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Effectiveness of a Virtual Learning Environment on Pediatric Students' Knowledge, Self-Confidence and Satisfaction with Learning Growth and Development Concepts

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EFFECTIVENESS OF A VIRTUAL LEARNING ENVIRONMENT

ON PEDIATRIC STUDENTS' KNOWLEDGE, SELF-CONFIDENCE AND SATISFACTION

WITH LEARNING GROWTH AND DEVELOPMENT CONCEPTS

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Tell me and I forget
Teach me and I learn
Involve me and I remember

Benjamin Franklin

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ABSTRACT

Purpose: To explore the relationship between knowledge change, self-confidence, and satisfaction with learning concepts of growth and development across the pediatric age span using a virtual learning environment (VLE), My Virtual Child[©].

Design: A cross-sectional descriptive correlation design.

Measurement: An author-created assessment entitled Growth and Development Assessment administered via Qualtrics assessed knowledge change from pre-test to post-test with data collected before and after the knowledge test. The NLN Student Satisfaction and Self-Confidence in Learning instrument assessed the relationship between knowledge change and satisfaction and self-confidence in learning.

Intervention: The VLE My Virtual Child[©] was used during which participants raised a virtual child from birth to 18 years applying learned concepts of growth and development.

Data Analysis: Data were analyzed using a paired *t*-test, correlation, and regression.

Results: Data analysis demonstrated knowledge change pre- to post-test to be statistically significant ($p = < .001$). Pre-test mean = 16.66; SD 5.518 and post-test mean = 20.37; SD 2.223.

The NLN Satisfaction and Self-Confidence in Learning instrument means for satisfaction items ($M = 3.51\text{-}3.95$) and self-confidence items ($M = 3.51\text{-}4.11$) indicated students were satisfied and felt confident with their learning the concepts of growth and development using the VLE, My Virtual Child[©]. A regression analysis demonstrated that the change in knowledge was positively but weakly correlated with satisfaction ($r = -0.030$, $p = 0.431$) and positively but

weakly correlated with self-confidence (r = 0.121, p = .238), and neither was statistically significant. However, satisfaction and self-confidence were highly correlated (r = .840) and statistically significant (p < .000). Age as a covariant was weakly correlated to knowledge change, satisfaction, and self-confidence (R^2 = .019/.036).

Conclusion: The data demonstrate participants were satisfied and felt confident in their learning using the My Virtual Child[©] VLE. The data further demonstrated that age had minimal impact on knowledge change, satisfaction, or self-confidence in learning concepts of growth and development using a VLE.

Nursing Education Implications: This study can contribute to the literature on the efficacy of active learning strategies such as a VLE to assist nursing students in learning career-necessary concepts in a new and meaningful way.

CHAPTER ONE

INTRODUCTION

Background

The Society of Pediatric Nurses (SPN), in their 2017 Position Statement, identified

required curricula for nursing students to engage in before entering practice (Society of Pediatric

Nurses, 2017). Required elements of theoretical, empirical, and clinical knowledge of

infant/child/adolescent growth and development in pediatric nursing curricula and core

competencies for pediatric nurses have been identified (Society of Pediatric Nurses, 2017).

Harrison and colleagues (2020) discussed the necessity for pediatric-focused research to care for

this vulnerable population in the 21st century. "The population of children under the age of 18 is

growing, and many of these children have complex and diverse healthcare needs" (Harrison et

al., 2020, p. 74). Within this population, there is an increasing number of both physical and

mental chronic conditions. In addition, there is a high number of children living in poverty who

lack health insurance.

The Federal Interagency Forum on Child and Family Statistics Report (2019), also

known as the Forum, recounted the most current statistics related to children in the United States.

This report demonstrated that there were 73.4 million children under 18 in the United States at

the time of data collection, accounting for 23.3% of the population. This report identified that 5.9

million children experienced a hospital stay, and 75% of this population interacted at some time

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with a healthcare professional. While 8.8 million children were treated in Emergency Departments, over 10 million children were diagnosed with asthma, 60% missed school due to illness or injury during the data collection year, and 13% of the 12–17-year-old population experienced a major depressive episode. These statistics demonstrate that children under 18 are a large population consuming healthcare in society and elucidate some of the health disparities found in this vulnerable population that pediatric providers, including nurses, must address.

Harrison and colleagues (2020) found an alarming decrease in nurses entering pediatrics as their chosen career path. A workforce survey of registered nurses demonstrates this critical shortage of pediatric nurses, with national numbers dropping from 12.1% of nurses in pediatrics in 2008 to 6.9% of nurses in 2017. Their paper also included the challenges facing nurse educators tasked with teaching pediatrics and supported outcomes from other studies completed in 2008 (Leonard et al., 2008), 2014 (Green et al., 2014; McCarthy & Wyatt, 2014), and 2017, the latter an SPN editorial, about the challenges facing pediatric nursing (Betz, 2017). These articles all discussed the decline in pediatric faculty and stand-alone pediatric courses as the challenges facing pediatric nursing education. Harrison and colleagues (2020) found that <50% of nursing programs surveyed offered a stand-alone pediatric theory and clinical course to prepare nurses to care for this vulnerable population. Thus, these authors concluded that faculty shortage was the main reason for the pedagogical shift and that these findings were consistent with the earlier studies.

Leaders in pediatric nursing are increasingly concerned that newly graduated nurses are not educationally prepared to address the increasing technology, complexity, and diversity in pediatric care. Therefore, due to the uniqueness of this patient population, pediatric nurses must have in-depth knowledge of the concepts of growth and development to provide developmentally

supportive care across the pediatric age span. Unfortunately, there have only been two research studies on this topic in the past 31 years, thus demonstrating a dire need for pediatric-focused nursing research about growth and development in education and practice.

Precipitous changes in healthcare, and notably in pediatric healthcare, require a substantial shift in nursing education. Pedagogies utilized in the 20th century are no longer appropriate in the 21st century with a new generation of students. For example, the roles of medicine and nursing in the early 20th century focused mainly on acute illnesses that had created very high mortality rates across the lifespan. However, in the 21st century, many patients have chronic diseases and acute illnesses that require many healthcare dollars and resources. Thus, nursing education must change to meet the difference in the needs of today's society.

The Institute of Medicine (IOM) 2008 created a committee within the Robert Wood Johnson (RWJ) foundation with the explicit charge of creating a report about the future of nursing, which included nursing education. The finalized report was released in 2011 and has resulted in a movement to transform nursing education, focusing on both the acute and chronic needs of society since the way in which nurses were educated in the 20th century is no longer appropriate in the 21st century, given the current landscape of healthcare (Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, 2011). However, this transformation is slow as nurse educators continue to utilize old pedagogies in the classroom, most notably the "sage on the stage." This phrased pedagogy encompasses an educator who feels they have the knowledge to impart to their students and uses lecture methodology exclusively (YourDictionary, n.d.). Pedagogies used to educate nursing students in the 20th century are no longer appropriate for the 21st century.

In the lecture format, educators presume that all students learn in the same way and at the same speed. However, this methodology does not consider how individual students may learn. Another drawback to this methodology in the classroom is the passivity of the students. Passive learning does not promote deep understanding with more extended retention periods for the information imparted during the lecture (Schwerdt & Wuppermann, 2011). Additionally, during this type of classroom setting, students' attention may wander, resulting in even less retention of the presented material. The RWJ/IOM report on nursing education encourages nursing educators to move away from this type of pedagogy and toward a more student-centered active learning pedagogy.

For nurse educators to embrace an active learning pedagogy, it is suggested that they understand the learning styles of their students and adjust classroom activities to meet students' needs. The premise of this pedagogy is that active learning based on the students' preferred learning styles will increase student success and academic achievements.

Researchers since the 1970s have presented many theories and models to identify and discuss the way individual students process information. Kolb's (1984) Experiential Learning theory describes how learners see and interpret information. Experience is translated into concepts that guide the choice of new experiences (Kolb, 1984). There are two dimensions to Kolb's theory which identify how individuals perceive information through concrete experience or abstract conceptualization and how they process information using active experimentation or reflective observation (Kolb, 1984). Kolb's experiential learning model seems to be the underlying principle in many of the models presented in the literature and supports the notion that deep learning occurs through experiences and understanding those experiences.

Experiential learning, as described by Kolb (1984), can result in more profound and lasting connections with course material which supports student motivation for learning and promotes learning through critical reflection (UNT Teaching Commons, 2020). Ak (2008) explored the concept of deep learning vs. surface learning in concept analysis. In Ak's review of literature, it seems to be well accepted throughout the literature cited that deep learning will better contribute to achieving outcomes. Students who approach learning for understanding and the desire to apply acquired knowledge in the real world demonstrate intellectual processing. According to Ak and Kolb, this type of learning is accomplished through experiences and understanding those experiences through active reflection. The opposite approach to learning, that of surface learning, relies on rote memorization, lacks personal understanding, and accepts information given in class without question. Nurse educators are tasked with helping students to have learning experiences that lead to deep learning with the goal of application in clinical practice. Nurse educators are further charged with creating learning environments that students perceive as safe and supportive and allow for effective information processing at a deeper level (Ak, 2008). Thus, the intersection of the learning environment with the student's preference for learning determines how the student receives and processes information. Experiential learning is an antecedent for knowledge acquisition followed by the transfer of knowledge from theory to practice, both critically necessary for nursing practice.

Significance of the Problem

Students attend college to acquire the knowledge necessary to earn a degree that will lead to a career that they wish to engage in for the entirety of their adult work life. According to the American Academy of Arts and Sciences, in 2017, there were 17 million undergraduate students attending colleges and universities in the United States. Of those attending colleges and

universities, 363,433 students as of 2018 were enrolled in a nursing program, according to the

American Association of Colleges of Nursing (2018). In the Future of Undergraduate Education,

the Future of America report, it is noted that colleges and universities are asked to provide

"foundational knowledge for future citizens, practical skills for future workers, technical

innovations for future discoveries, and the understanding and habits of mind that can sustain

them throughout the course of their lives" (American Academy of Arts and Sciences, 2017, p. 8).

The report further states the following:

> …given the accelerated rate of change in American society—technological change,
> demographic change, the evolution of a global economy—a quality education must
> encourage and develop intellectual resilience and flexibility. It must offer students a
> combination of knowledge, practical skills, and personal dispositions that empower them
> to live productive and meaningful lives and to participate effectively in the American
> economy and democracy regardless of their program of study or their age at enrollment.
> (p. 9)

The commission points out that both the rigor and depth of undergraduate learning

depend highly on the quality of the instruction and the expertise of the faculty. The report further

points out that attempts to measure learning and teaching effectiveness are not supported by

sufficient research or funding (American Academy of Arts and Sciences, 2017).

The teaching-learning relationship between the faculty and the students is a primary

element of a quality undergraduate education. Effective student/faculty interactions correlate

with increased retention and completion rates, better grades and standardized test scores, and

higher career and graduate school aspirations (American Academy of Arts and Sciences, 2017).

More simply stated, "students learn more and fail less" (American Academy of Arts and

Sciences, 2017, p. 12) when faculty utilize multiple effective methodologies of teaching culled

from the research of their discipline. Unfortunately, faculty within an institution and even within

the smaller academic unit of a particular program of study "may harbor vastly different theories about how learning occurs" (American Academy of Arts and Sciences, 2017, p. 12).

This discussion from the American Academy of Arts and Sciences is very much in line with the discussions from the IOM/RWJ report on the future of nursing education. The undergraduate report elaborates further:

> …a crucial first step toward the rehabilitation of undergraduate teaching is the articulation of good teaching practice: Go od college teachers help students make explicit connections between theory and practice, and to do this effectively, faculty must be prepared to become facilitators as well as instructors. (American Academy of Arts and Sciences, 2017, p. 13)

Helping students make connections between theory and practice in nursing will promote the narrowing of the often-discussed theory-practice gap in nursing.

Nursing students at the college or university level are educated in the essential humanities along with their nursing courses. Today's nursing students, in addition to the basic knowledge gained from their humanities courses and nursing studies, must be able to think critically and apply that knowledge to their clinical practice, prepared to work in the ever-changing healthcare arena of today's world (American Association of Colleges of Nursing, 2018). To educate tomorrow's healthcare workforce, nurse educators must change how they teach today. Digital technologies are rapidly entering the education of students from kindergarten through college and have the potential to enhance outcomes in terms of teaching and learning. Nursing education, much like undergraduate education in general, in this author's opinion, has been slow to adopt new technologies to meet the needs of the students in today's college classrooms.

The students in today's nursing classrooms belong to a newer generation than what has been discussed in the literature. Nursing literature related to teaching the "current" generation of students focuses mainly on the millennial generation, identified as anyone born between 1981

and 1996 (Dimock, 2019), but this is not the generation of students in college classrooms today. The new generation populating college campuses are Generation Z (Gen Z) students. These students were born between the mid-1990s and 2012, and thus current first-year college students were born in the early 2000s (Chicca & Shellenbarger, 2018). GenZ students were born with technology, it has been a part of their life for as long as they can remember, and they were interacting with technology as early as two years of age and thus are considered the truest digital natives (Chicca & Shellenbarger, 2018). This digital connectedness underpins their views of learning and education. GenZers want practical and relevant information in an individualized and immediate format (Chicca & Shellenbarger, 2018). Additionally, they want their educational endeavors to be "exciting, engaging, technically advanced and visually based" (Chicca & Shellenbarger, 2018, p. 181).

This expectation of current nursing students begs the question, are nursing faculty prepared to teach this generation of students? The answer, unfortunately, might be that they are not. This lack of preparation is partly due to an aging nursing faculty from the Baby Boomer (1946–1964) and Generation X (1965–1980) eras and who have very different views on education and learning. "Baby Boomers trail prior generations on technology adoption," which could be a problem if the faculty have not embraced technology as a teaching method or if "administrators have not updated and offered faculty development" for these newer technologies (Williams, 2018, p. 59). GenZers expect technology, not textbooks, for their learning, especially as this group of students reports reading less than 30 minutes per day and identifies a preference for storytelling over reading a book (Williams, 2018). In addition, it has been noted that the attention span of a GenZ student is about 8 seconds, 4 seconds shorter than their millennial counterpart (Chicca & Shellenbarger, 2018; Hampton & Keys, 2017; Williams, 2018). These

characteristics lead to GenZers preferring to learn visually and through observation and hands-on experiences versus lecture and textbook reading. Another interesting characteristic of GenZers is their belief that advanced education is necessary for both an individual's success and the prosperity of society (Hampton & Keys, 2017). GenZers have a strong work ethic, are diverse in their thinking and acceptance of others, and foster an entrepreneurial spirit and the desire to forge their path (Chicca & Shellenbarger, 2018; Hampton & Keys, 2017). These characteristics foster a more pragmatic approach to career choices, and GenZers may be more inclined to explore more traditional career paths such as teaching or nursing (Hampton & Keys, 2017).

The characteristics and educational expectations of the GenZ students in college classrooms today mandate a pedagogical shift from passive to active learning. However, nurse educators must be cognizant of the possibility of multiple generations of students in the classroom as more students are entering accelerated nursing programs in today's ever-changing society. Thus, the experiential learning theory can be a pedagogical underpinning for nurse educators today as they transition to teaching methodologies that will actively engage both the GenZ student and their more mature counterparts, the millennials, and meet their educational needs. More active and engaging teaching methodologies may include virtual learning environments.

Gaps in the Nursing Literature

Nurse educators are charged with creating generalist nurses who can critically think, apply clinical judgment, be both creative and flexible in their thinking, and have the self-confidence to be successful in the ever-changing healthcare arena. As the literature from earlier in this century has pointed out, it is necessary to change the way nurse educators teach students in the classroom today to effectively implement the changes required for nursing education

(Benner et al., 2010; Billings & Kowalski, 2006; Candela et al., 2006; O'Lynn, 2018). To transform nursing education, nurse educators must stop teaching as they were taught, focusing on covering content; and instead focus on new approaches that motivate the GenZ student and beyond to be active participants in their learning (Benner et al., 2010; Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, at the Institute of Medicine, 2011). Despite discussion in the literature of the many new and novel strategies for transforming nursing education, few recent research studies demonstrate how using these unique and novel strategies will transform nursing education. Some of these new and novel strategies include virtual learning environments via computer-assisted instruction or learning styles to guide teaching pedagogies, resulting in a self-confident, generalist nurse with strong critical thinking and clinical judgment skills and the ability to apply concepts from theory to practice.

Unfortunately, it has been a decade since the call for the radical transformation of nursing education and nursing practice was published, and there continues to be a lack of literature on the subject. Therefore, nurse researchers and educators wonder whether evidence-based nursing education (EBNE) is a reality or a myth (O'Lynn, 2018). O'Lynn points out a paucity of high-quality evidence to support EBNE and the necessity of nurse educators to engage in rigorous high-quality education-focused research linking the science of nursing education and the science of learning (O'Lynn, 2018).

