-tagging observations. Reliability was met with 92.5% agreeance. Additionally, all written reflections were sent to a peer reviewer and analysis generated a rating of 96% reliability. Any discrepancies in ratings were discussed with the peer

reviewer and the researcher. In addition, the research associate kept the researcher honest by asking the tough questions on the researcher's methods, meanings, and interpretations, including checking for researcher bias in the findings (Creswell, 2013; Creswell & Miller, 2000).

Phase-Two Procedures

After approval from the UCF Institutional Review Board and completion of the Delphi study, novices and experts participated in two TLE sessions in the lab at the UCF main campus. The participants came to the lab for two observations in a controlled environment, TLE. Two sessions were observed and recorded to create foundational knowledge of any emergent themes aligned with the behaviors identified in the Delphi study, and to check for differences between novice and expert performances. Since research on the practices of secondary teachers who work with students with ASD is extremely limited in the literature, this study is considered exploratory in nature to create a beginning foundation for future and more targeted research and potential intervention studies.

TeachLivE™ Simulator Study

Informational emails and flyers requesting pre-service students' participation were distributed throughout the college of education internship I and II courses and other various undergraduate courses via the instructors of record (See Appendix I for letters). In addition, emails were sent to past graduates of the federally funded Projects ASD and SPD. Participants were selected and notified of participation along with time and date options for observations (See Appendix J for Participant Instructions).

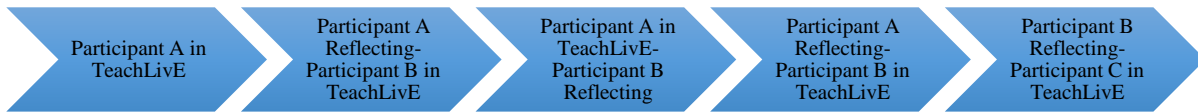


Figure 10 Research Process for Participants in TeachLivE™

During phase 2, participants came to the TLE lab at UCF’s main campus for their observation sessions. Participants received the NIH Technology lesson plan in advance, with directions provided in Appendix F as to the part of the lesson they were asked to teach in the simulator. Additionally, a seating chart of the student avatars was provided. Each participant entered the lab and taught the NIH technology lesson for a seven-minute session. The participant then immediately went to a separate area to complete the reflection survey. The participant returned back into the simulator, after the reflection, for one additional 7-minute session on the same lesson and then completed a final reflection on their experience. After the second reflection, the participant completed the observation and reflection phase.

The study’s exploratory nature and the compression of the simulator experience provide the rationale for the short sessions. An experience in the simulator is compressed to approximately one minute equaling six minutes of real time performance. Therefore, this observation in comparison is equal to 30+ minutes of classroom observation. The simulator acts as a standardized classroom to observe both expert and novice teachers’ approaches to a virtual student with ASD. This standardized classroom provides an opportunity to identify potential areas of observation or patterns for future studies in real classrooms. The researcher’s process of rotating participants through the simulator during the reflection period is provided in Figure 10 and was to show both an efficient use of a simulation and to quickly observe expert and novice teachers in this pilot study.

Data Collection

Observations

Multiple methods were used to collect data (e.g., video observations, interviews; Creswell, 2013) during the observations. The participants experienced the secondary classroom with virtual students with disabilities in TLE in two 7-minute sessions. Data were collected using a standardized science lesson provided to the teachers in advance (see Appendix F). The TeachLivE™ observation tool was utilized to assist in data collection and analysis of the simulation sessions. Teacher behaviors identified as important through the Delphi study were tagged manually. The observation tool embedded in the simulation recorded student/teacher talk time. A research associate reviewed recordings for 30% of all observations for reliability of coding. The videos of each session were analyzed for comparison of behaviors and common themes across teachers.

Reflections

Individual reflection by each teacher was conducted immediately after each session. Reflection questions included:

1. Tell me about your teaching experience.
2. Explain any preparation you have had in teaching students with ASD.
3. What would you say were your teaching strengths in TeachLivE™?
4. What would you say were your strengths in working with the students with ASD in the simulator?
5. What would you want to improve the next time you were in TeachLivE™?

6. Did the inclusive high school class seem like a real classroom? Why or why not?
7. Did the students feel like real high school age students?
8. Did Martin feel like a real student with ASD? Why or why not?

Demographic information was collected at the end of the second reflection. All interviews/reflections were written by the participants and used for data analyses. All data were saved to the researcher's password-protected computer in a password-protected file.

Data Analysis: Phase-Two

Data were collected from 10 teachers – five expert special education teachers and five novice pre-service teachers (Dukes, 1984). Data collected through the observations were analyzed as descriptive measures (Colorafi & Evans, 2016; Sandelowski, 2010). Simple parametric statistics were used to analyze on the Delphi behaviors used by teacher and to summarize teacher demographics. Information is presented in a table to reveal patterns. See tables and explanations in Chapter 4.

All written reflections were coded to identify common themes. Data analyses followed Creswell's (2013) procedures for phenomenological research analyses.

1. Describe the researcher's personal experience with the phenomenon. This description allows for attention to be directed towards the participants and set aside the researcher's own experience.
2. Develop a list of significant statements on the participants' experiences, also known as horizontalization of the data. The list was developed until non-repetitive, non-overlapping statements are formed.
3. Create meaningful units or themes from the significant statements.

4. Write a textual description or summary of “what” the participants experienced.
5. Write the structural description of “how” the experience happened.
6. Write composite description incorporating both textual and structural descriptions (pp. 193-194).

Additionally, a computer software program organized and stored the data, made comparisons among coded labels, and helped conceptualize different levels of abstraction (Creswell, 2013).

Ethics

Throughout the research activities, the researcher kept the anonymity of the participants through participant coding. All consents were given and explained to each participant. All video recordings were kept on a password-protected device.

Summary

This two-phase exploratory phenomenological research design used the SAM (Dreyfus & Dreyfus, 1986) to observe novice and expert teacher behaviors in a simulated inclusive secondary classroom. Phase One consisted of a Delphi study to identify 11 pedagogical practices experts believe are most important for teachers serving students with ASD in a simulated inclusive secondary classroom environment. Phase Two consisted of observations, reflections, and surveys of 10 teachers—five experts and five novices—in the simulated environment (TeachLivE™). Novice teachers were defined as pre-service teachers enrolled in teacher education; experts were defined as those who had completed the special education master’s program including a graduate certificate in ASD or SPD at UCF. Behaviors for observation were defined through the results of the

Delphi Study. The TeachLivE™ observation tool and was utilized to observe and tag the expert and novice teachers' behaviors in real time. Observations, reflections, and surveys were analyzed from teachers' participation in the simulated environment.

CHAPTER FOUR: DATA ANALYSIS

In this chapter, the researcher presents the findings of a two-phase phenomenological study exploring the best practices perceived by the field for supporting secondary students with ASD in an inclusive secondary simulated classroom. A Delphi Study was conducted to create a list of observable high leverage simulator practices for teaching students with ASD in a simulated classroom. Once a list was created, the researcher observed expert and novice teachers in the simulated inclusive environment. Their behaviors were analyzed and tagged in video recordings. Following the simulated experience, the experts' and novices' reflections were analyzed with Creswell's (2013) procedures for phenomenological studies. The results of each phase of this study were divided into three sections, each corresponding with the following research questions:

Phase One:

1. Presented with 51 practices already cross-validated as critical for teacher performance, what do experts in the field of autism spectrum disorders identify through a Delphi approach as the most important pedagogical skills for expert teachers in a secondary inclusive classroom simulator with a student with ASD?

Phase Two:

2. What are the patterns of pedagogical skills used by expert versus novice teachers in a simulated inclusive secondary classroom containing a virtual student with ASD?

3. What are the themes derived from the reflection of an expert versus a novice teacher after participation in a simulated inclusive secondary class containing a virtual student with ASD?

Research Question One

The researcher first analyzed research question one using a Delphi approach as to what high leverage practices should be exhibited by expert teachers in a simulated secondary inclusive classroom with a student with ASD. A total of ten experts in ASD were willing to be involved in this phase of the research study, with only eight completing all three rounds of the Delphi study. See Table 10 for the expert Delphi Study participants who completed the three rounds.

As noted in Table 10, the expert Delphi study participants range in age, gender, and experience. The ages range from 36-41 years to 61+ years of age. The majority (75%) of participants were female. Experienced ranged from total years of experience, including three participants with 30+ years of experience.

Round One: Results

Ten expert participants responded to the electronic Delphi Study. The initial round consisted of 51 pedagogical practices from Berliner's 13 prototypical features of an expert (Berliner, 2001), teacher behaviors found in the HLPs (TeachingWorks, 2016), teacher behaviors found in the Special Education High Leverage Practices (McLeskey & Brownell, 2015), and items from the instructional planning and strategies from the QIASD (Daly et al., n.d.). These four tools were reviewed, and a cross-walk was conducted to select these 51 practices for the first round of the Delphi study (See

Appendix B). The experts then selected what they perceived to be the top 15 most important pedagogical practices for teachers to exhibit in a simulated secondary inclusive classroom. The top 27 practices were then reviewed in round two, and ranked in order from highest response rate to lowest (See Table 12). This list consists of 1 practice from the prototypical of experts, 9 from HLP, 9 from the special education high leverage practices, and 8 from the QIASD.

Table 12

Delphi Study Round One Results

Round One: Delphi Study Results
Instructional methods are grounded in evidenced-based practices
Use explicit instruction
Systematically design instruction toward a specific learning goal
Teach students to maintain and generalize new learning across time and settings
Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement
Instructional pace promotes high rates of correct responding; correct responses are reinforced or promoting/error correction is provided as needed
Provide intensive instruction
Analyze instruction for the purpose of improving it
Checking student understanding during and at the conclusion of lessons
Communication directed to students is clear, relevant, appropriate to language ability, and grammatically correct
Use assistive and instructional technologies
Use and explicitly teach strategies to support learning and independence
Communication directed to students consists of largely instructive/ positive comments in comparison to corrective comments
Skills are taught in the context of naturally occurring activities and daily routines; there is no down time for teaching
Coordinating and adjusting instruction during a lesson
Scaffold instruction
Identify and prioritize long- and short-term student learning goals
Setting up and managing small group work
Providing oral and written feedback to students
Staff created opportunities for spontaneous use of communication skills including student-to-student interactions
Building respectful relationships with students
Students without verbal communication have AAC and actively use across activities
Explaining and modeling content, practices, and strategies
Implementing norms and routines for classroom discourse and work
Better problem solving skills
Implementing organizational routines
Selecting and designing formal assessment of student learning

Round Two: Results

Ten experts were sent the round two Delphi Study, with only eight responding to review the top 27 pedagogical practices identified in round one. The research experts selected their top 10 practices, and the top 20 practices then moved to the third and final

round. The following list, in Table 13, provides the top 20 practices sent to research experts in round three, ranked from highest to lowest response from round two. This list consists of 0 practices from the prototypical of experts, 5 from HLP, 9 from the special education high leverage practices, and 6 from the QIASD.

Table 13

Delphi Study Round Two Results

Round Two: Delphi Study Results
Instructional methods are grounded in evidenced-based practices
Use explicit instruction
Systematically design instruction toward a specific learning goal
Teach students to maintain and generalize new learning across time and settings
Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement
Instructional pace promotes high rates of correct responding; correct responses are reinforced or promoting/error correction is provided as needed
Provide intensive instruction
Analyze instruction for the purpose of improving it
Checking student understanding during and at the conclusion of lessons
Communication directed to students is clear, relevant, appropriate to language ability, and grammatically correct
Use assistive and instructional technologies
Use and explicitly teach strategies to support learning and independence
Communication directed to students consists of largely instructive/ positive comments in comparison to corrective comments
Skills are taught in the context of naturally occurring activities and daily routines; there is no down time for teaching
Coordinating and adjusting instruction during a lesson
Scaffold instruction
Identify and prioritize long- and short-term student learning goals
Explaining and modeling content, practices, and strategies
Implementing organizational routines
Selecting and designing formal assessment of student learning

Round Three: Results

Eight experts received the final 20 practices for the Delphi Study round three. These eight experts were asked to select their top five pedagogical practices. Eleven skills emerged as the final list. The results, as seen in Table 14, are as follows in order from highest response rates to lowest. This list consists of 0 practices from the prototypical of experts, 4 from HLP, 5 from the special education high leverage practices, and 2 from the QIASD.

Table 14

Delphi Study Round Three Results

Round Three: Delphi Study Results
Instructional methods are grounded in evidenced-based practices
Use explicit instruction
Systematically design instruction toward a specific learning goal
Teach students to maintain and generalize new learning across time and settings
Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement
Provide intensive instruction
Analyze instruction for the purpose of improving it
Checking student understanding during and at the conclusion of lessons
Use and explicitly teach strategies to support learning and independence
Explaining and modeling content, practices, and strategies
Selecting and designing formal assessment of student learning

The results of this final round were used to analyze data gathered in research question number two in the observation of expert and novice teachers' performances in a simulated secondary inclusive environment.

Research Question Two: Patterns of Pedagogical Skills

To further explore whether expected behaviors would actually occur, a pilot study was conducted with expert and novice teachers. Five expert and five novice teachers were asked to participate in two, 7-minute sessions in the TLE simulator, using a standardized lesson plan provided by the researcher and validated in earlier research for use in the simulator (National Institutes of Health, 2005). Their time in the simulator was short, but aligned with earlier research as to the amount of time needed in the simulator to observe behavioral changes. Also, to ensure a comparison could be made between the performance of expert and novice teachers' performances, a standardized process and lesson plan were used during the teachers' interactions with the avatar with ASD in the inclusive secondary classroom. Both groups of teachers' behaviors were analyzed in alignment with the outcomes of the high leverage simulator practices identified in phase one of this study, the Delphi study. The results from this phase are presented as a summary of what was observed when experts and novices completed two 7-minute sessions and reflected on their experiences in the TLE simulated secondary inclusive classroom with a student with ASD. A comparison is then provided, focusing on the observed patterns of expert versus novice teachers. Table 15 provides a summary of the behaviors of both groups to serve as an anchor for the discussion of the results.