It is necessary to identify a theoretical framework that can underpin this transformation of nursing education and the teaching strategies that can be utilized to educate this current generation of nursing students. A theoretical framework guides nursing research by identifying salient concepts, underlying theories, assumptions, and philosophical underpinnings (Meleis, 2012).

Theoretical Framework

The Experiential Learning framework (Kolb, 1984) underpins learning and educational strategies research. Kolb's theoretical framework builds upon Jean Piaget's theory of Cognitive Development, as well as Lev Vygotsky's theory of Social Development. The Experiential Learning framework supports the understanding of an individual student's learning style and how that, in combination with other individual characteristics, leads to learning whether in a classroom setting or one of the newer settings such as a virtual learning environment.

The premise of the Social Development theory is that children learn in the context of their family and society. Cognitive development, according to Piaget, is a spontaneous process begun at birth and continues through adulthood, whereas learning is provoked by situations and context and transferred from one situation to another (Piaget, 1964). As a constructivist, Vygotsky felt learning was an active and constructive process that allowed for the formation of new knowledge, which is constructed based on personal experience (Vygotsky, 1930/2004).

These elements dovetail with the beliefs of Kolb (1984) elucidated in his theory of experiential learning which posits that it is the learner's experiences that allow for their interpretation of information that translates into concepts and guides the choice of new experiences (Kolb, 1984). Both Vygotsky and Kolb contended that learning is experience-based and constructed by the individual (Kolb, 1984; Vygotsky,1930/2004). The literature on GenZ students indicates that they prefer experiential learning experiences to books or lectures (Chicca & Shellenbarger, 2018; Hampton & Keys, 2017; Williams, 2018). The learning styles literature also highlights the need for educators to vary their teaching methodologies in the classroom to support the students' individual needs to create the type of learning environment that supports the expansion of knowledge based on experiences in the classroom, which can be translated to

the outside world. Learning environments in which students feel more connected, more motivated, and more responsible for their learning allowed for the achievement of higher course grades (Evans et al., 2010). Dynamic learning environments support the notion of increased knowledge retention and application when the learner is actively engaged in their environment and is discussed in depth in both the American Academy of Art and Science and IOM/RWJ reports on higher and nursing education (American Academy of Arts and Sciences, 2017; Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, at the Institute of Medicine, 2011).

Experiential learning theory purports that one's experiences impact knowledge acquisition and development. This theory supports learning based on the needs and the style of learning preferred by the learner, whether a student or a professional (Kolb, 1984). Additionally, it builds off the tenets of Piaget and Vygotsky. It thus can be used as a theoretical framework underpinning research on the use of virtual learning environments and the impact of learning styles (Kolb, 1984). Educators who implement this theoretical framework focus on the needs of their learners and thereby can enhance the learning process and outcomes.

Kolb developed the theory of experiential learning to demonstrate how a person comes to know and develop. He postulated that learning is a social process and does not just occur in the classroom using lectures but, in the workplace, at home, or in the community (Kolb, 1984). In nursing education, learning has traditionally been approached through lecture, memorization, and return laboratory demonstrations (Lisko & O'Dell, 2010). This teacher-centered approach is not what the GenZ student in today's classrooms needs for learning to occur (Hampton & Keys, 2017). Utilizing the experiential learning framework, today's nurse educators will facilitate

learning in which practice integration leads to improved critical thinking, clinical judgment, and competence in the newly graduated nurse.

Kolb (1984) identified six propositional statements upon which the theory was built. These propositional statements included the idea that learning is circular, continuous, builds upon the ongoing experiences of individuals, and is the process of creating and building upon knowledge. Additionally, he postulated that learning occurs as individuals interact with their environment and make meaning of those interactions, influencing future interactions and behaviors (Kolb, 1984). These propositional statements form the basis for the experiential learning theory and support Kolb's definition of learning: "learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 38).

Concepts of the Experiential Learning Framework

The experiential learning theory is based on the four stages of learning that create the learning styles postulated by Kolb (1984). The first concept, concrete experience, is defined by Kolb as a new experience or the reinterpretation of an existing experience (McLeod, 2010). Reflective observation is defined as looking objectively at the experience and beginning to make meaning of it. The third concept, abstract conceptualization, refers to the individual's ability to reflect on the experiences and create new ideas or reimagine ideas previously held (McLeod, 2010). Lastly, active experimentation is when individuals apply what they have experienced to the world around them to test their thoughts and beliefs about their experiences. From these concepts, the learning styles emerged and added to the concepts of the theory.

Identified Learning Styles

In later publications, Kolb identified four learning styles but acknowledges that many students tend to be multimodal learners. The four learning styles include divergent, assimilation, convergent, and accommodation.

Diverging learners prefer to watch and feel and tend to think more abstractly, leading to the generation of ideas. The second learning style is assimilating, in which the learner applies critical thinking skills to their experiences. These learners tend to be less abstract and more logical in their approach to learning. Convergent learners prefer hands-on learning, so they are considered thinkers and doers. These learners like to solve problems and look for practical applications of knowledge. Accommodating learners prefer a hands-on approach and want to experiment with new information. These concepts and learning styles make up the experiential learning theory and contribute to Kolb's conceptual model to demonstrate the theory.

The experiential learning theory has been considered a gold standard for educators to plan teaching activities and understand how a person learns and develops since it was first published in 1984. This theory has clear definitions, and all references to this theory maintain consistency with the original publication. However, no new learning theories have been presented to replace this long-standing theory. It is interesting to note that in the early 2000s, many educational theorists began to lose faith in learning styles and write articles about how learning styles do not describe the only way people learn. Further, it is interesting to point out that in the early 2000s through today, nursing education researchers utilize this framework and the Kolb Learning Styles Inventory to research how nursing students learn and make recommendations to nursing educators.

Based on the purpose of the theory, Kolb did present a very understandable description of learning as a cyclical process, and a review of the literature did not dispute this theory despite some recent attempts to discredit it. This theory has remained consistent over the years since publication and is both simple and complex at the same time. The complexity lies in utilizing the Learning Styles Inventory to identify individual learning style preferences. This tool is quite long and might be too challenging for younger students to complete and is limited to identifying the students' preferred learning style. However, based on the literature review, just knowing the preferred learning styles can influence teaching practices in the classroom, moving towards more student-centered learning with a focus on active learning. Active learning occurs through student interaction with material from which they can derive meaning and is the type of learning experience expected by GenZ students.

Thus, the Experiential Learning Theory can be seen as the theoretical framework supporting the need for nursing students to feel satisfied and confident in their ability to learn nursing concepts and apply this learning to their practice. This theory also purports that the students must interact with the material in a meaningful way, through active engagement, to learn and then transfer knowledge to practice. The theoretical framework identifies the individual student's needs as an essential facet of this process of learning and transfer of knowledge. It supports active teaching and learning strategies for GenZ students in the form of virtual learning environments.

Implementation of the Experiential Learning Framework in Nursing Education

Nurse educators teaching GenZ students in nursing programs around the country need to shift their teaching focus from teacher-centered to learner-centered. These educators must learn new teaching strategies to meet the educational expectations of the current nursing students.

While this is true for all nursing students, one area has an increased need for active learning to apply the concepts learned in theory in practice.

Pediatric nurses are expected to demonstrate the transfer of growth and development knowledge, one of the core competencies of pediatric nursing, from theory to practice. The ability to apply this knowledge in the clinical setting identifies developmentally delayed children and provides early interventions to enhance outcomes (Society of Pediatric Nurses, 2017). The SPN states, "knowledge of expected growth and development characteristics facilitates individualized nursing care of children with special needs and their families" (p. 2). Pediatric nurses are expected to demonstrate this competency by using "knowledge and understanding of pediatric physiology and principles of growth and development to provide individualized holistic health information and nursing care to children within the context of their families" (Society of Pediatric Nurses, 2017, p. 2). Unfortunately, in terms of teaching growth and development to nursing students, nurse educators are challenged by many barriers, including lack of pediatric faculty, lack of dedicated pediatric theory time, lack of pediatric clinical experiences as well as lack of time and preparation to create innovative teaching-learning strategies that incorporate the learning styles of the GenZ nursing student.

Many nursing schools require a developmental psychology course prior to or at the beginning of the nursing courses. Yet, once the students take their pediatric courses, their child growth and development knowledge may still be limited. This limited knowledge may be due to a myriad of reasons and, in this author's experience, appears to be related to teaching methodologies in the aforementioned courses. These teaching methodologies allowed students to rely on surface learning to succeed in the course, which unfortunately negates the ability to transfer that knowledge from one context to another.

Ahmed and Richardson (2013), in the only relatively current research on the topic, concluded that even after completing a pediatric theory course, students continued to have weak knowledge scores regarding the main concepts of child growth and development. These authors suggested that creative strategies, such as standardized assessment tools to improve retention or online interactive modules, are needed to improve students' acquisition, retention, and application of growth and development principles (Ahmed & Richardson, 2013).

Nursing students may feel challenged to apply theory to practice as they have limited clinical experience in general, are less experienced in caring for children, and lack the self-confidence skills necessary to transfer their knowledge of growth and development to the clinical setting. Further, this learning may also be impeded by the way the content is taught in the course's theoretical component if it is not in a student-centered active learning format. Learning styles have been studied to assist students in acquiring knowledge better when the material is presented in a manner that matches their preferred learning style (Andreou et al., 2014; Candela et al., 2006; D'Amore et al., 2012).

Learning styles: Current state. The categorization of learning styles has been in the literature since the early 1950s and has been researched in multiple contexts by psychosocial theorists such as Jean Piaget and Lev Vygotsky (Piaget, 1964; Vygotsky,1930/2004). More recently, Kolb, in the 1980s, drawing from these renowned researchers, theorized that learning is a process by which knowledge is interpreted and transferred into an experience, and that is the philosophical underpinning of the Experiential Learning Theory (Kolb, 1984). He identified different ways individuals learn and labeled those learning styles (Kolb, 1984).

Learning styles can impact how students engage with the material in any given theoretical course, and nursing students are no exception (D'Amore et al., 2012; Evans et al.,

2010; Fleming et al., 2011; Hallin, 2014; Towle & Breda, 2014; Tulbure, 2012). Chicca and

Shellenbarger (2018) addressed the learning needs of GenZ nursing students and discussed that

while these students prefer non-traditional teaching methods, they also want them to be

individualized. The lack of innovation and transformation in nursing education has led to newly

graduated nurses who often lack the ability to think critically, make clinical judgments and have

the requisite skills necessary to succeed in practice (Towle & Breda, 2014). The way students

choose to or are inclined to approach a learning situation impacts performance and achievement

of learning outcomes, affecting the transfer of knowledge (Cassidy, 2004). The current student

population of nursing programs nationwide consists mainly of GenZers who prefer experiential

learning to book/lecture teaching. Virtual learning environments will most likely appeal to this

digitally native group of students.

Computer-assisted instruction, virtual learning environments. Computer-assisted

instruction (CAI) began as early as the 1960s (Seltzer, 1971) and was identified as a multi-media

method of interaction that uses audio, video, and interaction to deliver content to users (Rouse,

2007). CAI has been used increasingly within education, and nursing education is no exception.

However, despite the trends in digital education advancements, research about digital

technologies remains scant in nursing education (Chang et al., 2018).

Over the preceding several decades, the literature has recognized that CAI can enhance

student learning, retention, and application better than traditional instructional methodologies. A

comprehensive meta-analysis of 25 years of research demonstrated significant increases in

student learning, retention, and material application when students engaged in some sort of CAI

(Timmerman & Kruepke, 2006). Virtual learning environments are one type of CAI increasing in

their appearance in nursing education literature and requiring more in-depth research studies.

In 2011, the IOM challenged nursing faculty to implement creative strategies to meet educational competencies for evidence-based clinical practice. In pediatric nursing, these educational competencies include the nurses' ability to accurately identify deviations from expected growth and development milestones (Society of Pediatric Nurses, 2017). Virtual Learning Environments (VLE) allow for experiential learning in which the student can conceptualize certain aspects of the content, like growth and development, engage in active and concrete experimentation, and active reflection to achieve educational competencies. In pediatric nursing education, one such VLE is the My Virtual Child[©.] Using a virtual environment via CAI provides students with an exciting and engaging way to learn content, which is preferred for the current GenZ students in face-to-face and online nursing classrooms (Chicca & Shellenbarger, 2018). Within this VLE, pediatric nursing students raise a virtual child, making parenting decisions and interacting "first-hand" with their "child's" growth and development from birth to 18-years-old (Manis, 2009). This type of learning can reach all learners (Friedman & Goldschmidt, 2014). The challenge for nurse educators is to demonstrate knowledge gained using the CAI/virtual learning environments. However, educational and nursing research related to the effectiveness of virtual learning environments remains limited. So as the call for a radical transformation of nursing education continues, research must be undertaken to determine if these new teaching strategies are indeed effective for the GenZ nursing student, particularly in building their self-confidence and providing satisfaction in learning.

Self-Confidence in Nursing Education

GenX parents raised GenZ students in the era of social and economic unrest. These social and economic impacts in the aftermath of 9/11 and the 2008 recession, in conjunction with an increase in cyber-attacks and cyberbullying, have resulted in a group of students who tend to be

more cautious than their millennial counterparts (Chicca & Shellenbarger, 2018; Hampton & Keys, 2017; Williams, 2018). This cautiousness leads to students who are "not sure they will succeed, take fewer risks and are likely to have a back-up plan in case things do not work out" (Chicca & Shellenbarger, 2018, p. 181). So, despite a desire for active, independent learning, the GenZers may lack the self-confidence needed to succeed in nursing school. Nurse educators will need to be aware of this and foster an attitude of success amongst this generation of students.

Self-confidence, along with self-efficacy, has been extensively discussed recently in nursing literature, mainly in terms of simulation. For nurse educators to embrace new student-centered learning strategies that incorporate experiential and active learning, they must consider the impact on students' self-confidence when designing these learning activities.

Self-confidence is defined as "a person's belief that he or she can succeed… and is context-specific to particular tasks" (Perry, 2011, p. 219). As an antecedent to self-efficacy, a necessary component of success, self-confidence can be viewed as a dynamic, ever-changing cycle that positively and negatively influences learning (Perry, 2011). Further, according to Perry (2011), "self-confidence influences virtually every aspect of an individual's life, from the individual's ability to think optimistically, perseverance through difficulties to completion of activities" (Perry, 2011, p. 223). Thus, the level of self-confidence possessed by a student can directly impact and even possibly predict their success.

An essential antecedent to self-confidence is acquiring knowledge (Perry, 2011; White, 2009). Nursing students acquire knowledge both formally and informally, and this knowledge serves as a basis from which the student will draw inferences for decision-making (Perry, 2011). While nursing students will possess varying levels of experience and prior knowledge acquisition, they must be ready to learn as this will enhance the progress of confident practice

and success. "Success in past experiences is a strong antecedent to self-confidence" (Bandura, 1977; Perry, 2011, p. 226). Ultimately, successful outcomes for nursing students who possess self-confidence include but are not limited to improved self-efficacy, better clinical performance, ability to effect change, power to undertake challenges not previously encountered, and solid professional collaboration, all of which can lead to confident, autonomous clinical practice (Perry, 2011; White, 2009).

As a consequence of self-confidence, self-efficacy is a critical component necessary for understanding the impact of self-confidence on individuals and their ability to learn. Bandura first introduced the Self-efficacy theory in 1977. Bandura's self-efficacy theory focused on the concept that people will only try to do what they think they can do and not try what they think they cannot do (Bandura, 1977). GenZers, due to their more cautious nature, may not lean toward attempting things they feel they cannot be successful at and might have lower self-confidence scores than their millennial counterparts who were very self-confident (Chicca & Shellenbarger, 2018). However, both self-confidence and self-efficacy can come about by observing the task to be accomplished, which would speak to the GenZ student's preferred learning style (Bandura, 1977). Within Bandura's (1977) theory of self-efficacy, there are four primary sources of influence to assist in the achievement of personal self-efficacy (Bandura, 1994). These four sources of influence include mastery experiences, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1994). Each of these sources of influence has principal sources through which mastery can be created (Bandura, 1994).

The first source of influence, mastery experiences, can enhance self-confidence and self-efficacy by accomplishing an identified task or solution to a problem. In nursing programs, mastery experiences are allowed for through lab and clinical experiences. However, in today's

rapidly expanding technological landscape, virtual learning environments may also present a source of influence for mastery experiences.

Vicarious experiences, the second source of influence, involve social models. "Seeing people similar to oneself succeed by sustained effort raises observers' beliefs that they too possess the capabilities to master comparable activities required to succeed" (Bandura, 1994, p. 72). In nursing programs, for example, in the first lab course, nursing students watch their nursing instructors demonstrate skills and assessments. In the social model, the nursing instructor is considered similar in that they are a nurse, and the student feels confident in their ability to perform the same skill or assessment. In addition, they see their classmates also performing the skill or assessment, which further enhances their vicarious experience.

Perhaps, the least effective source of influence is verbal persuasion (Bandura, 1994). In nursing, verbal persuasion usually comes from the faculty providing verbal cues and support to the students to encourage success. The influencer must be cognizant of the words used to motivate the participant and not undermine their tenuous sense of self-confidence or self-efficacy.

Along with the challenges of verbal persuasion come the challenges of the fourth source of influence, that of somatic or emotional states. The person's perceived level of stress related to the task at hand impacts their belief in their ability to be successful. It is not the actual level of stress or emotion but rather the individual's perception of the stress or emotion that impacts this aspect of self-efficacy. In nursing programs, clinical experiences and simulation experiences are designed to support a positive attitude and hopefully mitigate some stress to increase students' self-confidence and, ultimately, self-efficacy.

According to Bandura (1994) and a growing body of research in the discipline of nursing, "human accomplishments and positive well-being require an optimistic sense of personal efficacy" (p. 75). Numerous studies (Kimhi et al., 2016; O'Donnell, 2010; Pellas, 2014; Pike & Schroeder et al., 2018; Vorderstrasse et al., 2015) have looked at the self-confidence and self-efficacy of nursing students in relation to simulation and clinical experiences and more recently in virtual learning environments and theorized that self-confidence in learning translates to self-confidence in practice. Thus, nursing education needs to have research exploring how experiential learning experiences, such as virtual learning environments, support nursing students' levels of self-confidence and satisfaction in learning. Further research is needed to explore this translation of satisfaction and self-confidence with learning to satisfaction and self-confidence in clinical practice.

Student Satisfaction in Learning in Nursing Education

The information on student satisfaction in higher education is often related to student satisfaction as a consumer of higher education and often discusses students' satisfaction with their overall university experience, not specifically with their learning. A thorough search of the literature found a paucity of research related specifically to students' satisfaction in learning in either higher education or nursing education. This concept is often linked and studied with self-confidence. Multiple studies were found in which satisfaction is measured along with self-confidence as one of the variables contributing to knowledge acquisition.

Multiple conceptual models that explore the relationship between students' experiences with university buildings, university services, and resources framed in the context of the student as a consumer are available in the literature (Douglas et al., 2008; Ruffalo, 2017). What is missing in this body of literature is an assessment of student satisfaction, specifically with their

learning. Universities tend to focus on students' satisfaction in terms of recruitment, retention, and rankings (Smith et al., 2018).

Smith et al. (2018) attempted to elucidate the specific factors that influence a student's satisfaction in learning, specifically in undergraduate nursing programs, through a grounded theory approach. These authors identified that satisfaction with learning is under-theorized and understudied. A "better understanding of how students determine satisfaction with learning is necessary if educators are to facilitate learning that meets the expectations of diverse stakeholders, including students themselves" (Smith et al., 2018, p. 176). They further highlighted that research related to student satisfaction with learning would drive curricular change, inform teaching practices, and provide a framework for interpreting satisfaction data (Smith et al., 2018). Evaluating student satisfaction in learning is a quality measure that is often combined with self-confidence in learning, and many studies have explored these concepts together. But what defines students' satisfaction in learning?

A literature review of thirteen studies in 2017 identified multiple definitions of student satisfaction (Weerasinghe et al., 2017). Some included "an experience of the fulfillment of an expected outcome or a feeling of pleasure or disappointment resulting from comparing perceived performance in relation to the expectation" (Weerasinghe et al., 2017, p. 533). Therefore, satisfaction with learning could be defined in terms of the expectation connecting with the learner's perceptions.

Further, satisfaction in and of itself is a multidimensional process that can be influenced by many factors (Weerasinghe et al., 2017). These factors can be divided into several categories: personal, institutional, and other factors. Personal factors include age, gender, employment, preferred learning style, and the student's GPA, while institutional factors incorporate the quality

of the instruction, promptness of instructor feedback, clarity of expectations, and teaching style. Other factors that influence student satisfaction include the school environment, quality of the classroom space, use of technology, the student-instructor relationship, interaction with fellow students, available learning equipment and library facilities, and learning materials (Weerasinghe et al., 2017). These factors have been identified as having a direct impact on a student's perception of satisfaction with learning.

Teaching and learning pedagogies are transforming from passive to active teaching and learning strategies on today's college campuses. Active learning strategies are grounded in experiential learning and have been demonstrated to increase student satisfaction with their learning. The small amount of research that has been explicitly undertaken related to student satisfaction with learning demonstrates an increase in satisfaction when the student's perception of learning matches their expectations and allows for the development of a valued learning journey. "Nurse academics need to continue to provide students with quality resources, as these enhance both student satisfaction in general, and student satisfaction with learning, more specifically" (Smith et al., 2018, p. 179). This study investigated the relationship between knowledge change and participants' perceived satisfaction and self-confidence with learning after using a quality VLE, My Virtual Child[©].

Purpose and Rationale

Recent literature has correlated increased confidence in clinical practice with nursing students who possess higher degrees of self-confidence in their educational endeavors (Bektas & Yardimci, 2018; Herron et al., 2019; Rushton et al., 2020) and increased satisfaction with their learning (Smith et al., 2018). Thus, nurse educators need to design learning activities, whether in the classroom or simulation, to allow for experiential learning, enhancing nursing students'

satisfaction with learning and self-confidence in transferring their learning to their clinical practice.

In response to both the American Academy of Arts and Science and the IOM/RJW calls for a radical transformation in higher/nursing education, nurse educators need to find new and active teaching strategies to support the learning characteristics and styles of the GenZ students currently enrolled in nursing programs. One active teaching strategy could be a virtual learning environment to accomplish these goals. For nursing students in a pediatric theory and clinical course, this would be demonstrated in their ability to perform an accurate developmental assessment of the patients assigned to them in the clinical setting and in their ability to discuss the impacts on growth and development a delay may have on an individual child.

This study aimed to describe the relationship between knowledge change, self-confidence, and satisfaction with learning using a virtual learning environment (VLE) to learn concepts of growth and development across the pediatric age span.

RQ 1: To what extent does the use of a VLE change pre-licensure nursing students' knowledge of concepts of growth and development in the pediatric population?

RQ 2: To what extent does the use of a VLE change pre-licensure nursing students' satisfaction with learning concepts of growth and development in the pediatric population?

RQ 3: To what extent does the use of a VLE change pre-licensure nursing students' self-confidence with learning concepts of growth and development in the pediatric population?

This study assessed the participants' change in knowledge of growth and development concepts across the pediatric age span as determined by the results of a pilot tested Growth and Development Knowledge Assessment pre-/post-test. A convenience sample of nursing students currently enrolled in the theory portion of the pediatric theory/clinical course at a private,

medium-sized Midwestern university was invited to participate in the study. Additionally, this study explored the relationship between the participants' perceived satisfaction and self-confidence with learning the concepts of growth and development using a virtual learning environment, My Virtual Child$^©$ using the National League for Nursing (NLN) instrument, Student Self-Confidence, and Satisfaction with Learning. According to the NLN website, for the Student Self-Confidence and Satisfaction in Learning instrument, "reliability was tested using Cronbach's alpha: satisfaction = 0.94; self-confidence = 0.87" (National League for Nursing, 2020, para. 5). This instrument has demonstrated reliability and validity.

Nurse educators could look to this research to assess the change in knowledge of the participants based on the pre/post-test and their perceptions of their satisfaction and self-confidence with their learning using a VLE as demonstrated in the instrument utilized. Outcomes from this descriptive research would begin to address an area in which a paucity of research exists, the effectiveness of a VLE on knowledge acquisition and retention, and the relationship to the satisfaction and self-confidence with nursing students' learning, more specifically the GenZers. While further research needs to be undertaken regarding the effectiveness of virtual learning environments on student learning, this research could contribute to that body of work.

CHAPTER TWO

LITERATURE REVIEW

Introduction

Nursing education aims to graduate students ready to enter clinical practice. In the 21st century hospital, administrators expect graduates who can critically think, make safe, appropriate clinical judgments, and provide safe patient care to optimize patient outcomes (Benner et al., 2010; Chicca & Shellenbarger, 2018; Schmitt & Lancaster, 2019). Nursing graduates who feel satisfied and self-confident with their learning are more likely to possess confidence in the clinical setting (Powers, 2020; Kim & Kim, 2015). The challenge for nurse educators is to create curricula that support students' acquisition of knowledge, skills, and, ultimately, self-confidence that will translate to their clinical practice (Chicca & Shellenbarger, 2018; Hampton & Keys, 2017; Mensik, 2018; Williams, 2018).

Nursing curricula that support the development of a confident graduate ready for clinical practice will be primarily based on experiential learning (Herron et al., 2019). Experiential learning theory underpins the concept of active learning. A review of some active learning literature identifies that active learning strategies have been used to help students achieve learning outcomes (Hill, 2017; Shin et al., 2015). Active learning strategy refers to a teaching and learning strategy based on experiential learning theory and consists of students actively engaging in their learning (Shin et al., 2015). This type of curricula for the twenty-first century supports students' individual learning styles and motivation for learning (Brannan et al., 2016).

A percentage of graduating nurses will seek out careers in pediatric nursing. In addition to thinking critically and applying theory to practice, these graduates must also be competent in providing developmentally supportive care across the pediatric age span. The Pre-Licensure Core Competencies statement was published by the Society of Pediatric Nursing (2017). The second core competency listed is growth and development with the elaboration of "uses knowledge and understanding of pediatric physiology and principles of growth and development to provide individualized holistic health information and nursing care to children within the context of their families" (Society of Pediatric Nursing, p. 2).

As nurse educators embrace new teaching and learning pedagogies, which one is best for teaching pediatric growth and development? Ahmed and Richardson (2013) stated that "creative strategies that improve student's growth and development knowledge retention and transfer such as case studies and scenarios that clarify the main concepts of the main developmental theories are warranted" (p. 86). These researchers made this statement after discovering that students' knowledge about growth and development concepts demonstrated little improvement from the pre-test to the post-test despite a pediatric theory course. Ahmed and Richardson (2013) also pointed out the need for nurse educators to utilize active strategies such as online interactive modules to improve the acquisition and retention of growth and development knowledge (Ahmed & Richardson, 2013).

Another barrier to knowledge acquisition and retention of growth and development concepts is the increasing and alarming trend of discontinuing stand-alone pediatric nursing courses. Harrison and colleagues (2020) identified that "national pediatric nursing experts have identified substantial challenges to increasing the number of pediatric nurses including a lack of undergraduate preparation in pediatrics, which serves to devalue pediatrics as a specialty" (p.

76). These authors further identified that only 49% of nursing programs in the United States

currently have a stand-alone pediatrics course (Harrison et al., 2020). The lack of preparation in

pediatric content for newly graduating nurses is having a direct negative effect on the pediatric

workforce, "including the ability to care for children with high acuity, identified as one of the top

10 challenges to pediatric nursing" (Harrison et al., 2020, p. 76). Further, a lack of clinical

experience in pediatric nursing care also challenges increasing the pediatric workforce (Betz,

2017; Harrison et al., 2020; Lynch, 2007; McCarthy & Wyatt, 2014). Thus, it is inherent upon

nurse educators to create active learning strategies based on the experiential learning theory, to

enhance students' knowledge acquisition and retention of pediatric growth and development

concepts.

Kolb's Experiential Learning Theory guides this research study of an active learning

strategy, a virtual learning environment—My Virtual Child©—that could enhance pediatric

nursing students in their acquisition of knowledge through concepts of growth and development,

supporting their satisfaction and self-confidence with their learning and their ability to apply this

knowledge to their clinical practice.

Audit Trail

The following databases were thoroughly searched using various combinations of

keywords for literature pertinent to the concepts being discussed, ERIC (educational content),

PROQUEST (multidisciplinary content), PubMed (allied health content), and CINAHL (nursing

and allied health content). The search parameters included English language, peer-reviewed, and

full text. The keywords used to search these databases included virtual learning environments,

My Virtual Child©, pediatric nursing, pediatric nursing education, pediatric nursing workforce,

virtual simulation, experiential learning, and learning styles. This robust body of literature thoroughly addresses the concepts at hand and the gaps in the research, presenting both the limitations identified in the literature and the directions for future research needs. This chapter addresses these central concepts: growth and development, knowledge acquisition and satisfaction, and self-confidence with learning.

Review of Literature

Pediatric Nursing Literature

As previously discussed, pediatric nurses must be able to accurately assess the growth and development of children entrusted to their care for early identification and intervention to optimize outcomes. Unfortunately, there is a paucity of research in this area in any discipline, more specifically nursing, in which there have only been two research studies in the last thirty-one years. "The nursing care of children and their families is grounded theoretically and empirically in the knowledge of physical growth, behavioral development, family relationships and parenting, community contexts and cultural beliefs and practices" (Pridham et al., 1996, p. 273). Throughout the pediatric nursing literature, these beliefs about the needs of pediatric nurses related to knowledge of growth and development can be found (Ahmed & Richardson, 2013; Betz, 2017; Harrison et al., 2020). Further, the Society of Pediatric Nursing (2017) supports this underlying principle as evidenced by their 2017 position statement, which states that "knowledge of expected growth and development characteristics facilitates individualized nursing care of children with special needs and their families" (p. 2). Pediatric nurses are expected to demonstrate this competency by using "knowledge and understanding of pediatric physiology and principles of growth and development to provide individualized holistic health information

and nursing care to children within the context of their families" (Society of Pediatric Nursing, p. 2). However, students lack the critical thinking and clinical reasoning skills necessary to provide this individualized, developmentally supportive care, as demonstrated in Ahmed and Richardson's (2013) research of undergraduate nursing students in a pediatric theory course. This is the only study about knowledge of growth and development concepts since 1990 in the nursing education literature.

Ahmed and Richardson (2013) conducted a prospective descriptive pre-/post-test study utilizing a convenience sample of senior nursing students in the pediatric theory and clinical course during the 2010–2011 academic year. In the pre-test, 125 students participated, and in the post-test, 123 students participated. The authors neglected to discuss the attrition of the two students from pre-test to post-test, nor did they discuss the number of students enrolled in the course and what percentage participated in the research study. The authors developed the pre-and post-test questionnaires utilized in the study. However, the authors did not include the questionnaire despite discussing its internal consistency identified by a Cronbach alpha of 0.54, which does not represent internal consistency as it falls in the poor range, nor did they discuss how the questionnaire was created.

Descriptive statistics for this study demonstrated that while there was a statistically significant change in scores between the pre-and post-test ($p < .0001$), the students neglected to achieve 80% on the post-test. Knowledge deficits were noted in all dimensions, including Piaget's theory of cognitive development, Erickson's theory of psychosocial development, and physical growth. This was after completing the entire theory and clinical portion of the course. Considering that a sound knowledge of growth and development is essential for the pediatric

nurse, the authors felt this study demonstrated the need for innovative teaching strategies for the millennial and beyond nursing students to foster knowledge acquisition and retention. According to the authors, this study supported the findings of an earlier study that assessed nurses' knowledge of growth and development principles in meeting the psychosocial needs of hospitalized children (Ahmed & Richardson; Gillis, 1990). These are the only two studies that look at the growth and development knowledge of pediatric nursing students and pediatric nurses over 31 years, demonstrating an egregious gap in the literature for this concept and an important area for future research. One area of innovation for this concept could be the virtual learning environment of My Virtual Child[©], an experiential-based program that could also speak to the various learning styles of today's nursing students.

Learning styles of nursing students were the subject of several research studies early in the 21st century, and it has been identified that a focus of utmost importance is that of the learning environment and how it contributes to student learning (Vizeshfar & Torabizadeh, 2018). It is understood from the literature on learning styles and nursing education that the recognition of both teaching and learning styles assists in students' competence with learning. Unfortunately, in recent years, there has been a paucity of literature on this vital subject that is necessary for nurse educators to embrace to transform nursing education to produce nurses who can critically think and apply theory to their clinical practice.

Learning Styles

Nursing is an evidence-based practice profession that requires nurses to be able to think on their feet, make clinical judgments and promote improved outcomes for the patients in their care (Benner et al., 2010; Billings & Kowalski, 2006; Lockwood, 2016). Nurses acquire the

knowledge needed to provide safe, patient-centered care to enhance outcomes in the context of both the theory and clinical courses taken throughout the nursing program. Making connections from the classroom (theory) to clinical practice is essential for an evidence-based practice profession. Nursing researchers have discussed, in the literature, the shortcomings of the current teaching-centered model in most classrooms, that it is not fostering nursing students' abilities to make connections from theory to practice (Candela et al., 2006; Chmil et al., 2015; Lisko & O'Dell, 2010). Bloom's taxonomy demonstrates the hierarchy of knowledge acquisition that has been foundational in curricular development for decades (Armstrong, 2016). Within this taxonomy, nursing curricula have tended to be taught in the domain of remembering and understanding, yet nursing practice occurs in the application domain (Armstrong,2016). The findings of Cheraghi et al. (2010) demonstrated this discrepancy in nursing education by highlighting the "lack of competent educational structure or content" (p. 162). So, if this is the case, why are nurse educators still teaching in the remember and understand domain? Nursing curricula must transform from a teacher-centered pedagogical model to a student-centered one, and nurse researchers must study this transition for efficacy.