The goal of the observations of these expert and novice teachers was to determine whether the behaviors identified by the Delphi Study experts could be identified in the simulator. Table 15 summarizes the results. Eleven high leverage simulator practices, which experts expected the teachers to exhibit in a simulated inclusive environment, were identified. Over two 7-minute observations, the researcher conducted this pilot study to

see if these 11 practices occurred, and if any differences existed in the skills exhibited by expert and novice teachers. With a very small sample of five expert teachers and five novice teachers, only five total strategies were observed in the simulator, and one of these behaviors was not directly observed in practice but during the reflection of the expert and novice teachers as described in research question three. A summary of what was observed in the experts versus novices is provided.

Table 15

Summary of results for research question two

Phenomenological Skill	Number of Expert Use of Skill	Number of Novice Use of Skill
Use Explicit Instruction	0	1
Instructional methods are grounded in evidenced-based practices	5	5
Systematically design instruction toward a specific learning goal	0	0
Explaining and modeling content, practices, and strategies	5	2
Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement	3	1
Teach students to maintain and generalize new learning across time and settings	0	0
Use and explicitly teach strategies to support learning and independence	0	0
Selecting and designing formal assessment of student learning	0	0
Checking student understanding during and at the conclusion of lessons	2	5
Analyze instruction for the purpose of improving it	0	0
Provide intensive instruction	0	0

Four high leverage simulator practices were observed for the five experts during their time in the simulator: (a) Instructional methods are grounded in evidenced-based practices, (b) Explaining and modeling content, practices, and strategies, (c) Behavior

problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement, and (d) Checking student understanding during and at the conclusion of lessons.

Interestingly, the novice teachers also displayed all four of these same high leverage simulator practices, as well as explicit instruction. The observed practices for the novice teachers were as follows: (a) Explicit instruction, (b) Instructional methods are grounded in evidenced-based practices, (c) Explaining and modeling content, practices, and strategies, (d) Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement, and (e) Checking student understanding during and at the conclusion of lessons.

The following is a summary of the results of expert versus novice teachers' performances. The differences described are not meant to be definitive in any statement related to experts' or novices' performances, but to inform the field of beginning patterns observed in this pilot, and for others to build upon any potential differences in these practices. These differences will be further elaborated on and discussed in chapter 5.

Use Explicit Instruction

The definition of explicit instruction, for this research, followed the Special Education High Leverage Practices: "instructional approach in which teachers clearly identify the expectations for learning, highlight important details of the concept or skill, offer precise instruction, and connect new learning to earlier lessons and materials" (McLeskey et al., 2017, p. 122). Expert teachers did not display this behavior as defined in this study, yet one novice teacher (N4) demonstrated explicit instruction in the 7-minute observation in the simulator. In this observation, the participant clearly stated, in

specific detail, the expectations for learning the lesson about technology, and prepared the students to talk about technology as both electronic and non-electronic tools. Interestingly, this novice teacher, still in an undergraduate program, was the only participant to exhibit explicit instruction in the classroom simulator.

Instructional Methods Are Grounded in Evidenced-Based Practices

Evidenced-based practices were defined as those that have empirical evidence of efficacy. Wong and colleagues (2015) identified 27 EBPs through the CEC standards (CEC, 2014; McLeskey et al., 2017; Wong et al., 2015). The researcher focused on those specific 27 EBPs as noted in Table 8.

All five expert teachers exhibited EBPs in their 7-minute simulated lessons. All five experts exhibited reinforcement, or specific praise, targeted specifically to the student with ASD. Three experts (E2, E4, E5) used response interruption redirection with the student with ASD. For example, when Martin, the student with ASD, got out of his chair and went back to the board, E4 called to Martin to talk about how his chair is technology, and thereby demonstrated a practice aligned with an EBP.

All five novice teachers also exhibited EBPs in the simulator, in the same lesson, for the same amount of time. All five novice teachers used reinforcement (specific praise). One novice (N1) showed response interruption/redirection by engaging Martin in conversation after he got up from his chair and went to the back of the room, but this novice teacher's behavior was the only observed instance of any EBP practice beyond specific praise.

Expert Versus Novice

Although each expert and novice teacher exhibited EBPs, the experts used more practices and appeared more comfortable and knowledgeable using response interruption/redirection than the novice teachers in general. Each time an expert teacher demonstrated an EBP, Martin's behavior was directed from getting out of his seat and going to the back of the room by the board. While some novices did not know how to handle that specific behavior, the experts appeared to seamlessly utilize a response interruption/redirection more often to help change Martin's behavior while connecting it to the topic of discussion.

Explaining and Modeling Content, Practices, and Strategies

For the purpose of this research, explaining and modeling content, practices, and strategies was defined by teachingworks.org: "Depending on the topic and the instructional purpose, teachers might rely on simple verbal explanations, sometimes with accompanying examples or representation...Modeling includes verbal explanations, but also think aloud and demonstrating" (teachingworks.org, 2017, para. 3).

Expert

All five expert teachers demonstrated explaining and modeling during their 7-minute lessons in the simulated classroom. Expert E3 explained and modeled what is needed to build machines with materials and content knowledge from math and science. Additionally, expert E5 gave the examples of a chalkboard and paper as technology.

Novice

Two novice teachers (N4, N5) demonstrated explaining and modeling during their 7-minute lessons in the simulated classroom. For example, both N4 and N5 took a student's response about technology and went into more detail about how technology helps us solve problems.

Expert versus Novice

While expert teachers appeared to demonstrate this teaching strategy more often, they also provided more examples of the desired answers from students, instead of just explaining as the novice teachers did. The experts expanded the student avatars' answers with new examples to model, explain, and extend information provided, whereas novice teachers took the student avatars' answers and continued with an explanation of technology without eliciting further information or having the student expand upon his or her original idea.

Behavior Problems Are Minimized By Using Proactive Strategies Including Choices, Clear Expectations, And Positive Reinforcement

Minimizing behavior problems, for the purpose of this observation, was defined as participants giving one or more clear choices to redirect a student's behavior, providing clear expectations of what behavior the teacher wanted the student to do, and/or providing positive reinforcement directly after a desired behavior occurred, or sporadically to encourage the desired behavior to continue.

Expert

Three expert teachers (E1, E4, E5) demonstrated behavior-minimizing strategies. For example, participant E5 reinforced Martin's behavior by saying, "Martin, you are doing a great job sitting there and listening to Maria," after he had been redirected to move from the back of the classroom and sit down in his chair.

Novice

One novice teacher (N4) demonstrated behavior-minimizing strategies. This novice gave clear expectations to Martin as he was out of his chair and in the back of the room at the board. She clearly stated she wanted him back in his chair to write down the examples of technology Maria had given.

Expert Versus Novice

Behavior management appeared to be second nature for the expert teachers, whereas the novice teachers were hesitant and unsure of how to respond to certain behaviors. This difference could have been related to the expert teachers' experience of effortlessly recognizing and responding to these types of behaviors, whereas some novice teachers had no previous experience teaching in an environment with a student with ASD.

Checking Student Understanding During And At The Conclusion Of Lessons

For the purpose of this study, the researcher used the definition from TeachingWorks (2017): "Teachers use a variety of informal but deliberate methods to assess what students are learning during and between lessons (para. 16)."

Expert

Three expert teachers (E1, E4, E5) checked for student understanding during their lessons in the simulated inclusive secondary class. The teachers who were observed using this teaching practice followed the lesson plan provided by asking the students to look around the room and identify technology around them. One expert (E4) went further in depth and inquired about non-electronic technology on the student avatars' clothes. Another expert (E1) not only asked the class as a whole to identify technology in the room, but also checked Martin's understanding after their discussion. The potential reasons why are discussed in chapter 5.

Novice

All five novice teachers checked student understanding during their lessons in the simulated inclusive secondary class. All novice teachers followed the lesson plan and asked the students to look around the room and identify technology around them. One novice (N3) had the student avatars rethink their definitions of technology after they discussed what technology is and does for them.

Expert Versus Novice

Interestingly, only three of the expert teachers checked for student understanding, whereas all five novice teachers checked for student understanding. Both expert and novice teachers followed the lesson plans provided; however, two of the expert teachers (E1, E4) checked the students' understanding more often than the novices did as a whole. The novice teachers followed the lesson plan more closely, whereas the experts added additional questions to enhance student understanding and learning.

Skills Not Observed in the Simulator

Skills recommended by the expert researchers – selecting and designing formal assessment of student learning, teaching students to maintain and generalize new learning across time and settings, systematically designing instruction toward a specific learning goal, using and explicitly teach strategies to support learning and independence, analyzing instruction for the purpose of improving it, providing intensive instruction – were not observed in either group and no further analysis for those skills occurred.

Research Question Three: Reflections

The researcher analyzed expert and novice teachers' reflections in order to answer research question three (What themes could be derived from the reflection of expert versus novice teachers after teaching in the simulated inclusive secondary classroom?) Three main themes emerged from the reflection and these themes were the same for the expert and novice teachers. Despite the same themes, the interpretation of these themes differed in the reflections of expert versus novice teachers. The three themes identified were: (a) teacher self-awareness of their own feelings and behaviors, (b) pedagogical skills and teacher practices, and (c) teaching experiences, attitudes, and thoughts on teaching in a simulated environment with avatars. Table 16 summarizes the reflections of the expert and novice teachers by theme. Throughout these three themes, 11 sub-themes emerged and each theme and subtheme is defined and presented in Table 17.

Table 16

Reflection Summary of Expert and Novice Teachers

Themes	Experts	Novice
<i>Teacher self-awareness of their own feelings and behaviors</i>		
Analyze Own Instruction	Provided more specific ways to improve instruction as if they were in their own classrooms (i.e. write on board, guided notes, graphic organizers, visuals).	Wanted to improve their teaching and engage with Martin, Bailey, and Maria more. Thought they could accommodate the lesson more, try different types of questions, do group or collaborative learning.
	Wanted to improve their student engagement through wait time and proximity.	Knew they needed more work and did not improve over the sessions. (N-2; N-2)
	Analyzed more instruction after the first simulation experience, yet did not change much of their behavior in the second experience.	Mentioned using skills possibly taught in pre-service classes (i.e. cooperative learning, UDL, activating prior knowledge). Made actual changes from the reflection after the first experience to the second experience.
Lack of Preparation	4 out of 5 experts felt they were not prepared to teach in a simulated classroom despite having met the avatar one previous time and the lesson plan was provided one week in advance. (E-2)	Only 1 novice mentioned lack of preparation, which related to needing to know more background in the content being taught .
Teacher Behavior	Created a positive classroom environment regardless of knowledge of students and classroom. (E-5; E-4)	Felt they had positive dispositions towards the students. (N-1) Felt they were able to adjust their questioning to help engage Martin, Bailey, and Maria. (N-1;N-2)

Themes	Experts	Novice
Teacher Feelings	Anxious and nervous about the experience in general (N-5; E-3)	Felt it was challenging, anxious to deal with the different behaviors presented (N-5; N-1)
<i>Pedagogical skills and Teacher Practices</i>		
Student Engagement	Overall, felt they kept the class engaged including Martin. (E-4)	Felt they called on each student; however, it was a challenge to get Martin engaged. (N-2)
	One expert felt they didn't keep Martin engaged. (E-2)	Tried to find alternatives ways to engage Martin (i.e. drawing pictures; cooperative groups) (N-3)
Behavior Management	Felt they ignored most of the behaviors as the best strategy. Allowing Martin to move around the room and time away was the best strategy for Martin. (E-1; E-4)	Was unsure of how to handle Martin's behaviors (N-3; N-5; N-2)
Pedagogical Practices	Use of wait time (EJF1)	Used UDL practices and Think, Pair, Share (N-3; N-4)
<i>Teaching experiences, attitude, and thoughts of a simulated environment and avatars</i>		
Simulation Experience/Avatar	"Interesting" experience in general (E-1) but also a positive one (E-4)	Interesting but fun and enjoyable (N-1)
Simulated Classroom Environment /Student Avatars	Felt the student avatars and classroom were very typical of areal classroom (E-1; E-3; E-4; E-5)	One novice felt students were not realistic in their behaviors or responses (i.e. sassy remarks). However, Martin did seem like a student she might see in a real class (N-4). Others felt the diverse students made it realistic (N-2)
Teaching Tool	Can see the benefit of using tool for new teachers (E-1)	Great tool for new teachers to practice (N-1)

Table 17

Theme Definitions

Theme	Definition
Teacher Self-Awareness Of Their Own Feelings And Behaviors	Teacher reflection focused on themselves and their actions and feelings.
Analyze Own Instruction	The participant gave examples or mentioned how they would or could improve their instruction in the simulator for the next experience.
Lack of Preparation	The participants' feelings of preparedness to teach the lesson provided in the simulator. Four experts and one novice commented on this section.
Teacher Behavior	Anything teachers described that they exhibited physically or verbally in the classroom, specifically using "I" words.
Teacher Feelings	How the teachers felt about the experience of teaching to an inclusive simulated classroom.
Pedagogical Skills and Teacher Practices	Any pedagogical skill focused on during reflection.
Student Engagement	Participants talked about what behaviors they exhibited to get the student avatar engaged.
Behavior Management	Commented on how they dealt with or mentioned strategies they did use or would use for any virtual student in the class.
Teaching Experiences And Attitude Within A Simulated Environment	The participant spoke directly about the simulated classroom or avatars.
Simulation Experience	Comments made about the experience in the simulated classroom instead of general teaching techniques.
Simulated Classroom Environment /Student Avatars	Comments made in regards to the classroom environment or virtual student avatars.
Teaching Tool	Comments that mentioned TeachLivE as a teaching tool.

Theme One: Teacher Self-Awareness Of Their Own Feelings And Behaviors

Analyze Own Instruction

Analysis of instruction was based on whether the participant gave examples of or mentioned how they would or could improve their instruction in the simulator for the next experience.

Expert vs Novice: Universal Design For Learning

A common theme of Universal Design for Learning emerged; as novice teachers wanted to improve on providing multiple means of engagement, experts looked to improve multiple means of action, expression, and representation. Novices made statements such as this one by participant N3: “I would have more partner work and ask students to write or draw pictures to keep them more engaged.” Participant N4 stated, “Maybe incorporate some cooperative learning in the beginning by having them partner up and talk about technology before asking the group as a whole to give answers.” More importantly, these novice teachers followed through with their suggestions in their second TLE experience. Experts, on the other hand, wanted to improve by providing accommodations such as guided notes or visuals, or changing their questioning to students, but did not change any of their instruction between their first and second experiences. Participant E2 stated, “If it were my own classroom, I also would have written things on the board and referred to it later, maybe used mapping to show how technology helps us relate to each other.” Unlike the novice teachers, the experts did not attempt to incorporate any of their proposed UDL strategies from their first to second observations.

Expert vs Novice: Improvements

Both expert and novice teachers expressed ways to improve their instruction; however, novice teachers felt they did not improve enough. For example, N2 stated, “This being said (felt more comfortable in the TLE simulator), I don't think that I refined my technique enough between the first and second attempt.” Many focused on working better with the students with disabilities – specifically, Martin. Participant N5 said, “If I had to go again I would have to find a way to extend the discussion to Martin with ASD”; similarly, N1 stated, “I would like to reach Martin and Bailey a little bit better and teach them more about technology rather than the other topics they brought up.” While the novice teachers wanted to improve their work with students with disabilities, they did not provide specific examples on how to accomplish that task. On the other hand, the expert teachers were able to communicate and provide specific examples as to how they would improve their instruction for the students with disabilities. For example, E3 said, “I know the topic and/or setting was above his comfort level, so I would accommodate with passing out visuals beforehand/email, or allowing him to have guided notes.”

Expert vs. Novice: Lack of Preparation

Lack of preparation referred to the participants’ feelings of preparedness for teaching the lesson provided in the simulator. Four experts and one novice commented on this section

Interestingly, the expert teachers felt overwhelmingly unprepared to teach the provided lesson (See Appendix F), whereas the novice teachers did not bring up preparation as a factor in their teaching. Participant E2 stated, “It was a challenge, because I didn't read the information beforehand that was emailed to me, so I felt very

unprepared.” Participant E3 explained, “I would like to be able to have more planning time or the freedom to plan.” Experts, according to Berliner (2001), should be able to “go with the flow”; therefore, this theme is more surprising coming from the expert participants rather than the novice participants.

Expert vs Novice: Teacher Behavior

Teacher behavior was identified in the reflections as anything that they described that they exhibited physically or verbally in the classroom, specifically using “I” words.

Both groups of teachers felt they were able to create a positive environment for all the students. Participant E4 stated, “I felt I was able to connect to the students and promote learning,” and participant E5 shared, “I also maintained a learning environment for all of the students by keeping the questions/answers as something they could relate to.” A novice participant, N2, also commented, “I did take the time to reach out to each student and make them feel as though there was no wrong answer.” In general, both expert and novice teachers felt as if their behaviors created a positive environment for the students.

Teacher Feelings

Teachers feelings referred to teachers’ discussions about the experience of teaching in an inclusive simulated classroom.

Expert vs Novices: Feelings of Nerves

Although experts may have had more experience in a real teaching environment, experts still felt nervous about the experience in general. Participant E5 stated, “I was

nervous to be with students that are ‘virtual,’ however, the nerves stopped once I engaged with the students and began the lesson.” Nerves did not seem to bother the novice teachers as much. This level of confidence could have been related to the fact that the novice teachers have had experience in the simulator in their undergraduate program.

Expert vs Novices: Feelings of Challenge

Novice teachers did express that teaching to this inclusive class was a challenge. Determining how to deal with Martin’s behaviors was a challenge for many, especially for novice N5, as this was the teacher’s first experience teaching a student with ASD. Participant N5 stated (referring to his teaching strengths with a student with ASD), “Zero, I have none to be honest, even if it is simulated this would have been my first time interacting with this. I tried to shift the problem to the back of my mind until I could figure something out, but nothing came of it.” Additionally, participant N1 stated, “I felt that it was hard to engage Martin in the lesson. Also, I felt rude interrupting Bailey, because she got off topic so quickly, and I wanted to get all of the lesson in.” The expert group did not mention the act of teaching or experiencing a challenge, perhaps due to their real classroom experiences working with and managing behaviors.

Theme Two: Pedagogical Skills and Teacher Practices

Student Engagement

Student engagement was coded if the participants talked about what they did to gain student avatar engagement or described how they engaged the student avatars.

Expert vs. Novice: Martin Student Engagement

While both novice and expert teachers discussed engagement with Martin, the student avatar with ASD, the comments had contradictory meanings. The experts expressed their ability to engage Martin; for example, participant E4 “gave him some additional time to respond and some cueing questions to guide him to the answer of doctors as a person who helps guide technology.” On the other hand, the novice teachers expressed their challenges in engaging Martin during their lessons. Participant N4 stated, “I also tried to have him participate in the class discussion, but it is very difficult to do so when I don't know how he will respond to different questions as well as how exactly to ‘get through’ to him in the classroom.” Participant N2 said, “I would want to think more about how to keep those who have disabilities engaged. Just calling on them to answer and letting them have time in class to voice what they know isn't enough to keep them engaged. I do think that I may have let Martin fall to the wayside, which I had wanted to improve.” Finally, a definite difference in expert and novice teachers’ engagement with Martin was seen through the amount of talk time given to Martin during the 7-minute lesson. Expert teachers gave Martin more talk time, allowing a range of 16 to 40 seconds with a mean of 27 seconds, while the novice teachers allowed a range of 0 to 44 seconds with a mean of 18 seconds. Interestingly, the experts allowed Martin to speak 9 more seconds, on average, than the novice teachers. This finding is experiential in nature, as are all findings in this pilot, but an interesting difference in this short period of instructional time.

Expert vs. Novice: Whole Class Engagement.

Expert teachers felt they were able to keep and monitor class engagement. Participant E1 felt she was “being aware of student engagement” and participant E4 expressed she had “[t]he students...engaged throughout the lesson.” The novice teachers took a different approach to engagement, although they felt it was hard to keep the class on track, as Participant N1 conveyed: “I found it difficult to keep the class on track when we were having discussions about technology.” Novices were the only group to incorporate cooperative learning and alternative ways for students to express learning in their lessons. For example, N4 said, “I thought it would be helpful to use the collaboration between students,” and others provided opportunities for students to draw pictures during the lessons.

Expert vs. Novice: Behavior Management

Behavior management was coded if participants commented on how they dealt with or mentioned strategies used for behaviors of any virtual student in the class. Behavior management showed interesting differences in the expert and novice teachers. Expert teachers noted that they mostly ignored Martin’s unwanted behavior. Expert participant E5 stated, “I monitored Martin continually. I ignored some behavior and rewarded him verbally when the desired behavior was being shown.” Expert teachers expressed their ignoring behavior and the comfort in redirecting behaviors. Participant E1 brought up the need to be “aware of the fact that the student may need time to get up and move,” and E2 claimed, “I was able to ignore some of his behaviors and bring him back to task,” whereas novice teachers openly discussed that they did not know how to deal with such behaviors. Participants N3 and N5 stated, respectively: “I was very unsure of

how to handle the student who kept getting up,” and “Martin started walking around the classroom a lot and I was not sure if I should ignore him or tell him to sit back down.”

Theme Three: Teaching Experiences and Attitude within a Simulated Environment

Simulation Experience

Simulation experience was coded if teachers’ remarks were specific to the experience in the simulator. The use of a simulation (specifically, TeachLivE) was a new experience for the expert teachers. A sentiment shared across the expert group was summarized by E1 as “very interesting since it was a new experience for me.” The novice teachers may have had an advantage when it came to the comfort level during the first observation, since the university the novice teachers attended incorporated different environments of the TLE simulation into an education course, so it was not the novices’ first TLE experience. Both expert and novice teachers did find that their experiences in the simulator with the inclusive student avatars was a constructive one, as described by E4, “The teaching experience was very positive” and N1, “I really enjoyed my TeachLive experience”.

Simulated Classroom Environment/Student Avatars

Comments were coded for simulated classroom environment/student avatars if the teachers commented specifically about the environment and avatars related to a real classroom and students. According to the expert teachers, the classroom and student avatars were direct reflections of a real classroom and students they had personally taught. Participant E4 commented, “The teaching experience, I found, was amazingly similar to teaching students in a typical setting,” and in regards to Martin, E3 felt “Martin

had very typical ASD characteristics.” In comparison, novice teachers did not comment much on the realness of the class and/or student avatars. The lack of comments in this area could have been due to the novice teachers’ lack of experience in classes of their own.

Teaching Tool

Comments and remarks were coded under teaching tool, if teachers mentioned TLE as a teaching tool. Both experts and novice teachers alike felt unanimously that the TLE simulation is a “great” tool and beneficial for teachers to practice their skills. Participant E1 commented, “What a great tool for teachers, especially new teachers.” Furthermore, N2 stated, “I think that TeachLive can be a great tool to help teachers learn how to work with an inclusive classroom in a way that is less pressure than if they were to be placed in a regular classroom first.” Neither expert nor novice teachers provided negative comments about the tool.

Trustworthiness/Validity

Following Creswell’s (2013) guidelines of two or more forms of validation to determine validity. The researcher used triangulation, member checking, and peer review of the simulation data.

Peer review was conducted to gain reliability of coded behaviors in the simulator and emerged themes through participants’ written interviews. Inter-rater reliability was found for both video observations and coding of themes through the written reflections. A peer reviewer coded thirty percent of recorded observations with behavior tagging. Reliability was met with 92.5% agreeance. Additionally, all analyzed written reflections

also were sent to a peer reviewer and generated 96% reliability. Any discrepancies were discussed with the peer reviewer and the researcher.

Summary

In this chapter, the researcher presented the findings of this exploratory phenomenological study on the use of a simulator to observe teacher practice in a secondary inclusive classroom containing a student with ASD. The researcher first identified the desired pedagogical skills for a simulated inclusive environment according to experts in the field. These 11 high leverage simulator skills were then observed for potential use by expert versus novice teachers. Interesting trends emerged in the differences between expert and novice performances, but the use of all 11 high leverage simulator practices was not observed in the simulator. Only 5 of 11 identified high leverage practices were observed in the simulator during this pilot study.

Data from the reflection of the expert and novice teachers were then analyzed to find themes in their thoughts on the use of the simulator. Additional HLP behaviors emerged from their discussions. Summaries of their reflections and differences in experts versus novices were provided. The behaviors observed and themes coded in the reflection of expert versus novice teachers provide an emerging framework for discussion, reflection, and future research on the use of simulated environments for more effective instruction for students with ASD. Emerging themes and observed behaviors are further discussed, and aligned with the literature related to effective practices in Chapter 5.

CHAPTER FIVE: DISCUSSION

In this chapter, the researcher begins by reviewing the statement of the problem and the methods used to answer each research question. The researcher then discusses the findings of the two-part research study in relationship to each research question and compares the findings with the existing literature in the field. Next, limitations and implications of the research are discussed. The researcher concludes with recommendations to the field on the use of simulation and teacher preparation for secondary students with ASD, based upon the findings of this study.

Statement of the Problem

Special and general education teachers alike are expected to be prepared to teach a variety of students in the classroom, including students with ASD. Currently, pre-service teachers are not adequately prepared to teach students with ASD, citing a lack of information, preparation, and classroom experience (Busby et al., 2012; Coleman, 2000; Hart & More, 2013; Kaufman & Ireland, 2016; Loiacono & Valenti, 2010; Martin & Mulvihill, 2016; National Research Council, 2012). This same gap in practice establishing evidenced based practices (EBP) for teacher candidates teaching students with ASD is present in the research literature (Burns & Ysseldyke, 2009; Cook, Tankersley, & Harjusola-Webb, 2008). This lack of an agreed-upon knowledge and skill base in both preparation and practice of teachers for students with ASD is especially problematic for novice or advanced beginner teachers, as defined by Berliner (2004) and Dreyfus and Dreyfus (1986).

High leverage practices have been validated for general education (www.teachingworks.com, 2017) and most recently for special education (McLeskey et al., 2017). However, pre-service teachers may not have the opportunities to have repeated practice of these skills prior to entering the classroom and this lack of feedback could impact their performance and the learning outcomes of their students (McLeskey & Brownell, 2015). Furthermore, teachers do not have control over when quality opportunities arise to practice those skills in a real classroom, and these repeated opportunities are essential for novice teachers to master effective and evidence-based practice (Ericsson, 2014).

Review of the Methods

The researcher conducted an exploratory phenomenological study to better understand the issues around teaching students with ASD and potential differences in the behaviors of expert versus novice teachers. Both phases of this study were framed in the emerging use of a simulated classroom, TLE, as a potential tool to better prepare teachers to work with students with ASD in inclusive secondary settings. The researcher examined the experiences and patterns of master and novice secondary teachers as they engaged with a virtual student with ASD in the TLE simulator. Following each of their two interactions in the simulator, both sets of teachers completed a written reflection on their experiences. The research questions that guided the researcher, and a summary as to what occurred related to each question, is provided.

Phase One: Delphi Study

To answer the first research question, “ presented with 51 practices already cross-validated as critical for teacher performance, what do experts in the field of autism spectrum disorders identify through a Delphi approach as the most important pedagogical skills for expert teachers in a simulated secondary inclusive classroom with a student with ASD?” a Delphi study was conducted.

In response to this question, 51 pedagogical practices were identified through a crosswalk of teacher behaviors in the general and special education literature. Experts selected 11 practices for teachers working with students with ASD at the secondary level in a simulated environment. These 11 practices were included in the original 51 practices harvested from three databases; 5 practices from the high leverage practices in special education (McLeskey et al., 2017): 4 from the general high leverage practices (TeachingWorks, 2016) and 2 were from the OSSAD-R, specific to autism (Daly et al., n.d.)

With only two ASD-specific practices identified as important for use in the simulator, and five from the high leverage practices in special education, it appears that most practices of importance in the simulator were not unique to students with ASD and could be generalized to a range of students with disabilities. The other four of the general high leverage practices also could be used in the instruction of any student. Interestingly, not one practice was selected from Berliner’s prototypical behaviors that drove the national board standards for special educators. This finding needs further investigation and discussion about the alignment of these practices in general, and how these practices may or may not be unique to special education and, more specifically, to students with

ASD, and how these practices may or may not be observed in a simulated environment. While the HLPs provided a framework for the general education population, and more recent practices for special education, the research is not currently available to substantiate the impact of how these skills will or will not make a direct impact on student learning. This level of uncertainty is even greater considering the unique characteristics and needs of students with ASD.

Phase Two: Expert versus Novice Performance

To answer the second research question, “what are the patterns of pedagogical skills used by expert teachers versus novice teachers in a simulated inclusive secondary classroom containing a virtual student with ASD?”, 11 identified practices were observed.