Connection-making methodologies can assist students to move from merely knowing (i.e., memorizing) to applying knowledge in a real-life context which is necessary for decreasing the theory-practice gap. Using experiential learning and learning styles as an underlying philosophy can position curricula as more student-centered. Felder and colleagues (2005) stated that "students have different strengths and preferences in the ways they take in and process information—which is to say, they have different learning styles." Further, they add that:

> when learning styles of most students in the class and the teaching style of the professor are seriously mismatched the students are likely to become uncomfortable, bored and

inattentive in class, do poorly on tests, get discouraged about the courses, the curriculum and themselves, and in some cases change to other curricula or drop out of school. (Felder et al., 2005, p. 103)

These statements have been further supported in the literature in recent years by Vizeshfar and Torabizadeh in their 2018 study about the academic achievement of nursing students when teaching was based on the students' learning styles. Using an interventional study of 40 third-semester nursing students in a nursing program in Iran, these authors sought to identify the relationship between learning styles, teaching styles, and academic success. The authors found that "education based on learning styles, particularly for college students, can not only enhance students' academic achievement and teachers' professional satisfaction, but can help with training professional nurses" (Vizeshfar & Torabizadeh, 2018, p. 103). Unfortunately, the literature on learning styles has not, to date, provided an "aha" moment that identified one best learning style of nursing students, but rather has shown that nursing students tend to be multimodal in their learning. Thus, nurse educators need to vary their teaching methodologies to incorporate all the learning styles.

Theoretical Framework: Experiential Learning Theory—Learning Styles

A theoretical framework guides the nursing research study by identifying salient concepts, underlying theories, assumptions, and philosophical underpinnings (Meleis, 2012). There are three theoretical frameworks that underpin the research on knowledge acquisition and retention, learning styles, pediatric knowledge of growth, development, and virtual learning environments. These theoretical frameworks will each be described in terms of their contribution to the body of research for the experiential learning theory. They include Jean Piaget's theory of

Cognitive Development and Lev Vygotsky's theory of Social Development, underpinning David Kolb's theory of Experiential Learning.

Cognitive development, according to Piaget, consists of two aspects, development and learning (Piaget 1964). He believed development was a spontaneous process started at birth and continued through adulthood, whereas learning is provoked by situations and context and transferred from one situation to another (Piaget, 1964).

The premise of the Social Development theory is that children learn in the context of their family and society. As a constructivist, Vygotsky felt learning was an active and constructive process that allowed for the formation of new knowledge, which is constructed based on personal experience (Vygotsky, 1930/2004). This dovetails with the beliefs of Kolb in his theory of experiential learning which posits that it is the learner's experiences that allow for their interpretation of information which translates into concepts and guides the choice of new experiences. Both Vygotsky and Kolb argued that learning is experience-based and constructed by the individual (Kolb 1984; Vygotsky, 1930/2004). The literature also highlights the need for educators to vary their teaching methodologies in the classroom to support the individual needs of the students (the educators' primary society), to create the type of learning environment that supports the growth of knowledge-based on experiences in and out of the classroom (Kolb 1984; Vygotsky, 1930/2004).

Additionally, nurse educators need to constantly think about the context of what needs to be taught, why, how, and by whom it should be taught. Learning environments in which students feel more connected, more motivated, and more responsible for their learning allowed for the achievement of higher course grades (Evans et al., 2010). This finding supports the notion of

increased knowledge acquisition and retention and satisfaction and self-confidence when the learner is actively engaged in their environment.

Experiential learning theory purports that one's experiences impact knowledge acquisition and retention. This theory supports learning based on the needs and the style of learning preferred by the learner, whether a student or a professional (Kolb, 1984). Additionally, it builds off the tenets of Piaget and Vygotsky. It thus can be used as a theoretical framework underpinning research on knowledge acquisition and retention, the impact of learning styles, and the use of virtual learning environments specifically related to the concepts of growth and development. Educators who implement this theory focus on the needs of their learners and thereby can enhance the learning process and outcomes.

Thus, the theoretical framework supporting the need for nursing students in a pediatric theory course to acquire and retain the knowledge of growth and development concepts can be illustrated using the theories of Piaget, Vygotsky, and Kolb. Each theorist discusses the individual student's needs as an essential facet of this process of learning and transfer of knowledge, and each supports active teaching and learning strategies that, for millennial students, could be in the form of virtual learning environments. These three theories also agree that the students must interact with the material in a meaningful way through active engagement to learn and feel satisfaction and self-confidence with their learning.

According to Kolb (1984), individuals who enter the human service disciplines, such as nursing, have concrete and people-oriented learning preferences (Kolb 1984). The four learning styles identified by Kolb (1984) include assimilator, converger, diverger, and accommodator (see Table 1).

Table 1. The Four Learning Styles Identified by Kolb (1984)

Learning Style	Characteristics
Assimilator	reason inductively; prefer concise, logical, organized information; less focused on people than abstract ideas effective in the sciences learners prefer information presented through readings and lectures with time for reflective analysis
Converger	like to solve problems and make decisions based on finding solutions to questions or problems prefer to engage in technical tasks and problems rather than with social issues and interpersonal issues In formal learning, situations prefer experimentation to see practical applications
Diverger	interested in people able to view concrete experiences from many perspectives gather information more emotional lean towards the arts prefer information presented through group work activities have an open mind
Accommodator	reliant on others for information prefer hands-on methods of learning tend to gravitate toward action-driven careers such as marketing or sales

Kolb (1984) identified that learning is lifelong, and learners can utilize combinations of learning styles at different times in their life. Further, the experiential learning theory encourages student exploration to promote learning and knowledge transformation (Kolb, 1984). Researchers have identified that students who actively engage in the classroom and clinical learning arenas are thought to have increased self-confidence, dependent upon their engagement, which is more experiential (Brannan et al., 2016; Mano et al., 2019). Further, students' preferred learning styles impact how they learn and how confident they feel in their learning.

The experiential learning theory is depicted as a cycle to demonstrate that learning can be defined as a process whereby knowledge is created through experience transformation (see Figure 1).

Figure 1. The Experiential Learning Theory

Thus, knowledge results from grasping and transforming the experience and giving it meaning (Kolb, 1984). Within the four cycles are the four identified learning styles. The learning styles are grouped within the cycle of experiential learning to conceptualize the dominant learning abilities. These learning groups are identified as concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) (Kolb, 1984). Each learning style utilizes a combination of learning abilities (see Table 2).

Table 2. Learning Styles and Learning Abilities

Learning Style	Learning Cycles
Assimilators	Abstract Conceptualization and Reflective Observation
Divergers	Concrete Experimentation and Reflective Observation
Convergers	Abstract Conceptualization and Active Experimentation
Accommodators	Concrete Experimentation and Active Experimentation

Using this model, Kolb (1984) postulated that educators who understand the diverse learning needs of their students would enhance their experiential learning and thus their acquisition and retention of knowledge. Several studies have been undertaken in nursing to assess the impact of learning styles on nursing students' course and program outcomes. Many of these studies used Kolb's reliable and valid Learning Style Inventory (LSI), which according to researchers who have also tested the instrument, demonstrates a Cronbach alpha of .73-.81, test-retest coefficient of .877-.917 (Lockie et al., 2013; Statistics Solutions, 2005).

Learning Style Studies in Nursing

As previously discussed, nurse educators must be able to make the connections from theory to practice, thereby guiding nursing students to make meaning out of their experiences in the classroom and clinical setting. The experiential learning theory guides nurse educators who want to incorporate a student-centered pedagogy into their teaching. Research on how to best create a student-centered pedagogy begins with understanding how students, including nursing students, best learn and has been conducted throughout the early years of the 21st century (Andreou et al., 2013; Brannan et al., 2016; Fleming et al., 2011; Hallin, 2014; Hampton et al., 2019; Hill, 2017; J. P. & Ranadev, 2018; Stirling, 2017; Vizeshfar & Torabizadeh, 2018).

Initially, in the education literature and now in the nursing literature, it is generally accepted that learning styles influence how a learner experiences an educational program and how they make meaning from it (Fleming et al., 2011). However, as Fleming and colleagues (2011) point out, despite this generally accepted precept, the concept of learning styles is not universally accepted, and there is much controversy around the concept altogether. Due to this controversy across several disciplines, Fleming and colleagues (2011) undertook a longitudinal

study to "examine changes in students' learning styles over time from a preference and dominance point of view" (p. 445).

A convenience sample of 58 nursing students in both the first and last term of the study completed The Honey and Mumford Learning Styles Questionnaire (LSQ) to determine participants learning styles. The students ranged in age from 17 to 49, and 97% were female while 3% were male. Honey and Mumford (2000) drew heavily from Kolb in creating their theory of learning styles. Thus, it is necessary to juxtapose Kolb's learning styles with Honey and Mumford to clarify the study results in terms of the Kolb theory of experiential learning.

Honey and Mumford (2000) identified four learning styles, Activist, Reflector, Theorist, and Pragmatist. These four learning styles when juxtaposed with Kolb's would look like this:

Activist = Accommodating = (to feel\to do—CE/AE)

Reflector = Diverging = (to feel\to watch—CE/RO)

Theorist = Assimilating = (to think\to watch—AC/RO)

Pragmatist = Converging = (to think\to do—AC/AE) (Sait, 2017, p. 1)

A paired sample t-test was used to examine the change in learning style preference from the first year to the last year. This study demonstrated that the student's preferred learning styles at both time points were that of reflector (Kolb, diverger)—69% and 57%, respectively. These outcomes were determined from the descriptive statistics used to analyze the data. These results are consistent with other studies in the literature (D'Amore et al., 2012; Suliman, 2010). Conversely, it is interesting that 21% of first-year students and 53% of the same cohort in their final year had no dominant learning style and seemingly used a combination of all the learning styles. The authors suggest using various teaching/learning strategies in designing nursing

curricula that are consistent with learner-centered education aimed to transform nursing education.

Consistent with the findings of Fleming and colleagues (2011), D'Amore and colleagues (2012) utilized the Kolb LSI-3.1 survey tool and a demographics survey distributed to 345 participants enrolled in their introductory first-year science courses in 2008. Sixty participants were excluded from the data analysis due to missing data for $N = 285$ participants.

Data analysis included a *t*-test in addition to one-way ANOVA and demonstrated a convergence of plots for the learning style diverger (29%) followed closely by assimilator (28.8%), then accommodator (23.9%), and converger (17.9%). These findings are consistent with other studies that the researchers cited in their literature review (D'Amore et al., 2012, p. 511). Nursing students tend to be divergers in their preferred learning styles and utilize concrete experimentation and reflective observation as their learning abilities. This finding supports Kolb's hypothesis that people who enter service professions are more concrete and people-oriented (Kolb, 1984).

Suliman (2010), in a two-group comparative survey, investigated how learning styles might differ between conventional and accelerated nursing students. The researcher found that of 600 nursing students divided between a conventional program ($N = 380$) and an accelerated program ($N = 220$), the predominant learning style was also that of diverger, again consistent with other nursing research findings. An additional finding in this study was that students' learning abilities (AE, RO, AC, CE) plotted on a scatter graph demonstrated a balance in learning abilities (Suliman, 2010). Another interesting finding of this study was that conventional students preferred a more hands-on approach to their learning than their accelerated counterparts.

This outcome may be due to the conventional students' age and eagerness. This finding was consistent with Kolb's (1984) postulation "that effective learning requires different learning abilities in whatever combination to satisfy learning situation needs" (Suliman, 2010, p. 141). Unlike Lockie et al. (2013), this study found no significant correlation between the relationship of learning styles and academic success (Suliman, 2010).

Interestingly, other studies of nursing students and their learning styles do not support the findings in the prior studies. For example, Hallin (2014) found that students tended to be "more or less heterogeneous" regarding the perceived learning style and that the majority fell into the "flexible" category indicating that they used multiple learning styles at any given time (p. 1448). This descriptive cross-sectional study of a convenience sample of 263 nursing students also discussed the finding that students in their final semester of nursing school preferred a lecture experience to an active learning experience. This finding is incongruent with the recommendations of the Institute of Medicine (IOM) for transforming nursing education.

Pettigrew and colleagues (2011) stressed that lecture leads to rote memorization with surface learning in contrast to the need for deep learning to develop critical thinking and clinical judgment skills despite students indicating that they prefer lecture. Despite the findings of their study, recommendations are for nurse educators to use new teaching strategies to promote deep learning and critical thinking. Hallin (2014) pointed out that in 1970 Dale, a preeminent educator, "found that after two weeks people remember 10% of what they read, 20% of what they hear, 30% of what is demonstrated but 90% of what is said and done in combination" (as cited in Hallin, 2014, p. 1447). This finding demonstrates the need for more learner-centered strategies, despite these not always being the learning method of choice of nursing students.

Another study with similar outcomes to Hallin (2014), Brannan et al. (2016), looked at an active learning strategy, simulation, versus lecture, assessing first students' learning styles and then the confidence and knowledge net gain/loss to determine the impact of learning styles. These authors utilized a convenience sample of 54 students in a baccalaureate nursing program enrolled in the senior-level adult health course. The purpose of the study was "to determine if learning styles affect students' confidence and knowledge about caring for a patient in distributive shock, having experienced one of two teaching methods: traditional classroom or simulation" (Brannan, 2016, p. 66). The researchers utilized a prospective, experimental, two-group, pre-test/post-test design for this study.

The outcome of this study demonstrated no significant difference ($p > 0.05$) in the impact of learning styles between or within groups as the learning styles were normally distributed. However, as with Hallin (2014), these findings, which it was thought would demonstrate an increase in student knowledge and confidence with the use of simulation over a traditional classroom, seem incongruent with the recommendations of the IOM for using active strategies to enhance student outcomes.

A more recent study supported the earlier studies that found nursing students tend to have a diverger learning style. Vizeshfar and Torabizadeh (2018) sought to correlate the students' learning styles with teaching styles. In an interventional study of 40 third-semester nursing students in a course ("The Principles of Patient Education"), the study participants' learning styles were assessed using Kolb's LSI. The sample comprised 55% female and 47% male, and of these participants, 57.5% expressed a desire for more interaction with learning material in the classroom. These researchers, continuing the work of earlier researchers (D'Amore et al., 2012;

Fleming et al., 2011; Suliman, 2010), found that most nursing students identify their preferred

learning styles as divergent (Vizeshfar & Torabizadeh, 2018). In this study, the researchers found

a statistical difference between learning styles and academic achievement, with the divergent

learning style scoring higher grades than the other learning styles (Vizeshfar & Torabizadeh,

2018). The authors stated in their discussion that there was "no statistical difference between the

demographic, educational characteristics and learning styles" (Vizeshfar & Torabizadeh, 2018, p.

106).

An incidental finding in the literature review noted an inconsistency in measurement

utilization, making it difficult to generalize findings from the research studies. A more focused

literature search based on the instrument used may increase the generalizability of the research

findings and support the notion that a student's learning style does impact their ability to acquire

and retain knowledge and increase their confidence to apply their knowledge to practice. Further,

the active learning activities in relation to learning styles need to be investigated to see if

millennials and GenZers prefer technological active learning strategies to traditional ones

(Chicca & Shellenbarger, 2018; Hampton et al., 2020; Towle & Breda, 2014). An active learning

activity that this group of students may prefer could be engaging in a virtual learning

environment such as My Virtual Child[©].

Virtual Learning Environments

Reviewing the literature on virtual aspects of education has highlighted an area of

necessary clarification: the terminology. Each article referred to something different—virtual

reality, virtual learning environment, virtual community, or virtual patient environment, to

identify a few. While each has some distinct characteristics, all virtual learning includes the

ability for the students to engage interactively with the material in a safe, non-judgmental

environment. Virtual learning environments can be considered a type of simulation. According to

the Healthcare Simulation Directory, a virtual simulation is "the recreation of reality depicted on

a computer screen… a type of simulation that injects humans in a central role by exercising…

decision skills, or communication skills" (Lopreiato, 2016, p. 56). These two definitions

highlight how a virtual learning environment can be considered a simulation. However,

according to Jeffries (2012), simulation

> involve[s] a student or group of students providing care for a patient who is represented
> by a manikin, an actor, or an SP, depending on the clinical situation. Often, simulation is
> an activity where students participate in groups and are observed by faculty. (p. 3)

Jeffries (2012) further identifies that reflection and debriefing are essential aspects of simulation,

and this element might be absent from a virtual learning environment. The allure of using online

technology in the form of a virtual learning environment is that the students can engage in the

process without the intervention of the faculty, either formally or informally, while still

providing an active learning experience. Ironically, this type of learning is based on an older

pedagogical theory of learning, experiential learning, as described by Kolb in 1984. Kolb's

theory posits that learning occurs when students directly interact with a situation, and

subsequently, "in situ problem solving occurs" (Goldschmidt, 2014, p. 281; Kolb, 1984). An

additional benefit to virtual learning environments is the lack of a time constraint, so the students

can reflect and possibly choose an alternative path resulting in an alternate decision after this

reflection. "This ability to take time and reflect on one's clinical performance and evaluate

strengths and weaknesses" plays a major role in becoming a safe practitioner and demonstrating

clinical judgment and reasoning skills (Goldschmidt, 2014, p. 282). Goldschmidt (2014) also

pointed out that virtual learning environments are a fun and creative way to improve learning and build upon experiences and appear to be "promising for expanding knowledge, behavior and skills" (p. 283).

As acknowledged throughout, nurse educators are challenged to transform nursing education towards a goal of increasing the transfer of knowledge from the theoretical realm to the practice realm (Benner et al., 2010; Billings & Kowalski, 2006; Hampton et al., 2020; Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, 2011; 2011; Lockwood, 2016). Likely not having been taught how to teach, many nurse educators may continue to utilize old and outdated methodologies while the millennial and GenZ students in the classroom today are far different than in preceding decades (Chicca & Shellenberger, 2018; Hampton et al., 2020; Towle & Breda, 2014). The millennial and GenZ students are "easily bored, expect variety, are self-directed, have high levels of self-esteem, are collaborative, ethnically diverse, and crave interactivity" (Chicca & Shellenbarger, 2018; Roehling et al., 2011; Towle & Breda, 2014). Thus, educators need to rise to the challenge of creating curricula that engage these generations of learners who will be the future nurses and leaders in society.

GenZ students, like their millennial predecessors, have been raised in a technologically advanced environment and can shift their attention rapidly from one technology to another (Chicca & Shellenbarger, 2018; Roehling et al., 201; Towle & Breda, 2014), which results in students with low tolerance levels for boredom and a heightened need for constant interactivity. A virtual learning environment for the millennial and GenZ students to engage in would appeal to their interactive learning desires. Despite these progressive character traits, millennials are "highly sensitive to criticism and reluctant to speak if they feel uninformed or are unsure of how

their comments will be received" (Roehling et al., 2011, p. 6), and GenZers "are not sure they will succeed, take fewer risks, and are likely to have a backup plan in case things do not work out" (Chicca & Shellenbarger, 2018, p. 181). While there is some research about how millennials learn and transfer knowledge into the real world, there is less related to the same concepts for the current generation of college students, the GenZers. Research on these two generations of students is vital as nurse educators will likely be teaching these students in today's nursing classrooms.

Teaching: Learning Preference Literature

While technological advances in higher education have burgeoned in the past two decades, literature about the impact of these strategies in nursing education remains limited. In an early study, Kraus and Sears (2008), in a primary survey design, sought to understand the teaching preferences of millennial students with a convenience sample of 15 psychology teachers and 120 undergraduate student volunteers. On a Likert-type scale, participants rated the level of interest and effectiveness of 17 pedagogical teaching strategies, including how effective the strategies were at helping them learn. A limitation is the lack of a reliability and validity discussion of the survey instrument. Definitions of the activities were purposefully not provided to participants allowing for individual interpretation and rating based on their own experiences (Kraus & Sears, 2008). The lack of definitions could be construed as a limitation to this study. Specific definitions of concepts or terms improve participant understanding and support better data interpretation.

This study demonstrated students' preference for active, student-centered teaching strategies to gain knowledge about a subject matter. Students strongly valued discussion,

projects, papers, and lab work as effective teaching strategies mainly because they involved themselves personally with the material, as demonstrated by the *t*-test analysis $t = (16) = 10.02$ *p* < .001 (Kraus & Sears, 2008), which is consistent with Kolb's diverger learning style predominant amongst nursing students. The least valued teaching strategies included quizzes, tests, textbook reading, journal writing, student presentations, and lecture, as they felt more isolated with these strategies (Kraus & Sears, 2008). These findings reinforced what cognitive psychologists have posited for decades, to learn something, one has first to pay attention and be involved in manipulating the material to make meaning of it for themselves. This finding supports Dale's (1969) notion that students retain 90% of what is said and done in combination after a period of time (as cited in Hallin, 2014).

In a study with a contradictory outcome to Kraus and Sears (2008), Hampton et al. (2020) found that GenZ students preferred lectures with audience response clickers over other teaching methodologies (Hampton et al., 2020). This contradictory outcome could be attributed to the study participants, those in the Kraus and Sears (2008) study were identified as millennials, and those in the Hampton et al. (2020) study were identified as GenZers.

These authors sought to "identify the teaching methods that Generation Z nursing students preferred, what teaching methodologies they identified as most engaging and effective for learning, and to understand student opinions about the use of a flipped classroom model" (Hampton et al., 2020, p. 161). The descriptive, cross-sectional survey study recruited participants enrolled in a traditional baccalaureate nursing program at a university in the south-central United States. Students born after 1995, the beginning of the GenZers, were invited to participate in the study. The study parameter timeline was conspicuously absent from this

research presentation and would seem to limit the interpretability and generalizability of the presented outcomes.

A total of 103 students participated in the study with a birth year breakdown of "1995, *N* = 23; 1996, *N* = 36; 1997, *N* = 22; 1998, *N* = 22 for a total of 103 participants" (Hampton et al., 2020, p. 162). The potential challenge with this sample is that when surveyed, the 1995–1997 participants were beyond the traditional college age of 18–22 years, potentially being 23–24 years old. This age group might have developmental maturity that could influence their thinking and opinions dependent on their learning experiences prior to attending a 4-year university. Traditional GenZ-aged college students would be those born in 1998–2002 who would be starting as traditional 18-year-old freshmen through seniors. Hampton et al. (2020) found that GenZers "prefer intrapersonal learning… and they do not like to be lectured at and want to be involved in their learning" (p. 160). To measure the learning preferences of these participants, the authors utilized a teaching preference survey the researcher created and adapted. This finding seemed to imply that the instrument had been used for a previous study. However, this was not made clear. Further, no reliability or validity data were presented for this researcher-created instrument which may cause implicit bias. Thirteen teaching methods were represented on the survey, and students were asked to rank them in two ways. First, based on those they felt they liked the best and found most engaging and secondly on those they felt were most effective in helping them learn. By combining the first two elements, "liked best" and found "most engaging", the results are sullied in that it is impossible to know if "liked best" indicated "most engaging." Often students "like" something because they do not have to exert much effort, such as in a teacher-centered lecture, where the students just show up. Furthermore, since most of the

students were actually beyond traditional college-age at the time of the survey, this may have skewed the results.

The survey results found that 94% and 95%, respectively, found that a lecture with audience response clickers was the preferred/most engaging and effective teaching-learning methodology (Hampton et al., 2020). Like the Kraus and Sears (2008) study, students found that quizzes, internet searches, assigned readings from the text, assigned readings from journals or other sources, and blogs were what they least liked/engaged in and found least effective for learning (Hampton et al., 2020). Interestingly, despite having students closer to the millennial generation (1995–1997), most of the respondents preferred the traditional to the flipped classroom, which is surprising given the characteristics of the GenZers of being more self-directed, intrapersonal learners.

Virtual Learning Literature

Virtual learning is a technology that can provide an interactive student-centered teaching strategy in which students can gain knowledge and practice applying it in a safe, non-judgmental environment. Kyaw and colleagues (2019) conducted a meta-analysis of 31 studies to evaluate the effectiveness of virtual reality (VR), identified as participant interaction with any form of virtual technology, including computer-based to individually worn headsets, in pre-and post-registration health professions education. Their results found that VR slightly improved post-intervention knowledge scores when compared to traditional learning or other types of digital education such as online or offline digital learning: [SMD] = 0.44; CI 95%, 0.18–0.69; $I^2 = 49\%$, demonstrating moderate certainty evidence (Kyaw et al., 2019). They also found that VR offers "a range of other educational opportunities, such as the development of cognitive, nontechnical

competencies" (Kyaw et al., 2019, p. e12959). Despite using a search parameter from 1990 to 2007, it is essential to note that none of the included studies was published prior to 2005, which "suggests that VR is an emerging educational strategy, attracting increasing levels of interest" (Kyaw et al., 2019, p. e12959). These authors felt that VR could transform health education but acknowledged that more research in this area is necessary.

In nursing education, a comparison of nursing research on virtual learning to other disciplines demonstrates positive outcomes for enhancing students' acquisition and retention of knowledge. Sixty-seven nursing students participated in a comparison of traditional lecture (TL) with computer-assisted instruction (CAI) about the difficult concept of congenital heart disease (Rouse, 2007). The 67 student participants were subdivided into three groups, group 1 received TL in the winter of 2006; group 2 received CAI in the spring of 2006, and group 3 received both TL and CAI in the winter of 2007. Students participated in the study during class time for the TL portion and one hour prior to class for the CAI portion. The author neglected to discuss how the students were sorted into the groups, nor how many students were enrolled in the course at the time, which may have impacted study outcomes.

Students were tested using a pre-and post-test, and the post-test scores differed significantly from the pre-test scores ($p < .01$) (Rouse, 2007), with each group demonstrating significant improvement. Interestingly, the TL group had the most significant difference in pre- and post-test scores, while the CAI/TL had the least significant increase in scores. This finding might be attributable to student preparation prior to the day of the study evaluation. Often students who know they will receive a TL do not read prior to class as they prefer the back-in method of learning, hear what the teacher feels is important, then do that reading, further

reinforcing the concepts. While the students who participated in the CAI and CAI/TL had higher

pre-test scores, this could be attributed to reading prior to engaging in the CAI before class

because they were interested to see how they would interact with the material and felt a need to

have some prior knowledge. Rouse (2007) postulated that the differences might be attributable to

learning styles or time constraints on the CAI occurring only one hour prior to the TL.

Regardless of the limitations, this study did demonstrate that CAI is an effective student-centered

teaching strategy, especially when combined with TL.

It is postulated that technological advances can alter how students learn and that neither

the nurse educator nor the textbooks should be the only sources of information in today's digital

world. These studies demonstrate that for both the millennial and generation Z students, active

learning via a virtual learning environment supported their desired preference of how to learn the

material in the educational setting. Nurses working in today's technologically advanced

environment must have technical skills related to technology, and it should be a focus of nurse

educators to create technologically focused curricula on building these necessary competencies.

Virtual learning environments are student-centered strategies nurse educators can implement in

the curricula to assist students with acquiring knowledge and increasing self-confidence, both of

which will also translate to practice. Nurse educators should use the finding of these studies to

underpin their necessary pedagogical shift to student-centered learning to educate better future

nurses who are self-confident in their clinical practice.

Satisfaction in Nursing Education

Student satisfaction in learning is often tied to their self-confidence, and the instruments

to measure either concept are often combined into one instrument. In the past 12 years, only

eight studies that specifically addressed student satisfaction in learning and not additional factors of satisfaction with higher education were found. Of those eight, only three are specific to nursing. However, of those three, only one is relevant to this review of literature as the other two relate to the students' overall satisfaction with multiple factors of their education, not their learning specifically. This paucity of literature can be evaluated in two ways. First, there needs to be more research on this important concept in nursing education; and secondly, as previously mentioned, there is literature on this concept, but it is most often tied to the research on student self-confidence in the nursing research. This finding was likely due to the creation of the NLN Student Satisfaction and Self-Confidence in Learning instrument by Jeffries and Rizzolo in 2006.

Smith and colleagues (2018) completed a grounded theory study to examine student satisfaction with learning in undergraduate nursing programs (Smith et al., 2018). Constructivist grounded theory methodology guided this study on determining how students determine satisfaction with learning identifying that constructivist inquiry facilitates the meaning-making of experiences (Smith et al., 2018). Participants were sought, utilizing a sampling frame, with various ages, gender identities, entry pathways to the programs, grade point average, modes of delivery, and years in the program from two large, multi-campus universities in Australia (Smith et al., 2018). A total of 17 participants volunteered to participate in semi-structured interviews after being informed of the purpose of the study and indicating consent. The researchers conducted 29 semi-structured interviews, and "consistent with interactionism, interviews were analyzed for action and meaning" (Smith et al., 2018, p. 176).

Based on the themes that emerged from the coded data, the authors concluded that "nursing students are satisfied with their learning when they shape a valued learning journey"

(Smith et al., 2018, p. 179). This study is important to nursing education as it demonstrates the necessity of nurse educators to consider the value of what they require of the students. The authors hope that this study will provide "nurse academics with an additional framework for understanding student satisfaction with undergraduate nursing programs and suggests where additional strategies to enhance satisfaction may be beneficial and where they may not" (Smith et al., 2018, p. 179).

In the disciplines of education and psychology, two studies specifically address student satisfaction with learning. Topala and Tomozii (2014) sought to validate a newly created student satisfaction with learning instrument. In their review of literature, these authors point out the paucity of literature specifically related to satisfaction with learning and not with the multi-faceted aspects of attending university (Topala & Tomozii, 2014). The purposive sample for this descriptive correlational study was recruited from adult students in the Psychology and Educational Sciences program at a university in Transylvania. Eighty students consented to participate in the reliability, and validity testing of the researcher created Student Learning Satisfaction Questionnaire (SLSQ) and completed the questionnaire related to their perceptions of learning in their educational program (Topala & Tomozii, 2014).

Data analysis demonstrated an overall reliability of Cronbach's alpha of 0.94 for the instrument as a whole and item reliability for each factor. The factors identified in the instrument included individual characteristics ($\alpha = 0.870$); material conditions and learning facilities ($\alpha = 0.714$); teacher and instructional activities ($\alpha = 0.921$); learning outcomes ($\alpha = 0.921$); learning environment ($\alpha = 0.815$); and peer relationships ($\alpha = 0.906$) (Topala & Tomozii, 2014, p. 384). Despite the authors opining about the paucity of literature specifically dedicated to just learning,

their scale accounts for other factors like the environment and peer relationships, which decreases the specificity of the instrument to just a learning experience and makes it more amenable to an assessment of overall satisfaction with learning in general.

Similarly, Hyun and colleagues (2017) sought to determine students' satisfaction with learning in active learning classrooms versus traditional classrooms. These researchers defined active learning as a student-centered pedagogy that is anything other than a lecture that engages students individually and in groups (Hyun et al., 2017). The researchers recruited their convenience sample for their correlational study from sixteen classes of both undergraduate and graduate students. "Five of the classes were taught in active learning classrooms (four undergraduate and one graduate), and eleven of the classes were taught in traditional classrooms (seven undergraduate and four graduate)" (Hyun et al., 2017, p. 110). The sample was culled from across multiple disciplines, including undergraduate courses in business, economics, geography, political science, and theology, while the graduate courses were mainly in business administration, education administration, and counseling (Hyun et al., 2017).

The data analysis of the proposed hypotheses found that "classroom-type was a statistically significant predictor of student satisfaction; $p = .032$" and "that active learning pedagogy was also a statistically significant predictor of student satisfaction; $p = .019$" (Hyun et al., 2017, p. 113). Additionally, the data further elucidated that students were satisfied with their learning in the active learning classroom and satisfied with their group learning process; $p = .025$ (Hyun et al., 2017, p. 114). Thus, the researchers concluded that active learning pedagogy activities could transcend the rigidity of the classroom structure for both individual and group learning processes to improve satisfaction with learning (Hyun et al., 2017).

These studies demonstrate that student satisfaction is a powerful and statistically significant factor in student learning. Thus, it is incumbent upon nurse educators to move towards active learning strategies to increase student satisfaction and, ultimately, their self-confidence and their learning.

Self-Confidence in Nursing Education

"Self-confidence is an attribute that may be fostered or mired and can be influenced by many factors" (White, 2009, p. 103). In a concept analysis of self-confidence White (2009) points out that "nursing is a service profession and those in its care must feel safe and reassured" (p. 103). As such, the possession of self-confidence is critical for nurses in practice and nursing students in their journey to become nurses.

It is crucial to distinguish between self-confidence and self-efficacy as they are often conflated in the literature. Self-efficacy refers to a person's belief in their ability to implement behaviors necessary to goal achievement, while self-confidence is "a person's belief that he or she can succeed… and is context-specific to particular tasks" (Perry, 2011, p. 219). Self-confidence is a necessary antecedent to self-efficacy and a necessary characteristic for nursing students.

Knowledge acquisition is the precursor to self-confidence, and knowledge can be achieved either through formal or informal education (White, 2009). In line with Bandura's (1994) self-efficacy theory, learning and learning reinforcement do not have to be individually achieved but can be attained through vicarious experiences such as an active learning strategy like simulation or a virtual learning environment. In addition to knowledge acquisition for the attainment of self-confidence, students need to feel supported in their learning endeavors. Nurse

educators can be seen as role models for nursing students and encourage to enhance a student's motivation to learn and succeed (Perry, 2011).