Of the 11 practices identified by the experts in the field, the expert and novice teachers used only 5 of these practices in the simulator. Two practices were ASD specific from the OSSAD-R, two were from the general high leverage practices, and one was from the high leverage practices in special education (Daly et al., n.d.; McLeskey et al., 2017; TeachingWorks, 2016). This study found non-ASD-focused strategies may still be important for teachers to exhibit for this population in a simulated classroom as ASD-specific skills for teachers did not emerge from the current list of practices identified. Another conclusion could be that teachers are not being properly prepared in strategies that work for students with ASD, and hence the identified practices did not emerge (Busby et al., 2012; Coleman, 2000; Hart & More, 2013; Kaufman & Ireland, 2016; Loiacono & Valenti, 2010; Martin & Mulvihill, 2016; National Research Council, 2004). Another option to consider is that the time in the simulator was not long enough or robust

enough to demonstrate all of the practices listed. These various conclusions and options lead to future discussion points and a clear path for extended and future research.

To answer research question three, “what are the themes derived from the reflection of an expert versus a novice teacher after teaching in a simulated inclusive secondary classroom containing a virtual student with ASD?”, the researcher examined written reflections after each observation.

Three overarching themes were revealed through expert and novice reflections after their experience in the TLE simulator. Teachers were (a) aware of their own teaching behaviors and feelings, (b) able to provide a rationale for their understanding of use or lack of use of certain pedagogical skills, and (c) able to express how they used their “real” experience in the simulator. While the teachers were able to express themselves and reflect on their behaviors, only one theme occurred from the high leverage simulator practices: analyzing their own practices for the purpose of improving. To focus on that specific behavior, the experts were able to bring real classroom experiences to their reflection and provide specific details as to how they would improve their practice in future sessions. While novice teachers did not appear to discuss how they could improve their teaching, they did acknowledge their need for further practice and instruction of students with ASD. Novice teachers did suggest ways to incorporate cooperative learning and engagement for the student with ASD, and mentioned UDL principles, while the expert teachers did not. While it makes sense that novice teachers, who have limited classroom experience, could not provide detailed explanations, it is interesting that novice teachers were more reflective about evidence-based practices than the expert teachers in this pilot study.

Discussion of Findings

Instructional Pedagogy

Out of 51 instructional practices for experts, experts in the field identified 11 high leverage simulation practices (HLSP) for teaching students with ASD. Out of these 11, only five were observed in expert and novice teachers in two sessions of a secondary inclusive simulated environment. It is important to note that this particular simulation experience was not created to be conducive to all practices identified, so whether or not practices were observed may have depended on the scenario used for this pilot study.

Figure 11 describes which expert practices were identified and where the five practices observed in the simulator emerged in the various practices databases considered for this study. More general teacher use of the high leverage practices were observed than those in special education. This finding could be because this scenario was observed in an inclusive setting and was not meant to give teachers a chance to work on a targeted strategy for the student with ASD alone, or that the practices identified may need a different scenario to observe. These outcomes lead to future research and further questions for the field.

Additionally, from the OSSAD-R, only the two practices specific to ASD were selected from the 11 HLSP identified as a result of the Delphi study. The two practices for an inclusive classroom specific to ASD were: (a) Instructional methods are grounded in evidenced-based practices and (b) Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement (Daly et al., n.d.). These practices are important for the success of students with ASD in the classroom, whether they require support at a Level 1 (“Without supports in place,

deficits in social communication cause noticeable impairments”), or very substantial support at a Level 3 (“Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning”; American Psychiatric Association, 2013, p. 52). The field may need to ponder a very basic questions of why, when, and how to best use simulation to prepare teachers in targeted and specific strategies for students with ASD as the next step from this pilot research study. This study began to illuminate the potential issues in teacher preparation for ASD in the use of simulation, as well as potential differences in the practices of expert versus novice teachers. All of these issues were only addressed at a surface level, leaving many more questions than answers.

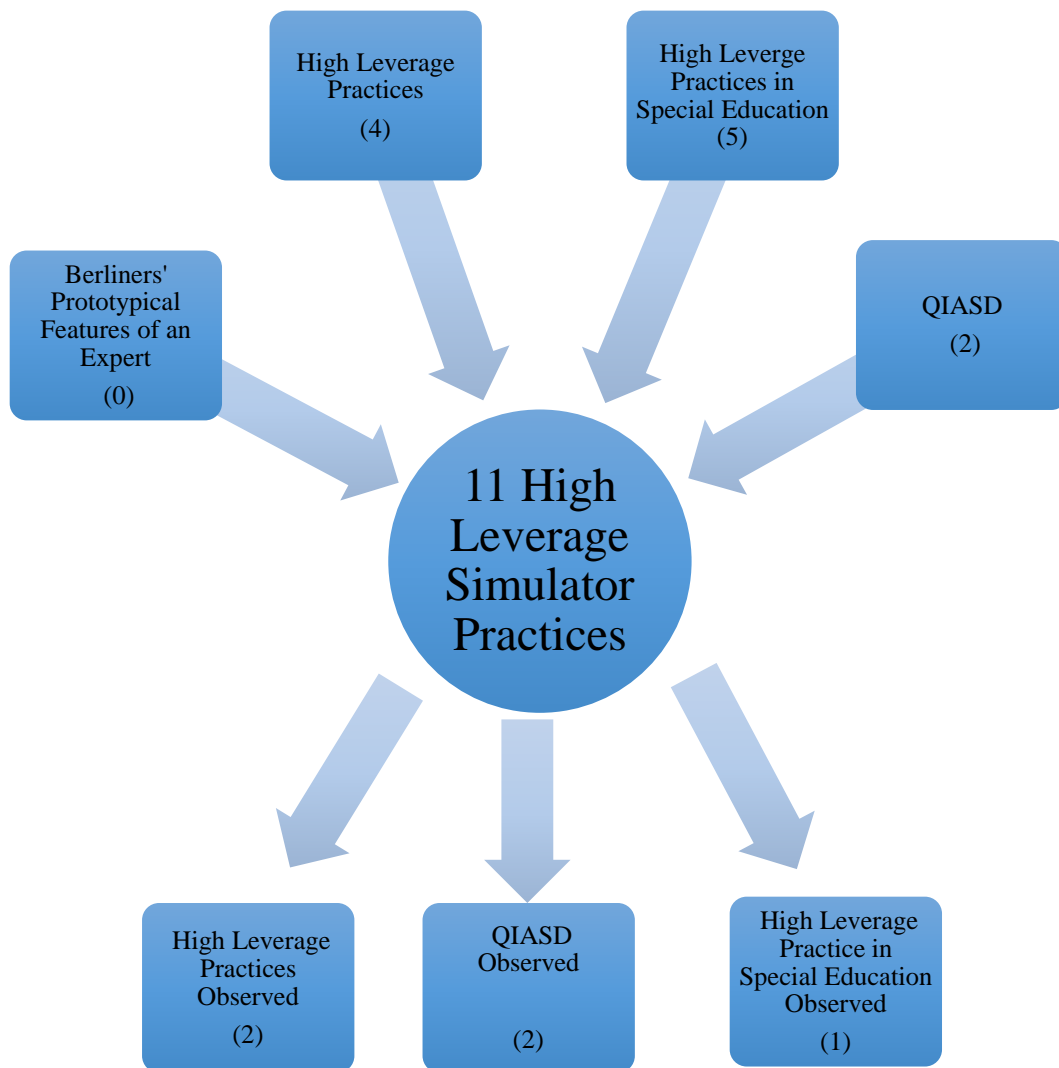


Figure 11 Makeup of the High leverage Simulator Practices

While practices specific to ASD were identified, these practices could benefit all students with or without disabilities. As McLeskey and colleagues explain, many practices can be used or seen in general and special education. However, when used for students with disabilities, the practices should look different. The list of 11 high leverage simulator practices for students with ASD are both relevant and important for all teachers to know and demonstrate, and this list is most likely not an exhaustive list of strategies for use in an inclusive secondary classroom simulator. The list currently defined in this study is only intended for use in the simulator. Additional scenario development, longer amounts of simulation time, and possibly targeted teacher preparation and feedback, are needed to further enhance these skills in expert and novice teachers. The use of simulations in teacher education is at its infancy in the field of educational research (i.e., less than a decade of wide scale use). However, simulation can provide a prolific and controlled environment for rehearsal of targeted behaviors (Dieker, Straub, Hughes, Hynes, & Hardin, 2014; Shaw, 2004). In only four 10-minute sessions, teachers are able to change two targeted teaching behaviors and take those behaviors back to the “real” classroom (Dieker et al., 2014; Straub et al., 2015), yet how those practices could emerge and be shaped for teachers working with students with ASD in simulation is just beginning, as this is the first study in the field using an avatar with ASD. Building upon this work is important as the number of students with ASD enrolled in public education and in inclusive classrooms continues to increase (U.S. Department of Education, Office of Special Education Programs, 2015).

Expert and Novice Usage of High Leverage Simulator Practices

Expert vs. Novice

Researchers over the past 30 years have pointed out a difference in expert and novice teachers' performances. Dreyfus and Dreyfus (1986) and Berliner (2001) explain the process of development of teacher practice evolving from a novice to an expert. Due to the developmental nature of teaching, the similarity of expert and novice teacher behaviors, as well as variances in their use of practices in the simulator, are not surprising. What is perplexing, is the differences were not aligned with variances in their skills in working with students with disabilities or with ASD as expected. During both the observation and reflection sessions, expert teachers were able to talk about and demonstrate skills to minimize behaviors and purposefully ignore unwanted behaviors from all students, yet novice teachers were able to utilize more group work as a way to include UDL into their lessons. These differences in skills are not clearly aligned with the expert and novice literature, yet the current literature is more about teaching in general and not specific to disabilities. It is important to note, 4 out of 5 novice teachers do have a sibling or family member with a disability. With the majority of novice teachers having exposure to individuals with disabilities, this past experience could have had an effect on their teaching in the simulator with student avatars with disabilities. Research on development for teaching students with ASD has not yet emerged. These variances in skills again provide a foundation for further research and discussion.

With the exception of explicit instruction, as reflected upon by a novice teacher, evidence-based practices for students with autism, identified by Wong and Colleagues (2015), were demonstrated by both expert and novice teachers. However, only two EBP

emerged: reinforcement, mainly in the form of positive praise, and response interruption/redirection. The researcher may not have observed more practices due to one of two reasons: (a) the majority of the EBPs for students with ASD in the literature are to occur in one-on-one settings, or (b) teachers are not being explicitly taught how to implement EBPs in the classroom (Busby et al., 2012; Friden, 2004; Garland et al., 2012; National Research Council, 2004). The research to practice gap may still be very wide as it applies to working with students with ASD, as the strong rise in the number of students and the identification of practices is just emerging. Many of these emerging practices have just been validated as part of the high leverage special education practices by extensive work from the CEEDAR Center (McLeskey et al., 2017), but the specific nuances and application of these practices to students with ASD, especially in a simulated environment, is something that may not emerge without further research. Additionally, experts were able to explain and model content and minimize behavior problems better than novice teachers, whereas novice teachers checked students' understanding during the lessons at a higher rate than expert teachers. What these findings mean is yet to be determined, but this initial pilot in the observation of these skills creates a beginning discussion for the field to reflect upon in future research.

Expert

Expert teachers are to be fluid and flexible in their instruction and to be able to explain their decisions related to their actions (Berliner, 2004; Ruppert et al., 2014). Expert teachers should no longer need to choose what they attend to in the environment; they respond to situations without thinking. Expert teachers continuously monitor and access classroom situations, behavioral and academic, in order to change or respond

instantaneously (Ruppar et al., 2014; Wolff et al., 2016). Expert teachers, Berliner (2004) adds, tend to do what works, having a “go with the flow” attitude (p. 208). In the simulator, the expert teachers were observed demonstrating immediate responses to the following behaviors: (a) instructional methods were grounded in EBPs, (b) explanation and modeling of content, practices, and strategies were observed, (c) behavior problems were minimized by using proactive strategies including choices, clear expectations, and positive reinforcement, and (d) checking for student understanding occurred during and at the conclusion of lessons. The conscious level of these decisions was not further explored beyond the basic reflection from expert teachers’ after their time in the simulator, but further targeted thinking and expansion of the use of strategies found from the HLSP by expert teachers is a logical next step in this line of research.

Experts also were able to monitor the classroom continuously, and noted in their reflections that they deliberately ignored Martin’s unwanted behavior. This teacher behavior correlates with the research on competent teachers, as they are able to prioritize classroom occurrences and can ignore those of less importance or not requiring attention (Berliner, 2004). Additionally, expert teachers can continuously monitor and access classroom situations, behavioral and academic, in order to change or respond instantaneously (Ruppar et al., 2014; Wolff et al., 2016), and this level of monitoring was observed.

In future sessions, experts in this pilot might benefit from checking student understanding during the lesson. Of the five expert teachers observed, only two used this skill in the simulator. Additionally, no expert teachers used explicit instruction during the 7-minute simulation sessions. The observations and reflections also revealed a lack of

grouping or cooperative learning in the simulation experience. It is possible that the experts did not perform as well due to a lack of comfort in being in a mixed-reality simulated environment. Only one of the expert teacher participants had ever been in the TeachLive™ simulator before this study, but like the novices this expert teacher had not experienced this secondary inclusive classroom. Either way, an introductory session could have been beneficial to deal with this potential level of newness of the simulated environment for the expert versus the novice in being in a mixed-reality simulated environment. These issues and findings all lead to further investigation and discussion in the field of teacher preparation.

Novice

Novice teachers excelled in checking for student understanding and exhibited two EBPs, and all but one displayed the skill of reinforcement. In this observation, reinforcement was seen as positive praise and was not always directed to Martin. Nearly every novice teacher checked for student understanding in the simulator. This finding aligns with novice teaching research, as novices tend to be inflexible and rational, and conform to the rules and procedures as told (Berliner, 2004). These novices clearly learned in their program how to check for student understanding, and were able to demonstrate this skill. But the demonstration of this skill may have been due to the fact that the researcher provided them with a semi-scripted lesson plan. As noted by Berliner, they may have simply been conforming to the lesson provided, therefore making sure they asked the “checking for understanding questions” listed in the lesson plan (National Institutes of Health, 2005). In contrast, the expert teachers did not follow this prompt, which creates another area for further investigation.

Novice teachers also have been found to be more anxious about behavioral management issues (Berliner, 2001), and this stress was evident in the simulator and during their reflections. Novice teachers talked about their “uncertainty” about how to best deal with the student labeled with ASD and his behaviors. This initial finding may lead to further discussions as to how novice teachers could benefit from using the simulator to work on minimizing behavior problems by using proactive strategies including choices, clear expectations, and positive reinforcement with all students, but specifically with students with ASD. Additional research may show what novices need, specific working with students with ASD, but no direct findings unique to novices emerged in this pilot study.

Study Limitations

Limitations are inherent in all research, especially when the research is exploratory in nature. Limitations in this study included (a) sample of teacher participants, (b) time in the simulation, (c) the researcher as an instrument, and (d) lack of depth and research behind the practices identified and observed.

Participants were selected based on completion of their master’s degree or position in the education program at the same university. Although certified special education teachers are certified K-12, not all participants had experience with secondary students. Additionally, at the point of the study, not all the novice teachers had completed an internship. Therefore, some novice teachers had no classroom experiences, even though they were at least juniors in the education program.

The observation time allotted may not have been adequate. In TLE, 10 minutes equal 45-60 minutes of real time (Dieker, Rodriguez, Lignugaris/Kraft, Hynes, & Hughes, 2013). Although each participant experienced a 7-minute session, equating to approximately 30-40 minutes of real time, it may not have allowed for enough time for all teaching strategies and pedagogical skills to come to fruition; therefore, the researcher cannot generalize the findings to a larger group at this time. Additional research needs to be conducted.

With phenomenological research, the researcher is a key instrument (Creswell, 2013). In this particular research, the researcher was not only a special education teacher, but also the creator of the avatars with disabilities within the inclusive classroom for the TLE environment. Having a peer debriefer was key in allowing the researcher to separate herself personally from the simulation, but this limitation was still present.

While many advances have been made in the field of special education to identify HLPs for special education teachers and HLPs for an inclusive simulator, these practices have not been observed to date. Since 2015, McLeskey and colleagues have been drafting a list of HLPs. The writing team finalized a list of practices and held multiple focus groups for feedback, after which the finalized practices were submitted to the CEC board of Directors in July, 2016 (McLeskey et al., 2017). Research is still needed on how these practices are used amongst teachers. Using this newly developed list in this study was critical to represent practices for special education, but does present a limitation until further validation of these practices occur.

Recommendations for Practice and Future Research

Practicing novice and expert teachers alike need professional development. Framing this PD in high leverage simulator practices could compress time and accelerate learning. As research with the TLE simulator has proven, four 10-minute sessions can change two targeted teacher behaviors (Dieker et al., 2014; Straub et al., 2015); teachers could benefit from the opportunity to practice, and reflect for a total of 40 minutes in the simulator with a coach on how to more effectively teaching students with ASD.

Experience with students with disabilities, specifically ASD, is lacking for pre-service teachers, as noted in the reflections of these novice teacher. The lack of practical experience before entering the classroom for novice teacher has been noted over the years (Ergül et al., 2013; Simpson et al., 2011). Therefore, teacher preparation program could provide opportunities for pre-service teachers to teach students with disabilities in simulated environments and provide more community-based preparation with real world experience. The TLE simulator is just one option to offer a safe environment for practicing new skills before teaching real students. Additionally, skills, specifically EBP and behavior management for students with disabilities, need to be explicitly taught and practiced in preservice programs before teachers enter a real classroom.

This expanded preparation in simulation could impact the attrition rate of novice teacher. Novice teachers often leave the field of education due to a lack of preparation for the classroom (Emery & Vandenberg, 2010). The correlating level of attrition for teachers of students with ASD has yet to be studied, but the field of special education in general has some of the highest levels of attrition rates (Haberman, 2012; Haynes et al., 2014; Kennedy, 2015; Martin & Mulvihill, 2016; Mitchell & Arnold, 2004; Podolsky et

al., 2016; Rock et al., 2016; Snyder & Dillow, 2013; Sutchter et al., 2016; Van den Bogert et al., 2014). Higher education institutions and school-based PD also could align simulated experience with targeted instructional practices to ensure novice teachers are more successful from the beginning and subsequently potentially aid in the reduction of teacher attrition (Simpson et al., 2011).

Master's level training and school-based PD for expert teachers could be beneficial to tailor simulated experiences to their specific jobs to ensure direct support in their roles focused on increasing student learning outcomes. Ericsson (2014) notes the field does not provide specific instruction for teaching students with disabilities, especially ASD. From this pilot study, the researcher recommends the following behaviors be considered for further observation, development and reflection by the field for pre-service teachers and consideration as to how these skills might be enhanced for practicing teachers embedded in their practice.

1. Increasing the experience and exposure to different classrooms,
2. Explicitly teaching deliberate practices,
3. Incorporating UDL into courses,
4. Provide TLE opportunities to practice:
 - a. High Leverage Practices
 - b. High Leverage Practices in Special Education
 - c. High Leverage Simulator Practices

Experience

A recurring theme in past and this current research study is the need for novice teachers to have experiences with students with disabilities, particularly ASD (Ergül et

al., 2013; Simpson et al., 2011). As noted by the novices in this study, preparation programs may not provide enough exposure for both education majors in working with students with ASD. With the rising prevalence of students with ASD, all pre-service teachers need to gain this experience, before they enter a “real” classroom. The researcher suggests incorporating the TLE inclusive classroom simulation into undergraduate courses inclusive of students with ASD, as well as field work experiences as follow-up to this simulated experience. In this way, TLE can be used to provide an initial safe environment for pre-service teachers to practice skills, make mistakes, reflect, gain feedback and try again without harming real students prior to their first “real” experience with students with disabilities.

Following repeated practice in the simulator and/ or in conjunction with a controlled environment, faculty members in higher education teacher preparation may want to provide additional real world experiences for pre-service teachers. Providing community-based opportunities to put into practice skills learned in their classes and in a simulated environment could benefit the pre-service teacher in generalizing information into “real” classroom practices. Providing multiple and diverse opportunities for all pre-service teachers is crucial in broadening the learning and generalization of novice teachers to bridge the gap from theory to practice.

Deliberate Practices

Pre-service teachers need opportunities to deliberately practice skills. Students with the greatest needs receive instruction by these novice teachers (Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2008; McLeskey & Brownell, 2015). If teachers feel more prepared, they might stay in the field for longer than 3-5 years (Haynes et al., 2014;

Podolsky et al., 2016; Sutchter et al., 2016). Helping teachers learn to minimize problem behaviors with proactive strategies—choices, clear expectations, and positive reinforcement (Daly et al., n.d.)—may assist in teacher retention and help teachers work effectively with students with ASD. Additionally, novices need to practice and improve upon explicit instruction; explaining and modeling are superfluous skills. Practicing these skills in a simulated environment could strengthen these skills prior to entering a “real” classroom. Teacher education programs could use targeted skills for preservice teachers to reflect upon the level of competency of their graduates related to working with students with ASD.

A Voice For Students

The TeachLivE™ observation tool data show that pre-service teachers were not allowing the students with disabilities to have a voice in the simulated classroom. Their ability to provide a voice or choices to Martin, the avatar with ASD, simply did not occur. Pre-service teachers may need to work on providing wait time and opportunities to respond, no matter the student’s ability level, thereby offering a voice to students with ASD. Teacher preparation programs may want to implement teaching preservice teachers the skill of scaffolding their questions to better engage students with ASD in classroom discussions. Allowing pre-service teachers to practice scaffolding questions and increasing student voice and engagement in a simulated environment needs further research and exploration with students with ASD, but is an interesting area to consider for the use of simulation.

Expert Teachers

Expert teachers still need ongoing professional development to review EBPs and retool their skills with new content or new groups of students, such as students with ASD. As noted by Berliner (1994), expert teachers often work at a level of automaticity and may fall into the habit of teaching a skill in a certain way that may or may not align with EBPs. Teachers noted that professional development often does not contain relevant and meaningful information, and therefore, can be a waste of time and effort, causing teachers to leave the field (Emery & Vandenberg, 2010). A simulated professional development model provides embedded practices that is personalized. From this pilot study, the researcher suggests meaningful professional developments in simulated environments for expert teachers be considered in the following areas: (a) Continued Deliberate Practices and (b) explicit instruction.

Continuing Deliberate Practices

Explicit Instruction

The researcher suggests providing in-service teachers professional development that will instruct, inform, and provide practice for implementation of explicit instruction. The expert teachers observed in the simulator failed to demonstrate explicit instruction in the simulated class within the seven minutes of instruction. Explicit instruction was determined by the experts in the Delphi study as one of the highest ranked practices when working with students with. Teachers could practice refining this skill in a safe environment like the TLE simulated classroom for multiple practice and reflections.

Explaining and Modeling

While expert teachers did explain and model in the simulated classroom, this skill could be improved upon and maintained. Practicing such skills in a variety of classrooms under an array of circumstances, is possible in simulation and could lead to expert teachers changing their practices as noted in past research in TLE (Hynes et al., 2016; Straub et al., 2015)

Recommendations for Future Research

This research, through a Delphi study and observations of expert and novice teachers, creates a foundation for future research in the field of teacher preparation for students with ASD in secondary settings embedded in simulated experiences.

Researchers in the field of special education should consider the following areas to address to expand upon this exploratory study:

1. Due to the small sample size, researchers should increase expert participants and focus on expert teachers' behaviors in an inclusive simulated classroom.
2. Examine teachers in their real classroom environments along with the simulated environment to determine if teachers exhibit and generalize the same skills across settings.
3. Create missing micro-credentials for all HLSP for use by both expert and novice teachers.
4. Focus on improving pre-service pedagogical skills; researchers could expand this work by focusing on the HLSP identified with pre-service teachers in their courses. Using a simulator like TLE to provide pre-service teachers practice within these HLP is an important next step and then to follow these

teachers into practice to see if these skills transfer into their first year of teaching.

5. Additional observations need to occur with expert and novice teachers in the TLE simulator for longer period of time. Providing 10-minute sessions could allow for demonstration of additional high leverage simulator practices or more repeated sessions might also be beneficial to observe.

The researcher in this study contributed to the literature on secondary inclusive practices specific to students with ASD by identifying from experts in the field 11 HLSP. This researcher also produced a pilot study to examine the teaching behaviors of expert and novice teachers providing a beginning research base for future discussion and expanded research to determine the preparation of expert and novice teachers in simulated inclusive settings for students with ASD.

As the prevalence of ASD continues to rise, teachers need to be better prepared for working with students with ASD. Retaining teachers in the field is important for all stakeholders, especially students. Giving pre-service and practicing teachers the experience and proper professional development in working with a range of learners, including the increased prevalence of students with ASD, could make a difference in both the longevity of teachers' careers and, most importantly, the learning gains of their students.

Conclusion

In this study, the researcher conducted an exploratory phenomenological research study to identify the best practices perceived by the field for supporting secondary

students with ASD, and explored the pedagogical skills used by master and novice teachers to teach students with ASD in an inclusive secondary simulated classroom. As noted in the literature, schools expect special and general education teachers to be prepared to teach a variety of students in the classroom, including students with ASD. One specific challenge is the current preparation of teachers qualified to work with students with ASD. Researchers suggest teachers lack adequate preparation and are in need of additional and targeted knowledge, skills, and practices to ensure students with ASD reach their educational potential (Busby et al., 2012; Coleman, 2000; Kaufman & Ireland, 2016; Loiacono & Valenti, 2010; Martin & Mulvihill, 2016; National Research Council, 2004). Additionally, the percentage of students diagnosed with ASD being included in general education classrooms, served by teachers not prepared for meeting their needs, is on the rise (Loiacono & Valenti, 2010). Teachers cited they are unprepared for the range of learners they are expected to instruct and lack clear toolkits to address the needs of their students with ASD (Boe et al., 2008; Brunsting et al., 2014; Coleman, 2000; Emery & Vandenberg, 2010; Martin & Mulvihill, 2016). Due to the lack of preparedness and professional development, an estimated 40-50% of new teachers leave the teaching profession after only five years (Emery & Vandenberg, 2010; Haynes et al., 2014).

This study revealed, through a Delphi study, 11 HLSP to be considered for use in an inclusive secondary simulated environment. The pilot component of this study explained how these practices were exhibited by expert and novice teachers. This pilot exposed potential gaps in the list of behaviors created and potential points of discussion in teacher preparation as a foundation for further research and discussion in the field of

special education. While the results from this pilot cannot be generalized at this time, additional research is warranted to take a deeper look at expert and novice teachers in ensuring the success of students with ASD in inclusive secondary settings.