Many research studies related to the self-confidence of nursing students can be found in the literature of the early 21st century, then there seemed to be a lull in the interest of researching this topic with a new resurgence of literature since 2012. Multiple authors have utilized the active learning strategy of simulation to study the effect on students' self-confidence and knowledge acquisition utilizing various self-confidence tools. Few researchers have looked at the virtual learning environment and its effect on students' self-confidence and knowledge acquisition.

Self-Confidence Literature

In a systematic review of self-confidence in a simulation conducted between 2007 and 2017 by Labrague et al. (2019), existing scientific articles were critically analyzed to ascertain the influence of utilizing high fidelity simulation (HFS) on the effects of nursing students' anxiety and self-confidence during undergraduate nursing education (Labrague et al., 2019). Six electronic databases were interrogated for literature on this subject matter and included ProQuest, SCOPUS, MEDLINE, PubMed Central, CINAHL, and Psych INFO. Out of 582 papers, 35 met the inclusion criteria of "evaluating the effects of HFS on nursing students' anxiety levels and self-confidence" (Labrague et al., 2019, p. 359). Quantitative, qualitative, and mixed methods studies were included in the final selection. In the authors' screening method to identify articles, they worked from the premise of irrelevance to their inclusion criteria despite being in the search results (582 results) and included the title of the paper (356 excluded), the abstract (76 excluded), full-text screening (45 excluded) which ultimately resulted in only 105

papers to be thoroughly reviewed. Further elimination of papers occurred with those deemed to have methodological problems resulting in the final 35 papers.

As a result of the simulation experience, self-confidence was one of the two criteria of this review. Of the 35 papers, 29 assessed the effects of HFS on nursing students' self-confidence. Most of these studies identified HFS as an effective learning pedagogy for simulation, with the effect being an increase in student self-confidence. Of the 29 studies, 26 demonstrated a statistically significant increase in students' self-confidence following an HFS. However, three studies demonstrated no significant change. It was noted that students' self-reported self-confidence levels in clinical were higher for students who experienced a preclinical simulation experience. "Participants reported that the simulation-based activity was meaningful, facilitated the better development of their knowledge and skills and further enhanced their self-confidence in their performance of skills" (Labrague et al., 2019, p. 364). Thus, these authors concluded that HFS is a meaningful activity to enhance students' self-confidence in caring for patients.

In a focused study, Kim and Kim (2015) studied 94 undergraduate nursing students' knowledge, clinical reasoning, and self-confidence in a quasi-experimental study utilizing the intervention of simulation at a university in South Korea. Knowledge was measured using a 10-item multiple-choice written exam covering topics from the simulation on gastrointestinal bleeding (GI bleed) and compartment syndrome (CS). As a measure of reliability, the Kuder-Richardson formula 20 was calculated. The reliability coefficient was .74 and .71 for GI bleed and CS, respectively, indicating relatively good reliability (Kim & Kim, 2015). Self-confidence was measured with a modified version of the scale developed by Hicks et al. in 2009, which was

comprised of a questionnaire of 11 items measured on a 5-point Likert-type scale that assessed self-confidence on eight domains. The Cronbach alpha of the scale was identified as .85 for pre-test, and .92 for post-test in the GI bleed scenario and 0.70 for pre-test and .86 for post-test in the CS scenario (Kim & Kim, 2015).

Results demonstrated that the pre-/post-self-confidence scores were not statistically significant between groups ($t = 0.81$, $p = .418$). Following crossover for the second simulation, results still did not demonstrate statistical significance between groups ($t = 1.10$, $p = .276$). This lack of statistical significance could be explained by the fact that first-time simulation experiences in students with no prior clinical practice may cause performance anxiety resulting in poor confidence (Kim & Kim, 2015). Thus, the authors concluded that since "self-confidence is an important variable in simulation education, more work is needed to identify predictors of self-confidence, and to find strategies that can elevate students' self-confidence" (Kim & Kim, 2015, pp. 610–611).

Similarly, Chuang et al. (2018) found no statistically significant difference between the intervention and the control group on the measure of self-confidence in their study. These authors looked at the effect of a skill demonstration video via smartphone delivery and nursing students' self-confidence (Chuang et al., 2018). Utilizing a randomized controlled trial study design, a convenience sample of 90 nursing students at a university in northern Taiwan enrolled in the Fundamentals of Nursing Practicum course were recruited (Chuang et al., 2018, p. 64).

These authors utilized a 5-item confidence scale (C-scale) developed by Grundy in 1993. The C-scale was then translated into Chinese by Jones and colleagues in 2001, according to Chuang et al. (2018). There have been more recent and updated self-confidence scales, and thus

this could affect the study outcome. Data analysis via an ANCOVA test to examine the effectiveness of the intervention demonstrated no statistical difference between groups on the C-scale (F = 2.201, p = 0.142) (Chuang et al., 2018, p. 65). However, this study did demonstrate an increase in both groups' confidence in performing urinary catheterization skills after watching skill videos via their smartphone (intervention group) or through a DVD (comparison group), which suggests that video learning is an effective teaching modality for increasing students' overall confidence in skill performance (Chuang et al., 2018).

Lubbers and Rossman (2017) had similar findings to the previous studies in their research on student satisfaction and self-confidence in a pediatric community simulation. These researchers utilized a quasi-experimental design with 61 undergraduate nursing students in the pediatric theory and clinical course at a small Midwestern university. This convenience sample of participants utilized the NLN Student Satisfaction and Self-Confidence in Learning Scale (SSSC) to assess students' perceptions of their satisfaction and self-confidence with learning after participating in five community-based pediatric scenarios over a five-week timeframe. The results of the SSSC instrument demonstrated that "students in this experience reported a high level of satisfaction and self-confidence with the simulation experience as a whole… M = 4.04 SD 0.44" (Lubbers & Rossman, 2017, p. 143). These authors failed to provide any further statistical analysis of the data from this study, but the overall results support the findings of previous studies on student satisfaction and self-confidence in learning with the intervention of simulation.

Karkada and colleagues (2019) also concurred with earlier studies that indicated simulation to be an effective pedagogy for increasing student satisfaction and self-confidence in

learning. This quasi-experimental study utilized a convenience sample of 69 nursing students registered in the Fundamentals of Nursing Laboratory course at one university in Oman. In a two-group intervention, the control group received a traditional case scenario teaching about inserting a nasogastric tube while the experimental group learned the skill during a simulation (Karkada et al., 2019). Satisfaction and self-confidence in learning were measured using the NLN SSSC instrument. The results demonstrated a positive statistical significance in satisfaction and self-confidence in the experimental group over the control group $p < 0.001$ (Karkada et al., 2019, p. 531). Thus, the authors felt that the outcomes of this study showed that while there was a positive increase in knowledge of both groups, the experimental group had a statistically significant increase in satisfaction and self-confidence in learning via a simulation than the control group had learning via traditional methodology (Karkada et al., 2019).

Likewise, de Oliveira Costa and colleagues (2020) found similar outcomes in their study of 34 nursing students between the fifth and ninth semesters of the nursing program. This non-probabilistic convenience sample was then subdivided into an experimental ($N = 17$) and control group ($N = 17$). The control group received the traditional education methodologies, including lecture and simulated skill training, while the experimental group educational methodologies included simulated scenarios and lecture classes and skills training (de Oliveira Costa et al., 2020). Data analysis demonstrated that the experimental group had higher mean values on both the satisfaction and self-confidence subscales than the control group. However, this was not statistically significant ($p = 0.812$ and 0.136, respectively) (de Oliveira Costa et al., 2020). Despite the lack of statistical significance, these authors concluded that simulation strategies along with traditional methodologies could be used mutually in nursing education.

Finally, Powers (2020), in a study using an unfolding video patient scenario in the classroom, demonstrated student satisfaction and self-confidence in learning utilizing the NLN SSSC instrument. In this one-group quasi-experimental study, 54 students comprised the convenience sample from a university in the southeast United States. The author presented an unfolding Real-Life Clinical Reasoning Scenario video created by Academic Technologies Institute (ATI). Prior to the intervention, the PI asked the participants to complete the NLN SSSC instrument based on previous simulation experiences in the simulation laboratory (Powers, 2020). After the in-class unfolding video scenario and debrief were complete, the students completed the NLN SSSC instrument again. Data analysis found that students had higher mean scores for satisfaction and self-confidence after the in-class video scenario than they had for previous laboratory-based simulations and that this finding was statistically significant at $p = 0.002$ (Powers, 2020).

These studies demonstrate that the active learning strategy of simulation, whether in the simulation lab, community, or via video, resulted in increased student satisfaction and self-confidence in learning. This finding is an important in nursing education that supports the IOM's call for the radical transformation of nursing education from sage on the stage to guide on the side and the incorporation of student-centered learning activities to support not only knowledge acquisition but also self-confidence in their ability to transfer their knowledge and skills to their clinical practice.

Nursing Student Satisfaction and Self-Confidence With Learning in a Virtual Learning Environment

As mentioned, the students in nursing programs today belong to Generation Z and, to a

smaller extent, the millennial generation. These students have different expectations for their

learning and expect to have a high level of satisfaction (Towle & Breda, 2014). It has been

discussed that nurse educators must change their teaching pedagogies from sage on the stage to

guide on the side by integrating active learning strategies that support experiential learning into

the classrooms. In particular, nurse educators who teach the pediatrics course in nursing

programs must focus on developing students' knowledge related to the concepts of growth and

development. Further, given that the students in the classroom are mostly considered digital

natives, nurse educators need to create active learning experiences that appeal to the digital

natives and provide motivation for learning that leads to satisfaction and self-confidence with

learning. The use of the VLE, My Virtual Child[©], for this research study meets these

qualifications.

The My Virtual Child[©] virtual learning environment provides the students in a pediatric

theory/clinical course the opportunity to raise a virtual child from birth to 18 years of age,

making parenting decisions that directly impact the child's cognitive and psychosocial

development across the pediatric age-span. According to Manis (2009):

> …at each age, the student will hear about various milestones the child has attained,
> specific problems the child is having, or experiences that occur in the family or the school
> or community environment, and the student will be able to make decisions about how to
> parent the child. (p. 6)

Manis (2009) also adds:

> Users running the program will see a series of about 296 screens, on each of which is a
> message if they run all the way through age 18 years. There are several types of
> messages, including instructions, a description of an event that happened to the child,
> interactive parenting questions where the student has to decide what to do as a parent in a
> specific situation involving the child, a report on the child or a set of reflective questions
> for the student to answer in class or through a written response. (p. 4)

This interactive virtual learning environment, created for psychology students and used in a pediatric theory course, is postulated to be a creative student-centered active learning experience that will assist pediatric nursing students in their knowledge acquisition and subsequent satisfaction and self-confidence with learning pediatric growth and development. Unfortunately, there are no research studies in the literature about using this virtual learning environment with pediatric nursing students. There are, however, a few articles about using virtual patients in the nursing literature and utilizing My Virtual Child[©] in the psychology and education literature.

Zimmermann (2013) explored using the My Virtual Child[©] virtual learning environment to teach child development in a 200-level developmental psychology course at a southeastern university in the United States. The researcher expounded upon the notion that "for child development courses, student exposure to the different stages of child development is often quite limited because access to children at different ages is generally restricted" (Zimmermann, 2013, p. 138). The author further explained that "even in settings where children are available for class purposes, situations that involve decision making by the students on aspects of child behavior and care are not present" (Zimmermann, 2013, p. 138). She further discusses the need for real-world experiences to foster the learning of the concepts of growth and development, and as pointed out in Kolb's (1984) experiential learning theory, learning is fostered through making meaning of experiences.

Zimmermann (2013), in a quasi-experimental mixed-methods study, divided the convenience sample of 100 students into two groups. The control group used the standard method of lecture and textbook readings, while the experimental group participated in raising a

virtual child in the My Virtual Child$^©$ virtual learning environment. The participants were

divided across four semesters, with the first two semesters being the traditional methods in fall

2010 and spring 2011 and the virtual learning environment being used in fall 2011 and spring

2012. The qualitative aspect of the study related to the researcher creating questions inquiring

about the students' feelings about their experience with raising a virtual child. The questions

included:

1.   Did the MVC program help you relate to the class material? Why or why not

2.   How do you think programs like MVC differ from traditional textbooks in helping you

       to understand the class material?

3.   Do you think using simulation programs like MVC makes it easier to relate class material

       to the real world? Why or why not?

The researcher coded students' responses to demonstrate increased student engagement, as

evidenced by statements like:

> "A lot of what we learned in class went right along with the program and helped make
> the concepts make more sense."
> "Yes, because I based my parenting decisions on the material I learned in class."
> "I believe it does make it easier to relate class material to the real world because it sets up
> real life situations that could happen." (Zimmermann, 2013, p. 140)

Additionally, Zimmermann compared the exam grades from the four sections and found no

statistical difference in the scores between the traditional method group and the active learning

method group. However, student engagement was increased, which could be correlated to

student satisfaction with learning. As the researcher pointed out, "the results of the current study

suggest that the use of online virtual simulation programs can increase students' engagement

with, as well as their grasp and retention with class material" (Zimmermann, 2013, p. 142).

Similarly, Symons and Smith (2014) found similar results to Zimmermann's research. These researchers sought to ascertain evidence of psychological engagement in the virtual learning environment, My Virtual Child©. This qualitative records-keeping method study with a convenience sample of 117 students recruited from the second-year developmental psychology course utilized the responses to two questions on the teaching evaluation and a bonus question on the final exam to collect the data. The two teaching evaluation questions germane to the study included rating the MVC for "being helpful in understanding the course material" and "encouraging critical thinking and analysis" (Symons & Smith, 2014, p. 54). The bonus question on the final exam had the directions that "there are no right, or wrong answers and you get a point for answering anything at all" and asked, "Do you have any strong feelings about your virtual child? What are they? Why?" (Symons & Smith, 2014, pp. 54–55). Written responses were coded for emotional content and behavioral responses to the virtual child assignment.

The analyzed data demonstrated that 88% of the students rated the assignment of raising a virtual child as either good or very good, and no one rated it as poor or very poor. Of the emotional coded responses, 84.62% identified having formed a relationship/had a positive experience, 33% expressed pride in their virtual child, and 15.83% expressed love, care, affection, interest, and excitement in their virtual child. Of the coded behavioral responses, 51.27% identified self-reflection that assisted in gaining insights about self or childhood; 17.09% said the assignment assisted in learning course content, while 34.19% mentioned aspects of the course content specifically. Thus, the authors concluded from these results the following:

> …students raised a virtual child and reported a considerable amount of psychological engagement in terms of a forming relationship with their child, having emotional reactions towards their child and the experience itself and behavioral reports that they found the experience personally meaningful. (Symons & Smith, 2014, p. 56)

These authors further pointed out that student engagement has become a critical pedagogical goal of higher education, and this can be extrapolated to student satisfaction with learning.

These studies demonstrate the positive outcomes of using a virtual learning environment, specifically, My Virtual Child©, on student learning and engagement. However, these studies were not conducted in nursing, and to this author's knowledge, this VLE has not been used in nursing education.

Summary of Review of Literature

Literature in nursing, education, and psychology suggests that active learning strategies are the best way to transform education from teacher-centered to learner-centered (Benner et al., 2010; Chicca & Shellenbarger, 2018; Schmitt & Lancaster, 2019). Many studies have been conducted over the previous two decades, and some find that students in both the millennial and GenZ populations prefer active learning strategies while others found they did not. This dichotomy needs to be further researched given the learning traits and characteristics of both generational age groups: being self-motivated, independent learners who prefer to see and do as opposed to read and listen. Despite the outcome of the research studies, enhancing student outcomes aimed at success still requires the learner's active engagement. These learners will best be served by taking an active role in their learning through embracing active learning strategies that support the experiential theory of learning. Nurse educators first must embrace the path to transformation and then portray the benefits of being a facilitator or "guide on the side" rather than the old way of "sage on the stage" (Morrison, 2014). This research study will utilize the active learning strategy of a virtual learning environment.

CHAPTER THREE

METHODOLOGY

The overall purpose of this study was to describe the relationship between knowledge change, self-confidence, and satisfaction with learning using a virtual learning environment (VLE) to learn concepts of growth and development across the pediatric age span. The overall aim explored what relationships exist among knowledge change, satisfaction, and self-confidence in learning in a pediatric theory course. Results of this study can inform nurse educators who wish to add VLE to their courses about knowledge acquisition, satisfaction, and self-confidence of students who engage in the VLE in a theory course.

The following research questions were addressed:

RQ 1: To what extent does the use of a VLE change pre-licensure nursing students' knowledge of concepts of growth and development in the pediatric population?

RQ 2: To what extent does the use of a VLE change pre-licensure nursing students' satisfaction with learning concepts of growth and development in the pediatric population?

RQ 3: To what extent does the use of a VLE change pre-licensure nursing students' self-confidence with learning concepts of growth and development in the pediatric population?