APPENDIX A
HIGH LEVERAGE SIMULATOR PRACTICES OBSERVATION
FRAMEWORK

Tag	Strategy	Definition
Explicit In	1. Use Explicit Instruction	Instructional approach in which teachers clearly identify the expectations for learning, highlight important details of the concept or skill, offer precise instruction, and connect new learning to earlier lessons and materials. (McLeskey et al., 2017)
EBPS	2. Instructional methods are grounded in evidenced-based practices	Evidenced-based practices defined as those that have empirical evidence of efficacy. (see EPB sheet below). (Daly et al., n.d.)
Sys Design Inst	3. Systematically design instruction toward a specific learning goal	Sequence lessons that build on each other and make connections explicit, in both planning and delivery. <i>Will not be seen in this simulation experience</i> (McLeskey et al., 2017)
Explaining & Modeling	4. Explaining and modeling content, practices, and strategies	Depending on the topic and the instructional purpose, teachers might rely on simple verbal explanations, sometimes with accompanying examples or representation...Modeling includes verbal explanations, but also thinking aloud and demonstrating improved reading comprehension, teachers might choose a more elaborate kind of explanation that we are calling “modeling.” Modeling includes verbal explanation, but also thinking aloud and demonstrating. (Teachingworks, 2017)
Behavior Min.	5. Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement	Giving one or more clear choices to redirect the student’s behavior, providing clear expectations of what behavior the teacher wanted the student to do, and/or providing positive reinforcement directly after a desired behavior occurred, or sporadically to encourage the desired behavior to continue. (Daly et al., n.d.)
Maintain & Gen	6. Teach students to maintain and generalize new learning across time and settings	Using numerous examples in designing and delivering instruction...using schedules of reinforcement, providing frequent material reviews, and teaching skills that are reinforced by the natural environment beyond the classroom. (McLeskey et al., 2017)

Tag	Strategy	Definition
Support learning and indep	7. Teach cognitive and metacognitive strategies to support learning and independence (Use and explicitly teach strategies to support learning and independence)	Teachers explicitly teach cognitive and metacognitive processing strategies to support memory, attention, and self-regulation of learning. (McLeskey et al., 2017)
Formal Assess	8. Selecting and designing formal assessment of student learning	Effective summative assessments provide teachers with rich information about what students have learned and where they are struggling in relation to specific learning goals. In composing and selecting assessments, teachers consider validity, fairness, and efficiency. Effective summative assessments provide both students and teachers with useful information and help teachers evaluate and design further instruction. (Teachingworks, 2017)
Chk St Understanding	9. Checking student understanding during and at the conclusion of lessons	Teachers use a variety of informal but deliberate methods to assess what students are learning during and between lessons. These frequent checks provide information about students' current level of competence and help the teacher adjust instruction during a single lesson or from one lesson to the next. They may include, for example, simple questioning, short performance tasks, or journal or notebook entries. (Teachingworks, 2017)
Analyze Instr	10. Analyze instruction for the purpose of improving it	Learning to teach is an ongoing process that requires regular analysis of instruction and its effectiveness. Teachers study their own teaching and that of their colleagues in order to improve their understanding of the complex interactions between teachers, students, and content, and of the impact of particular instructional approaches. Analyzing instruction may take place individually or collectively and involves identifying salient features of the instruction and

Tag	Strategy	Definition
Intensive Inst	11. Provide intensive instruction	making reasoned hypotheses for how to improve. (Teachingworks, 2017) Teachers match the intensity of instruction to the intensity of the students learning and behavioral challenges. Involves working with students with similar needs on a small number of high priority, clearly defined skills or concepts critical to academic success. <i>May not be seen in this simulation.</i> (McLeskey et al., 2017)

Evidenced Based Practice	Definition
Antecedent – based interventions	Arrangement of events or circumstances that precede the occurrence of an interfering behavior.
Cognitive behavior intervention	Construction management for control of cognitive processes that lead to changes in overt behavior.
Differential reinforcement of other behaviors	Provisions of positive/desirable consequences for behaviors for their actions that reduce the occurrence of an undesirable behavior. Reinforcement provided: a) when the learner engages in a specific desired behavior other than the inappropriate behavior (DRA), b) when the learner engages in a behavior he or she is physically unable to do well while engaging in the inappropriate behavior (DRI), c) when the learner is not engaging in the interfering behavior (DRO).
Discrete trial training	Instructional process usually involving one teacher/service provider and one student/client, designed to teach appropriate behavior or skills. Instruction usually involves masses trials. Each trial consists of the teacher’s instruction/presentation, the child’s response, a carefully planned consequence, and a pause prior to the next instruction.
Exercise	Increase in physical exertion as a means of reducing problem behaviors.
Extinction	Withdrawal for removal of reinforcements of interfering behavior in order to reduce the occurrence of that behavior. Although sometimes used as a single intervention practice, extinction often occurs in combination with functional behavior assessment, functional communication training, and differential reinforcement.

Evidenced Based Practice	Definition
Functional behavior assessment	Systematic collection of information about interfering behavior designed to identify functional contingencies that support behavior. FBA consists of describing the interfering for problem behavior, identifying antecedents or consequent events that control the behavior, developing a hypothesis of the function of behavior and/or for testing the hypothesis.
Functional communication training	Replacement of interfering behavior with more appropriate communication that accomplishes the same function. FCT usually includes A, DRA, and/ or EX.
Modeling	Demonstration of a desired target behavior that results in imitation of behavior by the learner and the acquisition of the imitative behavior. This EBP is often combined with other strategies such as prompting in reinforcement.
Naturalistic Intervention	Intervention strategies that occurred within a typical setting/activity/routine of the learner. Teachers/service providers establish the learner’s interest in the event through its arrangement, provide necessary support for the learner to engage in the targeted behavior, elaborate on the behavior when it occurs, and/or arrange natural consequences for the targeted behavior or skills.
Parent – Implemented Intervention	Parents provide individual intervention necessary for their child to improve/increase a wide variety of skills and/or to reduce interfering behaviors. Parents learn to deliver interventions in their homes and/or community through a structured parent training program.
PECS	Learners are initially taught to give a picture of a desired item to partners in exchange for desired item. PECS consists of six phases: (1) “ how” to communicate, (2) distance and persistence, (3) picture discrimination, (4) sentence structure, (5) responsive requesting, and (6) commenting.
Peer-Mediated Instruction in Intervention	Typically developing peers interact with and/or help children and youth with ASD to acquire new behavior, communication, and social skills by increasing social and learning opportunities within natural environments. Teachers/service providers systematically teach peers strategies for engaging children with ASD in positive and extended social interactions in both teacher-directed and learner–initiated activities.
Pivotal Response Training	Pivotal learning variables (i.e., motivation, responding to multiple cues, self-management, and self-initiation), guided intervention practices implemented in settings that build on learner interest and initiative.

Evidenced Based Practice	Definition
Prompting	Verbal, gestural, or physical assistance to help learners acquire or engaging in a targeted behavior or skill. Prompts are generally given by an adult or peer before or during the learner’s attempt to use the skill.
Reinforcement	An event, activity, or other circumstance occurring after a learner in engages any desired behavior, leading to the increased occurrence of said behavior in the future.
Response Interruption/Redirection	Introduction of a prompt, comment, or other distractors and interfering behavior, designed to divert the learner’s attention away from the interfering behavior and resulting in its reduction.
Scripting	A verbal and/or written description about a specific skill or situation that serves as a model for the learner. Scripts are usually practiced repeatedly before the skill is used in the actual situation.
Self-Management	Instruction focused on discriminating between appropriate and inappropriate behaviors, and learners accurately monitoring and recording their own behaviors and rewarding themselves for behaving appropriately.
Social Narrative	Narratives that describe social situations in some detail by highlighting relevant cues and offering examples of appropriate responses. Social narratives are individualized according to learner needs and are typically quite short, perhaps including pictures or other visuals aids.
Social Skills Training	Group or individual instruction designed to teach learners with autism spectrum disorders (ASD) ways to appropriately interact with peers, adults, and other individuals. Most social skill meetings included instruction on basic concepts, role-playing or practice, and feedback to help learners with ASD acquire and practice communication, play, or social skills to promote positive interactions with peers.
Structured Play Group	Small group activities characterized by their occurrences in a defined area with a defined activity; specific selection of typically developing peers to be in the group; a clear delineation of theme and roles by adult leading, prompting, or scaffolding as needed to support students’ attainment of the activity’s goals.
Task Analysis	A process in which an activity or behavior is divided into small, manageable steps in order to assess and teach the skill. Other practices, such as reinforcement, video modeling, or time delay, are often used to facilitate acquisition of the smaller steps.

Evidenced Based Practice	Definition
Technology – Aided instruction and intervention	Instruction or interventions in which technology is the central feature supporting the acquisition of a goal for the learner. Technology is defined as “any electronic item/equipment/application/ or virtual network used intentionally to increase/maintain and/or improve daily living, work/productivity, and recreation/leisure capabilities of adolescents with autism spectrum disorders
Time Delay	In a setting or activity in which a learner should engage any behavior or skill, a brief delay occurs between the opportunity to use the skills and any additional instructions or prompts. The purpose of the time delay is to allow the learner to respond without having to receive a prompt and thus focus on fading the use of prompts during instructional activities.
Video Modeling	A visual model of the targeted behavior or skill (typically in the behavior, communication, play, or social domains), provided via video recording and display equipment to assist a desired behavior or skill.
Visual Support	Any visual display that supports the learner engaging in a desired behavior or skills independent of prompts. Examples of visual supports include pictures, written words, objects within the environment, arrangement of the environment or visual boundaries, schedules, maps, labels, organization systems, and timelines.

APPENDIX B
PEDAGOGICAL INSTRUCTIONAL PRACTICES CROSSWALK

Special Education

Draft of High leverage practices for Special Education

Identify and prioritize long- and short-term student learning goals

Systematically design instruction toward a specific learning goal

Adapt curriculum task and materials for specific learning goals

Use and explicitly teach strategies to support learning and independence

Prototypical Features of Experts

Extensive pedagogical content knowledge including subject matter

Better problem solving skills

Better adaptation and modification of goals for diverse learners based on the for individualization

Better decision making

More challenging objectives

Better classroom environment

Better perception of classroom events

Greater sensitivity to context

Better monitoring of learning and providing feedback

More frequent testing of hypotheses

High leverage Practices

Greater respect for students

Display of passion for teaching

Leading a group discussion

Explaining and modeling content, practices, and processes

Soliciting and interpreting individual students' thinking

Diagnosing particular common patterns of student thinking and assessment

Implementing norms and routines for classroom discourse and work

Coordinating and adjusting instruction during a lesson

Specifying and reinforcing productive student behavior

Implementing organizational routines

Setting up and managing small group work

Building respectful relationships with students

Talking about a student with parents or other caregivers

Learning about students' cultural, religious, family, intellectual and personal experiences into processes for students

Setting long – and short– term learning goals for

Designing single lessons and sequences of lessons

Checking student understanding during and at the conclusion of lessons

Selecting and designing formal assessment of student learning

Interpreting the results of student work including routine assessments, quizzes, tests, and standardized

Providing oral and written feedback to students

Analyzing instruction for the purpose of improving it

General Education

Quality Indicators for Classrooms Serving Students	Scaffold instruction	X	X	X		X			X			X			X	X				
	Use explicit instruction	X			X			X			X				X		X			
	Use flexible grouping		X		X	X	X			X	X		X	X						
	Use strategies to promote active student engagement	X	X			X		X	X	X	X						X			
	Use assistive and instructional technologies				X															
	Teach students to maintain and generalize new learning across time and settings	X		X				X									X			
	Provide intensive instruction	X				X			X			X					X			
	Analyze instruction for the purpose of improving it	X	X	X	X				X							X		X	X	
	Instruction is systematic and based on learner characteristics, interests, and ongoing assessments	X		X	X					X	X				X			X	X	X
	Students remain actively engaged learning opportunities throughout observation, with no more than two minutes down time.	X	X			X				X	X			X						X
	During five-minute observation, staff interacts				X		X	X	X						X					X

with each student at least once to teach or promote learning. Excluding students who are engaged in independent work. Instructional pace promotes high rates of correct responding, correct responses, are reinforced or promoting/err or correction is provided as needed. Skills are taught in the context of naturally occurring activities and daily routines. There is no down time for teaching. Communication directed to students is clear, relevant appropriate to language ability, and grammatically correct. Communication directed to students presents opportunities for dialogue (rather than

X

X

X

X

X

X

X

X

X

X

X

X

X

X

X

X

X

being largely directive). Communication directed to students consists of largely instructive/positive comments in comparison to corrective comments. Behavior problems are minimized by using proactive strategies including choices, clear expectations, and positive reinforcement.
Instructional methods are grounded in evidenced-based practices. Staff created opportunities for spontaneous use of communication skills including student-to-student interactions. Students without verbal communication have AAC and actively use across activities. Technologies are employed to support

			X		X	X			X			X	
X	X	X		X	X		X			X	X		
X		X	X					X				X	
							X			X			
								X					
									X				
			X			X	X				X	X	X

instructional
assessment,
planning, and
delivery for
individuals
with
exceptionaliti
es.

APPENDIX C
QUALITY INDICATORS FOR CLASSROOMS SERVING STUDENTS
WITH ASD (QIASD)

Quality Indicators for Classroom Serving Students with ASD (QIASD)

The *Observation Assessment for Teachers Providing Services to Students with Autism Spectrum Disorders Revised (QIASD)* was developed with the support of Project ASD, funded through the Office of Special Education Programs (OSEP). This instrument is designed to guide a classroom observer in evaluating the strength and consistency of specific indicators of quality educational programming for students with ASD. It includes quality indicators from the original *OAASD*, developed as a product of a Pepsa (Partnership for Effective Programs for Students with Autism) project by Dr. Teresa Daly (Director for the University of Central Florida Center for Autism and Related Disabilities (UCFCard) and Regina DeCatrel (Program Specialist in Autism, Seminole County School District); and subsequently revised and adopted by Florida Card Centers.

The *QIASD* reflects revisions and additions to quality indicators based on field testing of the *OAASD* and alignment with the Council for Exceptional Children (CEC) Initial Special Education Developmental Disabilities and Autism Specialty Set Standards. Seven CEC Preparation Standards to assure that professionals have mastered the specialized skills for safe and effective practice are addressed. The specialty sets capture the professional knowledge base, including empirical research, disciplined inquiry, informed theory, and the wisdom of practice for their area of expertise for each proposed knowledge and skill (CEC, 2010).

The *QIASD* consists of 52 quality indicators aligned with the seven CEC standards: (a) learner development and individual learning differences (b) learning environments (c) instruction curricular content knowledge, (d) assessment, (e) instructional planning and strategies, (f) professional learning and practice, and (g) collaboration. Each indicator is given a score of 0-4 or NA. Quality indicators received a 0 if unsatisfactory; 1 if developing; 2 if needs improvement; 3 if effective; 4 if highly effective; and NA if there was not an opportunity to observe quality indicator during the one hour observation.

A 13-item interview protocol was developed for the *QIASD* to ensure all items may be accurately and consistently scored across project staff, as observers may not have an opportunity to observe all indicators/items while in the classroom (e.g., family training sessions; family involvement in IEP meetings).

Observation Assessment for Teachers Providing Services to Students with Autism Spectrum Disorders Revised

Classroom/Teacher: _____ Administrator/Observer: _____
 Date/Time: _____ School District: _____
 School Name: _____ Grade Level of Students: _____
 Activities Observed: _____ Service Delivery Model: _____
 Number of Students Present: _____ Number of Staff Present: _____

Scoring: On scale of 0-4, to what degree is this indicator present?