Hypotheses

Null Hypothesis 1 (H_{01})

There will be no statistically significant difference in the knowledge of growth and development from the pre-test to the post-test.

Null Hypothesis 2 (H$_{02}$)

There will be no statistically significant correlation between change in knowledge of growth and development concepts and satisfaction in learning using a VLE to learn pediatric growth and development concepts in a pediatric theory course.

Null Hypothesis 3 (H$_{03}$)

There will be no statistically significant correlation between change in knowledge of growth and development concepts and self-confidence in learning using a VLE to learn pediatric growth and development concepts in a pediatric theory course.

This study explored if there was a statistically significant change in students' knowledge of growth and development concepts across the pediatric age span, determined by a comparison of pre/post-test scores. Additionally, this study also explored the students' perceived satisfaction and self-confidence with learning the concepts of growth and development using a virtual learning environment, My Virtual Child$^{©}$. The National League for Nursing (NLN) Student Self-Confidence and Satisfaction in Learning instrument was used to answer research questions 2 and 3 about the students' perceived satisfaction and self-confidence with learning. This chapter discusses the study design, setting, sample and recruitment, reliability and validity of the instruments, ethical considerations, data collection, analyses, limitations, nursing implications, and discussion for future research.

Design

A cross-sectional descriptive correlational study design was implemented utilizing a pre-test/post-test to assess for any statistically significant change in knowledge. The single-group pre-test/post-test design utilized an author-created assessment instrument entitled Growth and Development Knowledge Assessment, with data collected both before and after the use of the

VLE. A pre-test/post-test design allows the researcher the possibility of separating the effect of prior knowledge from the outcome (Trochim et al.,2016). There are inherent threats to internal validity related to the possibility of the pre-test influencing the results of the post-test. A large sample was recruited to address the threat to internal validity from not using a random sampling. Further, adding exclusion criteria of having children and or having completed the VLE in a previous course assisted in offsetting the threat to internal validity related to previous knowledge of the condition being studied.

Additionally, a cross-sectional descriptive correlational study design was implemented to assess whether there was a statistically significant relationship between knowledge change, student satisfaction, and self-confidence with learning after engaging in a VLE. This type of study is effective in addressing research questions related to the "incidence or prevalence of a condition, belief or situation" (Regoniel, 2020, p. 1) and in further paving the way for future research, given the ability to show a correlation even though it may not be able to demonstrate a direct cause. This study examined how students' knowledge changes, and self-confidence with learning correlated with their perceived level of satisfaction after engaging in a VLE.

This study design is effective and efficient for achieving the goals of this research study in that it drew from a sample of the population of nursing students in a pediatric theory/clinical course, and all data were collected within a short time frame of six weeks (Hulley et al., 2013).

Setting

The study took place at a private, medium-sized Midwestern university. The participants were recruited from the pre-licensure nursing students enrolled in the pediatric theory/clinical course across the three undergraduate pre-licensure nursing programs at this university. These

programs include a traditional 4-year BSN (TBSN), an in-person Accelerated BSN (ABSN), and Hybrid/Online BSN (H-ABSN) program options.

Sample

This convenience sample helps garner insights into the target population (nursing students enrolled in a pediatric theory/clinical course) (Hulley et al., 2013). The sample was recruited from the nursing students enrolled in the senior level of the TBSN program or the third semester of the ABSN and H-ABSN program pediatric theory/clinical course in the Fall 2021 semester. The sample recruited was homogeneous because all senior and third-semester nursing students took the pediatric theory/clinical course in the identified semester (Glen, 2020). These students were enrolled across six theory course sections in the three nursing program options. The entire population from which to recruit the participants totaled 240 students, TBSN-79, ABSN-70, and HABSN 91, respectively.

Inclusion and Exclusion Criteria

Inclusion criteria were all pre-licensure nursing students enrolled in the pediatric theory/clinical courses in the Fall 2021 semester. The completion of the VLE, My Virtual Child[©] is a graded course assignment for all students in the course. Exclusion criteria were students repeating the theory/clinical course or students who may have completed the My Virtual Child[©] program in another course as they will already have participated in the virtual learning environment, which could bias the findings. Additional exclusion criteria were students who identified that they had children. Having experience raising a child or children could place unintentional bias on the outcome of the concepts being studied due to the previous knowledge and their satisfaction with how they are parenting their child/children. This bias could negatively

impact the study results. Demographic data was requested at the beginning of the pre-test to identify students who needed to be excluded from the study.

Sample Size

Multiple sample size calculations were performed using G*power analysis, utilizing the four variables to be studied to assess the effectiveness of a virtual learning environment for students to learn the concepts of growth and development (Faul et al., 2007). A paired *t*-test addressed the first research question related to assessing for change in knowledge from the pre-test to the post-test six weeks later. Using this statistical analysis test in the G*Power calculator and a small effect size of 0.3, a significance level at an alpha of .05 and power of .8 is typical statistical testing criteria found in social science research with resultant projected sample size is 90. A small effect size was chosen to be more conservative in that effect size assists the researcher with the ability to demonstrate that the outcome of the research study is not due to random error (Hulley et al., 2013). Effect sizes were calculated from the literature by dividing the difference of the group means by the standard deviation (Thalheimer & Cook, 2002) and ranged between 0.3 and 0.8. Larger sample size can allow hypothesis testing to detect an even smaller effect size (Hulley et al., 2013). Thus, using an effect size of 0.3, considered a small effect size, this researcher theorized that the use of the virtual learning environment outcomes on student satisfaction and self-confidence with learning and the pre/post-test assessment instrument was not due to random chance. Instead, using a virtual learning environment enhanced students' satisfaction and self-confidence with learning and acquiring knowledge related to pediatric growth and development principles.

Additionally, this research study also assessed whether there was a statistically significant relationship between change in knowledge of growth and development concepts with satisfaction and self-confidence. It was postulated that an increase in knowledge or higher knowledge level could lead to higher satisfaction and self-confidence with learning. A linear regression analysis assessed a relationship between knowledge change, satisfaction, and self-confidence with learning while controlling for age and gender.

$$Y_{confidence} = \beta_0 + \beta_1 \ (Knowledge \ Change) + \beta_2 \ (Age) + \beta_3 \ (Gender) + \epsilon$$

$$Y_{satisfaction} = \beta_0 + \beta_1 \ (Knowledge \ Change) + \beta_2 \ (Age) + \beta_3 \ (Gender) + \epsilon$$

The G*Power calculator assessed the sample size for such a linear model with an F-test, a fixed model of four variables inputting an effect size f^2 of 0.15, an alpha of .05, and a power of .8; the projected sample size was 92. The effect size of 0.15, a reasonable effect size, was input in the G*power calculator when the F-test linear multiple regression fixed model analysis was selected to determine the sample size. The use of only the demographic data of gender and age allowed for assessing any influence on the outcome correlated to these demographic variables. Thus, based on the G*Power analysis, this researcher aimed to recruit 92 participants.

Recruitment

Upon approval of the university Institutional Review Board (IRB), students in the pediatric theory/clinical course in the fall semester of 2021 were presented with the research study information during the first class or synchronous session of the semester. In cooperation with the course faculty, the researcher explained the study to the students, answered questions, and invited student participation. In addition to the verbal in-person presentation, on-site or live video conferencing, a participation letter detailing the research study and inviting the students'

participation was provided to the course faculty and posted on the learning management system

for the course. The students were informed that participants would have the opportunity to be

entered into a drawing for one of ten $10.00 gift cards after the pre-test and one of ten $15.00

gift cards after the post-test.

After the use of the VLE, the researcher again met with the students, on-site or through

live video conferencing, during their regularly scheduled class period and invited those who

participated in the pre-test assessment to participate in the post-test and NLN survey. During this

in-person presentation, the researcher again answered any questions, and reassured the students

that there was no impact on their course grade, standing in the course, School of Nursing (SON),

or University and that by participating, they would be contributing to the body of knowledge in

nursing education research. The researcher again reminded the students that participants would

have the opportunity to be entered into a drawing for one of five $15.00 gift cards after data

collection. The same participation letter was again provided for the faculty to post in the course

learning management system for the students.

Human Subjects' Concerns and Ethical Considerations

To protect the safety and rights of the participants, approval for this study was provided

by the IRB at the study university. Participants had to be enrolled in the pediatric theory/clinical

course during the Fall 2021 semester to be eligible to participate in this study. As outlined in the

recruitment section, participants could read a letter from the researcher posted on their learning

management system for the course after a live either in person on-site or video conferencing

presentation that described the research study. The participants provided informed consent by

completing the pre-test as the informed consent was described as implicit by completing the pre-

test, post-test, and NLN survey questions. The researcher posted a statement at the beginning of the assessment stating that "by completing this assessment you are providing implicit consent for the data to be used in this research study." This implicitly informed consent kept all participants blinded from the researcher.

Confidentiality of the participants was ensured by using the Qualtrics secure cloud-based platform to deliver the assessments and survey. Confidentiality was also protected by not utilizing the course faculty in administering the assessments and survey or reporting of data collected, so there was no perception of a power differential for the participants.

Ethical codes and principles were maintained by allowing students enrolled in the pediatric theory/clinical course the right to not participate, with no impact on grades, academic standing in the course, or the school for either participation or non-participation.

Conceptual and Operational Definitions of Variables

This research study aimed to assess whether there was a change in knowledge of growth and development concepts from the pre-test to the post-test and the relationship of the change in knowledge of growth and development concepts to the independent variables of student satisfaction and self-confidence. It was hypothesized that using the VLE, My Virtual Child[©], would lead to higher satisfaction and self-confidence in learning the concepts of growth and development across the pediatric age span. It was further hypothesized that using the My Virtual Child[©] VLE would result in a statistically significant change in post-test scores from the pre-test scores, demonstrating a change in the participants' pediatric growth and development knowledge. Additionally, it was postulated that the VLE, My Virtual Child[©], would positively influence student satisfaction and self-confidence.

Satisfaction

"Students' satisfaction can be an important quality indicator with respect to teaching and learning" (Kabanya, et al., 2017, p. 1). Literature that analyzed only the concept of satisfaction, not in conjunction with self-confidence, suggested that active learning activities, such as VLE, motivate students to learn and lead to satisfaction with learning (Topala & Tomozii, 2014). Another way to consider student satisfaction with learning is to consider the consistency or cohesion between an individual's expectations and overall experience (Topala & Tomozii, 2014). A study cited by Hyun et al. (2017) indicates that student interaction in active learning activities was the most important factor positively impacting student learning.

Satisfaction with learning also referred to as learning satisfaction in the literature, is conceptually defined as "the pleasure resulted from student's implication in the specific activities suggested by the curricular designs, activities that lead to fulfilling the learning needs initially felt by the student" (Topala & Tomozii, 2014, p. 382). While operationally, it is defined as the students' attitudes towards the learning environment, conditions, activities, and outcomes as measured on the NLN Student Satisfaction and Self-Confidence in Learning instrument.

Self-Confidence

Self-confidence is an essential characteristic for both nursing students and nurses to possess. A primary characteristic of self-confidence is the individual's belief that they can achieve success in a given situation (Perry, 2011; White, 2009). Literature strictly on self-confidence is limited as it is often combined with other concepts such as satisfaction or self-efficacy. However, the available literature on self-confidence has demonstrated that students' success in the clinical environment builds self-confidence, and thus the more clinical successes

the student experiences, the more self-confidence is reinforced (Hyun et al., 2017; Kim & Kim, 2015; Perry, 2011; White, 2009). Additionally, as Bandura pointed out, in social learning theory, motivation and reinforcement promote confidence (as stated in White, 2009). Active learning activities, such as a VLE, can provide a safe, less stressful environment for students to engage in learning to bolster self-confidence.

A review of literature related to self-confidence identifies many defining attributes, such as self-concept, perseverance, motivation, and belief, to name a few, which contribute to the conceptual definition (Guerro et al., 2022; Kardon-Edgren, 2010; Perry, 2011; Sander et al., 2006; White, 2009). In this study, self-confidence is conceptually defined as an individual's perception of self in terms of their abilities and accomplishments, which motivates them to move forward, especially in learning. Operationally, self-confidence is the students' perception of their confidence in learning the principles of growth and development through using a VLE, as measured using the NLN Student Satisfaction and Self-Confidence in Learning instrument. The operational definitions of satisfaction and self-confidence will be utilized in this study.

Instrument and Measure

Two measures were utilized in this research study. The first was the author-created Growth and Development Knowledge Assessment, and the second was created by the National League for Nursing (NLN) entitled Student Satisfaction and Self-Confidence in Learning Questionnaire.

Table 3. Two Measures Utilized in This Research Study

Variable	Measurement
Individual Characteristics Knowledge	Demographics Growth and Development Knowledge Assessment Pre- and Post-Test
Satisfaction with Learning	NLN Survey—Student Satisfaction and Self-Confidence in Learning
Self-Confidence with Learning	NLN Survey—Student Satisfaction and Self-Confidence in Learning

Growth and Development Knowledge Assessment Pilot Test

Given that an instrument to measure growth and development knowledge was not found in the literature, the author created the Growth and Development Knowledge Assessment. This assessment is a multiple-choice test that was used to determine the change in knowledge from the pre-test to the post-test administration within a six-week timeframe. To ensure that the assessment was measuring what it was intended to measure, change in knowledge, it is paramount for the author of these types of assessments to perform due diligence regarding the reliability and validity of the assessment instrument (Considine et al., 2005). An additional consideration in using multiple-choice assessments in nursing education research is to understand that the assessment is strictly to test knowledge, not the ability to read, translate, or infer what is being asked. Thus, the language should be kept simple, straightforward, and easily understood by the weakest reader (Considine et al., 2005). Each question should be designed to test only one concept or specific element of the content, leading to internal reliability and validity (Considine et al., 2005). This practice is of particular importance when the effect of an intervention on knowledge pre-and post-intervention is being measured using a multiple-choice assessment (Considine et al., 2005). The essential concepts related to the reliability of the

multiple-choice assessment include consistency, precision, stability, and internal consistency, as demonstrated over repeated use of the measure (Considine et al., 2005). The reliability of a multiple-choice assessment is demonstrated through a Cronbach's alpha that is positive, strong, and greater than +0.70 (Considine et al., 2005, p. 21). The evidence of reliability and validity of a multiple-choice assessment used in a research study is typically obtained during a pilot test. Such a pilot test was conducted on the author-created Growth and Development Knowledge Assessment.

Prior to implementing the pilot testing to determine the reliability of the author-generated assessment, the content validity for the items was assessed. According to Polit and Beck (2006), content validity assessment involves a team of experts reviewing the instrument and scoring each item on a scale for congruence with or relevance to the construct being assessed. The Content Validity Index for Items (I-CVI) is commonly used to identify the content validity of individual items in the multiple-choice assessment and the overall content validity of the instrument. For the content validity of items and overall content validity, six subject matter experts were contacted and asked to participate in rating the individual items of the Growth and Development Knowledge Assessment multiple-choice test using an I-CVI rating form with a Likert-type scale (Yusoff, 2019). Five subject matter experts responded and participated in the evaluation of the items. Two of the subject matter experts were Pediatric Nurse Practitioners who were both active in practice and faculty teaching in the graduate program. The remaining three subject matter experts were full-time faculty teaching pediatric nursing theory, and clinical and have more than ten years of pediatric nursing experience in acute care pediatric nursing.

The subject matter experts were asked to rate the degree of relevance of the item to measuring growth and development knowledge across the levels of Bloom's Taxonomy on the researcher-created Growth and Development Assessment using the degree of relevance rating scale (see Figure 2).

Figure 2. Degree of Relevance Rating Scale

Degree of Relevance: Please circle the rating for each item.

1 = the item is not relevant to the measured domain

2 = the item is somewhat relevant to the measured domain

3 = the item is quite relevant to the measured domain

4 = the item is highly relevant to the measured domain

It has long been the recommendation in the literature to have a minimum of three subject matter experts and no more than ten (Polit & Beck, 2006). Further, it is recommended that with five or fewer subject matter experts, the item should score a 1.0, which considers the standard error of the proportion (Polit & Beck, 2006). Researchers should then use the I-CVI information collected to guide revising, deleting, or substituting items (Polit & Beck, 2006). Interestingly in most research reports, the I-CVI is not provided, only the overall content validity of the instrument (S-CVI) (Polit & Beck, 2006; Yusoff, 2019). "The I-CVI is often only reported in the methodological studies that focus on descriptions of the content validation process" (Polit & Beck, 2006, p. 491). However, the pilot study's purpose was to determine the validity of the author-created instrument and thus is relevant to the discussion.

The author created a 30-item multiple-choice assessment based on Erickson's psychosocial and Piaget's cognitive concepts of growth and development. The author aimed to

have at least 15-25 items with evidence of reliability and validity for use in the research study. This author chose 30 items because testing literature suggests 60 seconds per item, and utilizing these criteria, the participants would theoretically require only 30 minutes to complete the assessment (Bridgeman et al., 2007; Wang, 2019). This short time frame would not unduly burden the participants and hopefully, encourage participation in the post-test assessment. There is no scientific method in the literature to determine the best number of items for a pre-test/post-test instrument.