- 4: Highly Effective (Very Much Present)
- 3: Effective (Present)
- 2: Needs Improvement (Somewhat Present)
- 1: Developing (Very Limited Presence)
- 0: Unsatisfactory (Not Present)
- NA: Unrated

Data Collection Method(s)

- DO: Direct Observation
- I: Interview
- A: Artifact

LEARNER DEVELOPMENT AND INDIVIDUAL LEARNING DIFFERENCES		
<i>CEC 1.0- Beginning special education professionals understand how exceptionalities may interact with development and learning and use this knowledge to provide meaningful and challenging learning experiences for individuals with exceptionalities.</i>		
Quality Classroom Indicator:	Rating	Comments
a. Instruction is individualized and based on learner characteristics, interests, and ongoing assessment.		
b. Schedules reflect a variety of learning formats for each student, including 1:1 instruction, small group, large group, independent work, and social interaction/leisure options.		
c. Instruction incorporates natural and individualized reinforcers.		
d. Students with slow rates of learning are provided intensive levels of instruction, including daily one-on-one instruction sessions.		
e. All adults have knowledge/access to IEP objectives being worked on for each student. Staff can respond with specifics to the question, "What is student working on?"		Interview/Artifact
f. IEP goals and objectives are embedded within daily activities and routines throughout the day to promote maintenance and generalization.		Interview/Artifact

LEARNING ENVIRONMENTS		
<i>CEC 2.0- Beginning special education professionals create safe, inclusive, culturally responsive learning environments so that individuals with exceptionalities become active and effective learners and develop emotional well-being, positive social interactions, and self-determination.</i>		
Quality Classroom Indicator:	Rating	Comments
a. Room arrangement has clearly defined visual boundaries for specific activities.		
b. Room arrangement allows for supervision of all students at all times; and prevents or minimizes problem behaviors.		
c. Staff ratio of 1 adult for every 3 students is maintained during (at least 75%) observation. Allow greater ratio if the students are included for part of the day and are not on access points.		
d. A daily classroom schedule is posted at student level, is visible and appropriate for students' level of symbolic functioning, and is used throughout the day. Schedule indicates what activity is current.		
e. Individual schedules are posted at child level and are being used correctly. Schedule is referred to for each activity, sequence of activities is adhered to unless change is noted. Student is engaged in using schedule.		
f. Transitions are supported by routines, environmental arrangement and scheduling.		
g. Visual supports are at the correct level of symbolic functioning, and are used to enhance predictability, facilitate transitions, and help convey expectations.		
h. Instructional materials and furniture are age appropriate.		
i. Classroom materials are well organized (i.e. labeled, conveniently located, and stored when not in use).		
j. Individual workstations, when present, are arranged left-right or top-bottom, and tell how much work, what work, when finished, and what's next. Workstation materials are varied from day to day and are educationally/functionally relevant.		
k. The teacher can provide examples of opportunities for meaningful interaction and friendships with peers without disabilities.		Interview/Artifact
CURRICULAR CONTENT KNOWLEDGE		
<i>CEC 3.0- Beginning special education professionals use knowledge of general and specialized curricula to individualize learning for individuals with exceptionalities.</i>		
Quality Classroom Indicator:	Rating	Comments
a. Schedule and activities reflect distribution of curriculum across multiple domains that is appropriate for the age, level and individual needs of students in the classroom.		

b. Curriculum/activities address and are aligned with appropriate grade level general education curriculum and standards.		
c. Curriculum/activities address social communication skills (i.e. pragmatics, conversation, perspective taking) with adults and peers.		
d. Curriculum/activities address functional communication (avoid/repair miscommunications) for all students.		
e. Curriculum/activities address functional life skills and adaptive behavior to maximize independent functioning in school, home, vocational, and community settings.		
f. Specialized instruction to enhance social participation across environments is provided. If social skills instruction is infused, there is evidence of planning and evaluation.		
g. Curriculum/activities address self-regulation and self-monitoring.		
ASSESSMENT		
<i>4.0- Beginning special education professionals use multiple methods of assessment and data-sources in making educational decisions.</i>		
Quality Classroom Indicator:	Rating	Comments
a. Written data are gathered consistently and frequently (daily or weekly) to track progress on IEP goals and objectives.		Interview/Artifact
b. Assessment tools and methods are selected, adapted and used to accommodate the abilities and needs of individuals with developmental disabilities/autism spectrum disorders.		Interview/Artifact
c. Data are collected for monitoring and analyzing challenging behavior and its communicative intent.		Interview/Artifact
d. Students displaying behavioral difficulties have an individualized behavior plan that is being implemented or have been referred for a Functional Behavior Assessment (FBA).		Interview/Artifact
INSTRUCTIONAL PLANNING AND STRATEGIES		
<i>5.0- Beginning special education professionals select, adapt, and use a repertoire of evidence-based instructional strategies to advance learning of individuals with exceptionalities.</i>		
Quality Classroom Indicator:	Rating	Comments
a. Instruction is systematic and based on learner characteristics, interests, and ongoing assessment.		
b. Students remain actively engaged in learning opportunities throughout observation, with no more than 2 minutes down time.		

c. During five minute observation, staff interacts with each student at least once to teach or promote learning. Excluding students who are engaged in independent work.		
d. Instructional pace promotes high rates of correct responding, correct responses are reinforced or prompting/error correction is provided as needed.		
e. Skills are taught in the context of naturally occurring activities and daily routines. There is no down time for teaching.		
f. Communication directed to students is clear, relevant, appropriate to language ability, and grammatically correct.		
g. Communication directed to students presents opportunities for dialogue (rather than being largely directive).		
h. Communication directed to students consists of largely instructive/positive comments in comparison to corrective comments.		
i. Behavior problems are minimized by using proactive strategies including choices, clear expectations and positive reinforcement.		
j. Instructional methods are grounded in evidence-based practices.		
k. Staff create opportunities for spontaneous use of communication skills including student-to-student interactions.		
l. Students without verbal communication have AAC and actively use across activities.		
m. Technologies are employed to support instructional assessment, planning, and delivery for individuals with exceptionalities.		
PROFESSIONAL LEARNING AND PRACTICE		
<i>6.0- Beginning special education professionals use foundational knowledge of the field and the their professional Ethical Principles and Practice Standards to inform special education practice, to engage in lifelong learning, and to advance the profession.</i>		
Quality Classroom Indicator:	Rating	Comments
a. "Hands-on" contact with students promotes independence and preserves dignity.		
b. Inter-staff communication is respectful of students and limited in content to classroom issues and instruction. Confidentiality of students is preserved.		
c. Restrictive procedures employed are supported by a Functional Behavior Assessment and Behavior Intervention Plan.		Interview/Artifact
COLLABORATION		

7.0- Beginning special education professionals collaborate with families, other educators, related service providers, individuals with exceptionalities, and personnel from community agencies in culturally responsive ways to address the needs of individuals with exceptionalities across a range of learning experiences.		
Quality Classroom Indicator:	Rating	Comments
a. A staff schedule showing staff and student assignments, locations, and activities, is prominently posted and being followed.		
b. All classroom staff is involved in delivering instruction, including during out-of-classroom activities (lunch, recess, CBI).		
c. There is a consistent system in place for regular (daily/weekly), informative and positive communication with families regarding student participation, progress and concerns.		Interview/Artifact
d. Two-way communication is encouraged by soliciting information and questions from families.		Interview/Artifact
e. A variety of opportunities for family involvement are provided (classroom activities, information sharing, and parent training).		Interview/Artifact
f. Teacher collaborates with team members to plan transition to adulthood that encourages full community participation.		Interview/Artifact
g. Teacher collaborates with school personnel and community members in integrating students with ASD in various settings.		Interview/Artifact

Notes:

1. QIASD is based on the original OAASD, developed by Dr. Teresa Daly (UCFCARD) and Regina DeCatrel (Program Specialist in Autism, Seminole County School District). It was field tested and revised by Dr. Cynthia Pearl (Co-principal Investigator for Project ASD, University of Central Florida) and Jillian Gourwitz (Doctoral Candidate, Exceptional Student Education)
2. CEC Special Educator Preparation Standards- NCATE approved November 2012
3. DDA_S_ = CEC Special Education Developmental Disabilities and Autism Specialty Skill Set _Draft

APPENDIX D
INSTITUTIONAL REVIEW BOARD CONSENT



University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Taylor Bousfield**
Date: **November 17, 2016**

Dear Researcher:

On 11/17/2016 the IRB approved the following human participant research until 11/16/2017 inclusive:

Type of Review: UCF Initial Review Submission Form
Expedited Review
Project Title: AN EXAMINATION OF NOVICE AND EXPERT
TEACHERS' PEDAGOGY IN A SIMULATED INCLUSIVE
SECONDARY CLASSROOM INCLUDING A STUDENT
WITH AUTISM SPECTRUM DISORDERS
Investigator: Taylor Bousfield
IRB Number: SBE-16-12671
Funding Agency:
Grant Title:
Research ID: NA

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30 days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at <https://iris.research.ucf.edu>.

If continuing review approval is not granted before the expiration date of 11/16/2017, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of five years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the [Investigator Manual](#).

A handwritten signature in black ink, appearing to read "Nephia F. Dizon". The signature is fluid and cursive, with a large initial "N" and "D".

IRB Chair

APPENDIX E
MARTIN CHARACTER DEVELOPMENT

Martin Williamson Age 19



Martin's Personality Profile

- Aggressive Dependent – Peer focused
- Empathetic towards others, attempts to cheer or help those who are feeling bad.
- Easily distracted
- Enjoys praise

Martin's Academic Profile

- Math skills at 1st – 2nd grade range – simple adding and subtracting
- Can only follow single step instructions
- Language comprehension at 7th grade level – has difficult with academic vocabulary (example: compare and contrast)
- Ignoring Martin in class can lead him to exhibit increased behaviors out of boredom.

Martin's Key Facts

- Sister Kaley (16 yrs) attends a different high school
- Brother Matthew (13 yrs)
- Lives with mom and dad
- Loves sports, especially Baseball, Basketball, Football, and Wrestling
- On the wrestling team. Favorite professional wrestler is John Cena
- Likes action TV and movies (Transformers, Marvel movies, Agents of Shield, etc.)
- Likes humorous books like Diary of a Wimpy Kid (5th – 6th grade reading level)
- Tends to avoid eye contact with others

Martin's Vocal Profile

Catch Phrases	You're funny. That's alright. You know it. I'm sorry. Oh that's right
Vocal Qualities	Echolalia – repeats words spoken by others Often repeats a sound or phrase several times <ul style="list-style-type: none"> • Example: well..well..well • Example: oh..oh..oh When answering, maintains some continuous vocalization When the teacher is correcting an answer, may repeat "I'm sorry" several times
Energy / Pace	Sociable High energy

Martin High School Behavior Guidelines

Level	Description	Specifics for Bailey	Specifics for Martin
0	Demo mode. No classroom misbehavior. Goal is to provide a confidence building experience for any participant.	CJ will help Bailey answer and teachers interpret Bailey if teacher communications are unclear	Martin may walk away from his desk or tap. Sean can redirect Martin if the teacher has difficulty.
1	Mild misbehavior. Distraction, fidgeting, inattention, and off-task conversation when appropriate. Students are easily refocused by the teacher. Low frequency of behavior occurrence.	CJ will intercede and help Bailey refocus if she is getting frustrated.	Sean can help redirect Martin if the teacher has difficulty.
2	Mild/average misbehavior. All behaviors seen in level 1, as well as mild resistance from some students to following teacher instructions. Questioning of the necessity of assignments and utility of the lesson from students. Students are still easily refocused by the teacher. Low frequency of behavior occurrence.	CJ will advocate for Bailey and comfort her if teacher actions are inappropriate, but will not correct the issue.	Sean will be too helpful, answering for Martin.
3	Average misbehavior. All behaviors seen in previous levels as well as increased resistance to teacher instruction from some students. Students may choose not to participate in activities if the teacher fails to address motivational factors. Students will comply with teacher instructions only if teachers attempt address student needs in an appropriate way. While students may maintain resistance, behavior will not escalate to profanity or bullying. Average frequency of behavior occurrence.	If Bailey becomes frustrated or upset, CJ will comfort Bailey and criticize the teacher under her breath.	Sean will express mild annoyance with Martin's behavior. Maria will be willing to work with Martin.
4	Moderate misbehavior. All behaviors seen in previous levels as well as students bullying other students in the classroom. Profanity may be used. Students will comply with teacher instructions only if teachers address student needs successfully. High frequency of behavior occurrence.	If Bailey becomes frustrated or upset, CJ will attack the teacher on Bailey's behalf.	Sean will insist that the teacher stop Martin's distracting behavior.
5	Intense misbehavior. All behaviors seen in previous levels as well as personal attacks on the teacher. Students will comply with teacher instructions only if teachers address student needs successfully and in a way that allows the student to save face. Constant frequency of behavior occurrence.	CJ's attacks on Bailey's behalf will escalate.	Sean will complain about having to be in a class with Martin.

APPENDIX F
NATIONAL INSTITUTE OF HEALTH TECHNOLOGY LESSON PLAN

What Is Technology?

Lesson 1
Engage
Explore
Explain

Overview

This lesson consists of two activities linked by classroom discussion. Its purpose is to engage students in the general topic of technology. The first activity involves classroom discussion and a short scenario to allow students to develop a sense of what technology is and to dispel the notion that technology relates mostly to computers. The second activity introduces students to the concept of scale by using the classroom to represent a cell and other smaller objects to represent subcellular components.

At a Glance

Major Concepts

Technology is a body of knowledge used to create tools, develop skills, and extract or collect materials. It is also the application of science (the combination of the scientific method and material) to meet an objective or solve a problem. Scale is a way to represent the relationship between the actual size of an object and how that size is characterized, either numerically or visually.

Objectives

After completing this lesson, students will

- be able to explain what technology is,
- recognize that human intervention is the common bond among technologies, and
- describe the use of scale to distinguish between objects of different size.

Teacher Background

See the following sections in Information about Using Technology to Study Cellular and Molecular Biology:

- 1 Introduction (page 23)
- 2 Major Preconceptions (pages 23–24)
- 3.1 Scale (pages 24–25)

In Advance **Web-Based Activities**

Activity	Web Version
1	No
2	No

Photocopies

Activity 1	none
Activity 2	Master 1.1, <i>Searching for Scale</i> , 1 copy per student

Materials

Activity 1	none needed
Activity 2	<ul style="list-style-type: none"> • meter stick • rulers • objects of various sizes (see Teacher note on page 49)

Preparation

Activity 1
No preparations needed.

Activity 2
No preparations needed.

Procedure



Assessment:
This activity is designed to engage students in learning about technology and to help the teacher assess the students' prior knowledge of the subject.

Activity 1: *Technology—What's It All About?*

Tip from the field test: Activities 1 and 2 can be conducted in several ways. You can engage the class as a whole in discussion as directed. Alternatively, you can divide the class into groups of three to five students each, ask each group to consider the questions you ask, and then have each group provide its responses. It is also possible to have student groups consider only a limited number of the questions and then handle the remainder with the whole class. If you choose either of the last two approaches, you should limit the time allotted for groups to consider each question to several minutes. Field-testing indicated that no approach was superior to another.

1. Begin by asking the class, "How do you define *technology*?"

Accept all answers and write student responses on the board. Do not attempt to have students refine their definitions of technology at this point. They will revisit their definitions and refine them in

Step 5. Students, like older individuals, may harbor the preconception that technology relates mostly to computers. Through advertisements and media articles, they are familiar with the terms *information technology* and *computer technology*.

Teacher note: Asking this question requires students to call on their prior knowledge, and it engages their thinking. At this point, do not critique student responses. Appropriate teacher comments are short and positive, such as “good” and “what else?” Other appropriate teacher responses include, “Why do you believe that?” or “How do you know that?” Questions such as these allow the teacher to assess students’ current knowledge about the subject and to adjust lessons accordingly. They also provide a springboard to “Let’s find out” or “Let’s investigate.” In general, it is time to move forward when the teacher sees that thinking has been engaged.

2. Ask students, “In general, what does technology do for us?”

This question may help students understand that technology helps us solve problems, makes our lives easier, and extends our abilities to do things. Technology is used to develop skills or tools, both in our daily lives and in our occupations.

3. Focus discussion on technologies that are relevant to each student’s life. Ask students to look around the room. What technologies do they see? How do these technologies solve problems and make their lives easier?

Accept all responses and write them on the board. Students may mention any number of items. Some may be school-related, such as binders, backpacks, pens, pencils, paper, and paper clips. Other items may be more personal, such as water bottles, personal stereos, and hair clips. Students may neglect items such as shoelaces, zippers, buttons, fabric, eyeglasses or contact lenses, makeup, and bandages. Discussion should reinforce the notion that humans develop technology with a specific objective in mind. A related concept is that a given task requires the right tool or tools.

4. Pick a technology that students have mentioned. Ask them what types of knowledge were required to develop that technology.

Students may not realize that technologies are generally developed by applying knowledge from multiple disciplines. For example, producing today’s audio devices, such as a portable CD player, requires knowledge obtained from engineering, physics, mathematics, chemistry, and computer science.

5. On the basis of previous discussions, ask students to rethink and refine their definition of technology (from Step 1).

Using Technology to Study Cellular and Molecular Biology

Students should mention that technology is a way of solving problems through the application of knowledge from multiple disciplines.

6. Tell students to imagine that they live in the Stone Age. Their only garment has been ripped and requires mending. How would they do it?

Students first should recognize that the ripped garment is a problem requiring a solution. They should consider what technologies they have available. The Stone Age was a period early in the development of human cultures when tools were made of stone and bone. Clothing consisted of animal skins or fabrics woven from threads derived from plant fibers. Bones and sharp reeds were used to make needles.



Content Standard E: Technological design is driven by the need to meet human needs and solve human problems.

7. Ask students how their approach to mending the garment would change as time advanced from the Stone Age to the present. What new knowledge would allow the development of new technology?

Student responses will vary, and some students may want to jump directly from the Stone Age to the modern sewing machine. Slow them down and have them consider incremental changes in knowledge and technologies. They may cite the use of metals to fashion repair tools, like knives and finer needles. New knowledge of metals and chemistry would help here. Later advances in engineering and mechanics would lead to the development of human-run machines for assisting with repairs. Eventually, advances in physics (electricity) and engineering led to the invention of modern sewing machines. Similarly, advances in agriculture, chemistry, and engineering produced better fabrics and threads. Students should derive an understanding that technology advances through interactions among multiple disciplines. While a problem may remain basically the same over time (for instance, the need to make or repair clothing), advances in technology change how the problem is solved.

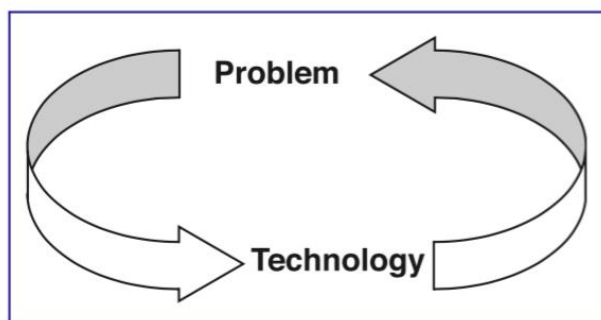


Assessment: Listening to students' responses will help you assess their understanding of the relationship between problems and technology.

8. Write the words *problem* and *technology* on the board. Ask students to use arrows to draw a graphic that represents the relationship they believe exists between a problem and the technology to solve it.

They can use arrows of any kind, and they should be prepared to defend their suggestions. The graphic should illustrate that a

problem does not drive technology unidirectionally, nor does technology exist solely in search of a problem to solve. Rather, these two areas exist to support and drive one another. Solving problems does require the development of new technologies, which can then be applied to other problems. A graphic to depict this indicates the cyclic relationship between the two:



Activity 2: Searching for Scale

1. Biological molecules are small, but how small is “small”? Ask students these two questions:
 - a. How do biological structures, such as cells, organelles, bacteria, and viruses, compare in size with one another?
 - b. How do molecules compare in size with biological structures such as cells, organelles, bacteria, and viruses?

Accept all responses and write them on the board. Students will explore these size relationships in the next steps.

2. Tell students that they will now investigate the relative sizes of different biological structures and see how close their estimates of relative size were.
3. Give each student a copy of Master 1.1, *Searching for Scale*. Work with the class to complete column 3, Size relative to cell.

The table with column 3 completed is as follows:

APPENDIX G
PARTICIPANT SELF REFLECTION QUESTIONS

Participant Self-Reflection

1. Tell me about your teaching experience in the TeachLivE™ High School Inclusive Classroom.
2. What would you say were your teaching strengths in the TeachLivE™ classroom?
3. What would you say were your strengths in working with the students with ASD in the simulator?
4. What would you want to improve the next time you were in TeachLivE™?

APPENDIX H
SIMULATION POST DIGITAL SURVEY

TeachLivE™ Session Perceptions Questionnaire

Your researcher given #:

Your Initials:

Please circle one answer for each question below.

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
I feel better prepared to teach after my TLE TeachLivE™ session.	5	4	3	2	1
Teaching in the TLE TeachLivE™ Lab is an effective way to practice new classroom skills.	5	4	3	2	1
My session seemed like a real classroom experience.	5	4	3	2	1
The TLE TeachLivE™ students seemed like real high school students.	5	4	3	2	1
After my TLE TeachLivE™ sessions, I have more confidence that I can engage students in my content area.	5	4	3	2	1
I was able to effectively manage the classroom during my TLE TeachLivE™ session.	5	4	3	2	1
I felt my instruction was delivered effectively.	5	4	3	2	1
I have more confidence after my session in my ability to manage undesired behaviors.	5	4	3	2	1
I am better prepared to teach lessons from my content area after my TLE TeachLivE™ Lab session.	5	4	3	2	1
I felt like I was in a real classroom within the first 2 minutes of the session.	5	4	3	2	1
I was prepared with a lesson plan to teach the TLE TeachLivE™ students.	5	4	3	2	1
I was prepared with appropriate educational aids (i.e. manipulatives, reading book, etc. to teach the TLE TeachLivE™ students).	5	4	3	2	1

Please turn the page to complete the questionnaire.

What classes, training, professional development, or certificates have you received to prepare you in teaching students with ASD?

Did the avatar with autism, Martin, feel like a real student with autism? Why or Why not?

Please turn the page to complete the questionnaire.

Start here.

1. Are you professionally licensed to teach?
 - Yes
 - No

2. If yes to question 1, is your professional license in special education?
 - Yes
 - No
3. If yes to question 2, what is your additional area of certification?
 - Elementary
 - Content area 6-8
 - (please specify): _____
 - Content Area 9-12
 - (please specify): _____
 - ASD graduate certificate
 - Other (please specify): _____
4. Please indicate the grade levels you have taught (check all that apply):
 - K-5
 - 6-8
 - 9-12
5. Please indicate your highest academic level (check one):
 - Bachelor's
 - Master's
 - Doctorate
6. If you have a Master's degree, in what area is your degree?
 - Not applicable
 - Education
 - Counseling
 - Educational leadership
 - Other (please specify): _____
7. How many years have you been teaching in a classroom?
 - Have not yet graduated
 - One year
 - Two years
 - Three years
 - Four years
 - Between five and ten years
 - More than ten years
8. How old are you? Please choose the range of years which matches your age:
 - 18-29 years
 - 30-39 years
 - 40-49 years
 - 50 years and above
9. What is your gender?
 - Male
 - Female

10. With which ethnicity do you self-identify? (please check all that apply)

- American Indian
- Asian
- Black
- Hispanic
- White
- Other (please describe): _____

11. Do you have a sibling or family member with a disability?

- Sibling
- Family member, other than a sibling
- None of the above

Please share any unique experiences or things you would like us to know about you related to this project.

Thank you for your time in completing this questionnaire.

APPENDIX I
LETTERS TO POTENTIAL PARTICIPANTS



Department of Child, Family
and Community Sciences

Dear Project Director,

I'm looking to recruit Model Demonstration Classroom Teachers who have been identified through Project ASD at the University of Central Florida for a study related to teacher pedagogy in an inclusive classroom. Participation will occur on campus in the TeachLive lab located in the Teaching Academy.

In the study I'm looking at the behaviors that teachers demonstrate while teaching in a simulated inclusive secondary classroom that includes a student with autism. This might be beneficial to teachers who want additional practice and experience teaching in an inclusive classroom.

I will be conducting an exploratory phenomenological research design. Every participant will have time working with the virtual avatars in UCF's TeachLive lab. To find out more about TeachLive, go to <http://teachlive.org/>

Each participant will interact with the avatars two times in one day. Completing the consent will happen prior to the start of the first session. A self-reflection will occur after each interaction and a survey will occur after the final reflection. Participants will not be needed more than 1-hour.

I can be contacted through the study e-mail address at teachliveresearcher@gmail.com

Please let me know if I can answer any questions and thank you in advance for your help.

Sincerely,

Taylor Bousfield

COLLEGE OF EDUCATION
P.O. Box 161250 • Orlando, FL 32816-1250 • (407) 823-2401 • FAX (407) 823-3859

An Equal Opportunity and Affirmative Action Institution



Department of Child, Family
and Community Sciences

Dear Educator,

I'm looking to recruit junior or senior pre-service students who have completed at least one semester of internship for a study related to teacher pedagogy in an inclusive classroom. Participation will occur on campus in the TeachLivE lab located in the Teaching Academy.

In the study I'm looking at the behaviors that teachers demonstrate while teaching in an inclusive secondary classroom that includes a student with autism. This might be beneficial to pre-service teachers who want an experience teaching in an inclusive classroom.

I will be conducting an exploratory phenomenological research design. Every participant will have time working with the virtual avatars in UCF's TeachLivE lab. To find out more about TeachLivE, go to <http://teachlive.org/>

Each participant will interact with the avatars two times in one day. Completing the consent will happen before prior to the start of the first session. A self-reflection will occur after each interaction and a survey will occur after the final reflection. Participants will not be needed more than 1-hour.

I'm attaching my recruitment flyer, I can be contacted through the information on there or also through the study e-mail address at teachliveresearcher@gmail.com

Please let me know if I can answer any questions and thank you in advance for your help.

Sincerely,

Taylor Bousfield

COLLEGE OF EDUCATION
P.O. Box 161250 • Orlando, FL 32816-1250 • (407) 823-2401 • FAX (407) 823-3859

An Equal Opportunity and Affirmative Action Institution

Are you a junior or senior who have completed
at least 1 semester of internship?



Gain an experience in an inclusive classroom

in a research study
Teaching to TeachLive™ Avatars



- Winter 2016/Spring 2017
- One 1-hour visit to the UCF Teaching Academy

For more information contact:

Taylor

Teachliveresearcher@gmail.com

APPENDIX J
DIRECTIONS FOR PARTICIPANTS IN TEACHLIVE

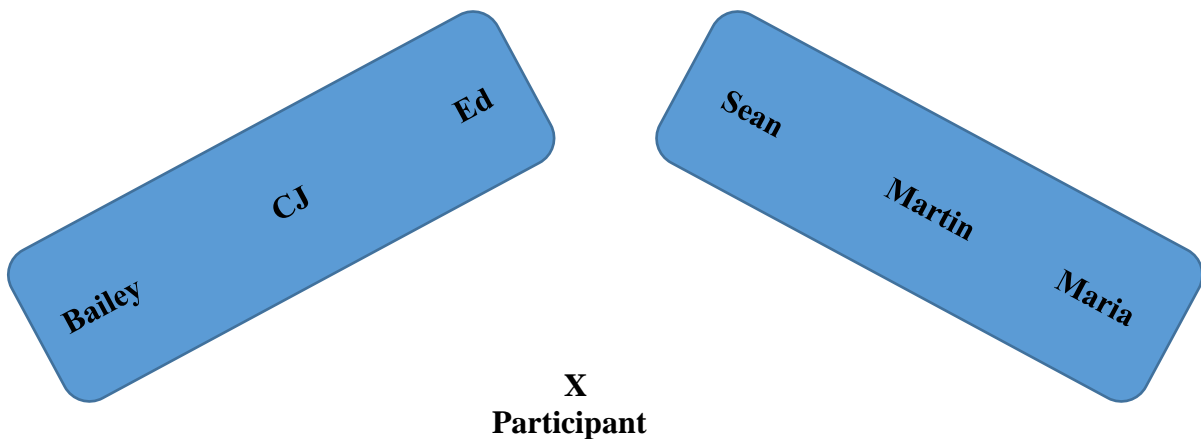
TeachLivE™ Inclusive Classroom Participant Directions

Congratulations! You have been selected to participate in TeachLivE Inclusive Classroom Research Study.

You will be teaching to an inclusive secondary classroom in the TeachLivE simulator.

Attached is the lesson that you will teach both sessions in the TeachLivE simulator. You will be teaching the National Institute of Health lesson, “What Is Technology?” Lesson One. You will focus on Activity 1: Technology-What’s It All About?

The class consists of six students, three males and three females. Two of the students have disabilities. Martin is a student with autism spectrum disorders, and Bailey is a student with intellectual disabilities. For the purpose of this research, the focus will be on Martin. Below is a seating chart for your reference.



If you should have any questions please contact me, Taylor Bousfield, at teachliveresearcher@gmail.com

Thank you for your participation!

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