The content experts scored the multiple-choice assessment items for content validity resulting in 17 of the 30 items being scored a 1.0 on the relevance to the measured domain, while 11 items scored a 0.8 and the remaining two scored a 0.4 and 0.6, respectively. After the I-CVI score for each item was assessed, the poorer scoring items (0.4-0.8) were revised according to suggestions from the content experts and sent back for rescoring, resulting in a 1.0 score for each item. Next, the scale content validity index (S-CVI) was calculated. The S-CVI is defined as "the proportion of items given a rating of quite/very relevant" (Polit & Beck, 2006, p. 491), and for the author-generated Growth and Development Knowledge Assessment, the S-CVI was found to be 0.893 which is considered to demonstrate content validity of the instrument if it is greater than 0.8 (Polit & Beck, 2006; Yusoff, 2019).

Student participants in the pilot study took the total 30-item Growth and Development Knowledge Assessment as it was determined that the individual items and the overall instrument were considered to have evidence of both item and content validity. The full 30-item assessment was administered to evaluate its psychometric properties including the reliability of the assessment along with item point biserial, difficulty index, and discrimination index.

The Growth and Development Knowledge Assessment was administered to the pilot test participants, nursing students enrolled in two sections of the pediatric theory/clinical course of the ABSN program, on the first day of class in the summer 2020 semester and during week 7 in the summer 2020 semester. To initially recruit participants, the researcher attended, via videoconferencing due to COVID-19 restrictions on in-person classes, and presented the pilot study to the students, answered questions, and distributed the consent letter via the learning management system of the course. After the researcher departed the videoconference meeting, the course faculty invited the students to enter the learning management system of the course to take the pre-test assessment that the researcher had preloaded. Thirty-nine students agreed to participate in the pilot study and took the pre-test assessment. The course faculty sent the de-identified item analysis report to the researcher.

In week 7, the researcher sent a recorded video to the course faculty to play for the students. In the video, the researcher reminded the students that they had participated in the pre-test assessment and invited those 39 participants to participate in the post-test. As the researcher was not there in person, the course faculty was available to answer questions and again distribute the consent letter electronically. However, the course faculty did not play the researcher's video and just reminded the students about their participation. The course faculty then released the students to enter the learning management system of the course to take the post-test assessment. The course faculty again sent the de-identified item analysis report to the researcher. Unfortunately, attrition of participants was experienced in the post-test assessment, and only 15 students participated. The loss of participants could be attributed to the inability of the researcher to be present in person via live video conferencing to recruit the students' continued

participation. Another consideration for the attrition might be that the course faculty did not play the researcher's recorded video (inviting student participation again), and thus students who had participated initially may have felt less motivated to participate again.

The reliability of multiple-choice assessment items is demonstrated through Cronbach's alpha. A multiple-choice assessment is considered reliable if Cronbach's alpha is 0.7 or greater (Considine et al., 2005, p. 21). The pre-test assessment demonstrated a Cronbach's alpha of 0.825 for the first participant section and 0.908 for the second participant section. The post-test assessment demonstrated a Cronbach's alpha of 0 for the first participant section and 0.457 for the second participant section. The discrimination of items in the pre-test was much stronger than in the post-test, and this could be attributed to knowledge gained during engagement in the virtual learning environment, which would diminish discrimination of the same items on the post-test resulting in lower reliability.

The pre-test demonstrated acceptable discrimination of 0.25 or higher for all but nine items for the first section of participants and all but five items in the second section. The five items with a 0.0 discrimination from both sections of participants demonstrate that neither the upper or lower quartile students answered the items correctly, and thus the items were removed from the final version of the Growth and Development Knowledge Assessment. When there is no discrimination between the upper and lower quartiles, the item has either a poorly worded stem or options (Tobin, 2018; Wells & Wollack, 2003).

The post-test had very little discrimination between the upper and lower quartiles, as reflected in the lower Cronbach's alpha for the overall assessment. This lowered reliability can possibly be attributed to the participants' increase in knowledge from the pre-test after the use of

the VLE to raise a virtual child in the My Virtual Child[©]. This finding could demonstrate an

increase in knowledge across both the upper and lower quartile participants. Given that the goal

of the of the VLE is to increase participant knowledge, it is not unexpected that there was poorer

discrimination between the upper and lower quartile participants in the post-test. A loss of

participants also contributes largely to a decrease in reliability of the assessment.

Based on the psychometric analysis of data from the pilot test of the researcher-authored

Growth and Development Knowledge Assessment, it can be concluded that this multiple-choice

assessment demonstrates evidence supporting both content validity and item reliability. Further,

it was concluded that this assessment could be used in the research study with confidence.

NLN Student Satisfaction and Self-Confidence in Learning Instrument

The second instrument utilized in this research study was the NLN Student Satisfaction

and Self-Confidence in Learning instrument (SCLS). This instrument was developed in 2006 and

has been identified as being used extensively in simulation research (Franklin et al., 2014;

Jefferies & Rizzolo, 2006; Unver et al., 2017).

This instrument is a self-report containing five items related to the concept of satisfaction

with learning and eight items related to self-confidence in learning. The instrument utilizes a

Likert-type scale with terms related to the strength of agreement. The range is 1 (strongly

disagree) to 5 (strongly agree) with an undecided choice instead of a neutral option. The

undecided choice versus a neutral option will encourage deeper consideration of the item than a

neutral response might elicit (Waltz et al., 2017).

The participant instructions included a statement that there were "no right or wrong

answers," which, theoretically, could decrease any concerns on the part of the participants that

they were being graded on this aspect of the study. Further, additional directions for this study explicitly describe that the participants are rating their attitudes about the use of the VLE, My Virtual Child[©].

Jefferies and Rizzolo, the authors of the NLN Student Satisfaction and Self-Confidence in Learning (SCLS) instrument, conducted a multi-site, multi-method study in 2006 that implemented the SCLS as one of the instruments. Prior to the initiation of the study, the authors undertook the reliability and validity testing of the instrument. They reported validity testing utilizing nine content experts who validated the content and relevancy of each item for the concepts of satisfaction and self-confidence. They reported a Cronbach's alpha of 0.94 and 0.87, respectively, which demonstrates evidence of the reliability of the items in the instrument (Jefferies & Rizzolo, 2006, p. 7).

Franklin and colleagues (2014) described the extensive use of the NLN Student Satisfaction and Self-Confidence in Learning instrument, citing eleven studies spanning the ensuing years with a concentration in 2011. These researchers decided to conduct this psychometric assessment because "despite the extensive use of these measures, little is known about their reliability and validity" (Franklin et al., 2014, p. 1298). The authors felt that using an instrument in multiple studies that did not have any additional assessment of the reliability and validity after repeated use weakened the outcome data from the instrument and thus decreased the generalizability of the findings (Franklin et al., 2014).

Thus, Franklin and colleagues set forth with a study purpose "to establish the psychometric properties" (Franklin et al., 2014, p. 1298) of the SCLS instrument and two other NLN instruments frequently used in simulation research.

At a liberal arts university in the southern United States, this study had a sample size of 2200 surveys completed by students enrolled in either a TBSN or ABSN track in a pre-licensure baccalaureate nursing program (Franklin et al., 2014). Data were collected over three years following each simulation in which students participated. Researchers utilized an item analysis to identify item difficulty/endorsement of each item. Item discrimination goal was > 0.3 for each item, with the authors noting that item difficulty scores between 0.3 and 0.7 indicate an item that adequately discriminates between being too difficult or being too easy. Further, the data were analyzed using confirmatory and exploratory factor analysis to provide evidence of the instrument's validity.

This psychometric analysis demonstrated evidence supporting the instrument's reliability with an overall Cronbach's alpha of 0.92, with an alpha of 0.92 for the satisfaction subscale and 0.83 for the self-confidence subscale. The authors noted a skewness of the students' responses toward agreeing and strongly agreeing and reverse discrimination on one item. The researchers noted that removing the reverse coded item would increase the overall Cronbach's alpha to 0.94 (Franklin et al., 2014). The researchers did not adequately discuss the effect the noted skewness had on the reliability.

Validity was assessed through both confirmatory and exploratory factor analyses. The results of the confirmatory factor analysis (CFA) suggested, according to the researchers, that there was an "improvement in model fit" (Franklin et al., 2014, p. 1302). Thus, the researchers performed an exploratory factor analysis and noted that a "two-factor model had the best fit compared with the CFA" (Franklin et al., 2014, p. 1302). The fit improved when one item was allowed to double load on the satisfaction and self-confidence subscales, and one item did not

load well on either subscale (Franklin et al., 2014). Thus, these researchers concluded that this research study provided evidence of reliability and validity for the SCLS instrument.

In a study conducted in Turkey in 2017, researchers sought to determine the reliability and validity of the NLN SCLS instrument and of two others once translated into Turkish (Unver et al., 2017). These researchers' sample consisted of 87 students in their final course at a university in Turkey in the fall semester of 2014. After a simulation, students completed three surveys, one being the SCLS. The researchers utilized item correlation analysis and exploratory factor analysis to determine the reliability and validity of the instrument after translation into the native language, Turkish.

Data analysis assessing reliability demonstrated a Cronbach's alpha of 0.77 for the instrument in its entirety. However, the researchers noted a negative correlation for one item, and when that item was removed, as done in the Franklin et al. 2014 study, the Cronbach's alpha increased to 0.79. Further analysis demonstrated an alpha of 0.85 and 0.77 for the satisfaction and self-confidence subscales, respectively (Unver et al., 2017). In analyzing the item discrimination data, values greater than 0.30 are desired, and this study noted that for all but one item, the discrimination was greater than 0.30, with only one item scoring at 0.18, and that item was the one the researchers planned to eliminate when using the scale in the future (Unver et al., 2017).

Validity was assessed using exploratory factor analysis and "produced two factors, with an eigenvalue greater than 1" (Unver et al., 2017, p. 66). Six items loaded to factor 1 and 7 items loaded onto factor 2, and thus these two factors explained 51.02% of the variance, with factor 2 having the most explanatory power at 39.09% (Unver et al., 2017). Thus, these researchers

concluded that "the Turkish version of the SCLS are valid and reliable measurement instruments for Turkish nursing students" (Unver et al., 2017, p. 70).

Given that these research studies found evidence supporting the reliability and validity of the SCLS instrument in both English and Turkish, this researcher felt confident utilizing this instrument in the research study.

Individual Characteristics

Demographic information on the study participants was solicited on the pre-test. The data requested included the participants' age, gender (that they identify with), if they have children, and if yes, how many. These data were used to describe the sample. They were also used to ascertain any correlations between the participants' age or gender and their satisfaction or self-confidence in learning using a virtual learning environment. The information related to whether the participant had children were used as an exclusion criterion. Having experience raising a child or children could place unintentional bias on the outcome of the concepts being studied due to the previous knowledge and their satisfaction with how they are parenting their child/children. This bias could negatively impact the study results. Additionally, participants were asked if they had ever previously participated in the My Virtual Child[©] virtual learning environment. Prior participation in this virtual learning environment could influence the participants' knowledge, satisfaction, and self-confidence, thereby potentially skewing the data. An affirmative answer was also an exclusion criterion.

Data Collection

A link to the pre-test assessment, located on the Qualtrics secure cloud-based platform, was provided to the course faculty, who posted it in the learning management system for the

course. The pre-test assessment was open for 24 hours for the participants to have time to complete the assessment. Once the assessment was begun, the participants had 60 minutes to complete it before it closed, which allowed 2.4 minutes per question for 25 questions.

Over the ensuing six weeks, all students used the VLE, My Virtual Child$^©$, a graded required component of the pediatric theory/clinical course. During this virtual interactive learning activity, students raised a virtual child, from birth to 18 years of age, making decisions about their virtual child that impacted the child's growth and development outcomes. The expectation is that students learn and apply psychosocial and cognitive pediatric development principles to their decision-making process in raising their virtual child.

The link to the post-test and the National League for Nursing (NLN) Student Satisfaction and Self-Confidence in Learning survey instrument, again housed on the Qualtrics secure cloud-based platform, was provided to the course faculty to post in the learning management system of the course and was open for 24 hours for the participants to have time to complete the assessment and the NLN survey. Once the assessment was started, the participants had 90 minutes to complete the assessment before it closed, which allowed 2.4 minutes per question for 25 questions and an additional 30 minutes to complete the 13-question survey.

Data Analysis

Data were collected from the password-protected cloud-based platform, Qualtrics, and utilized using SPSS v 27. Data were analyzed using paired *t*-test, Pearson correlation coefficient, and regression analysis. Following are details regarding the specific analysis for each research question.

RQ 1: The purpose of this question was to evaluate to what extent the use of a VLE alters pre-licensure nursing students' knowledge level of the concepts of growth and development in the pediatric population between a pre-test and a post-test assessment.

Methods: Analysis of the pre-test and post-test scores for the descriptive statistics of average, standard deviation, and standard error of the mean was completed. A two-tailed paired *t*-test was utilized to evaluate if there was a change in knowledge from the first-time measure of the pre-test to the second-time measure of the post-test. The two-tailed paired *t*-test was an appropriate statistical analysis to perform on the pre-test/post-test to determine whether there was statistical evidence that the mean difference between paired observations on a particular outcome was significantly different from zero representing a statistically significant change in knowledge after engaging in the virtual learning environment, My Virtual Child[©].

RQ 2: The purpose of the question was to evaluate the extent to which a VLE influences pre-licensure nursing students' satisfaction in learning concepts of growth and development in the pediatric population.

RQ 3: The purpose of this question was to evaluate the extent to which the use of a VLE influences pre-licensure nursing students' self-confidence in learning concepts of growth and development in the pediatric population. Research questions 2 and 3 are discussed together as the variables of satisfaction and self-confidence are assessed together in the NLN instrument.

Method(s): Analysis for the descriptive statistics of average, standard deviation, and standard error of the mean were completed to show the average extent to which the participants perceive feeling satisfied and confident in their learning after using the VLE. Correlation analyses of the knowledge change, satisfaction, and self-confidence were run using the IBM

SPSS v27 statistical analysis software to determine the Pearson product-moment correlation (*r*).

The researcher hypothesized a positive significant correlation between the variables of

knowledge change and satisfaction in learning using a VLE and another positive significant

correlation between knowledge and self-confidence in learning using a VLE. Once linear

correlations were assessed in those variables, a regression analysis was conducted to predict

further how much a change in knowledge influenced participants' satisfaction level and self-

confidence with the VLE. The researcher hypothesized that more knowledge gain would lead to

higher satisfaction and self-confidence in learning using a VLE. Further, a regression analysis

was conducted as this modeling would be more precise in predicting the impact of knowledge

change on satisfaction and self-confidence in learning using a VLE. This modeling aims to

assess the main effect of each variable and identify any interaction between them while also

assessing for any impact of age and gender of participants.

Figure 3. Variables and Measurements

$$Yconfidence = \beta 0 + \beta 1 Knowledge\ Change + \mathcal{E}$$

$$Ysatisfaction = \beta 0 + \beta 1 Knowledge\ Change + \mathcal{E}$$

$$Yconfidence = \beta 0 + \beta 1 Knowledge\ Change + \beta 2 Age + \beta 3 Gender + \epsilon$$

$$Ysatisfaction = \beta 0 + \beta 1 Knowledge\ Change + \beta 2 Age + \beta 3 Gender + \epsilon$$

When conducting linear regression, a few statistical assumptions were checked to ensure

regression analysis was conducted appropriately and the regression analysis results are

meaningful for interpretation:

1.   The residuals of the dependent variable (knowledge change or post-test knowledge) in the

regression were assessed for a normal distribution to meet the normality assumption. A

normal Predicted Probability (P-P) plot was examined to determine if the residuals were normally distributed.

2. Homoscedasticity refers to whether these residuals are equally distributed. This assumption was checked by plotting the predicted values and residuals on a scatter plot and identifying if the scatter plot looks like a shotgun blast of randomly distributed data to determine that the homogeneity assumption is met. The linearity of the key-dependent and independent variables in the regression model was confirmed by the correlation analysis between knowledge, satisfaction, and self-confidence. Additionally, if the homogeneity assumption is met, linearity will be considered to be met. In the regression analysis, any outlying observations will be assessed to see if there is an extra-large effect on the estimated coefficients. The leverage value for each observation will be calculated to meet this need.

Projected Study Limitations

All research has inherent risks or threats to validity. In this study, there may be a threat to internal validity related to using a single group design. This researcher attempted to reduce this threat by utilizing a pre-test/post-test design of the single group and allowing for the possibility of no prior knowledge of the subject, in this case, concepts of pediatric growth and development (Trochim et al., 2016). By providing the pre-test, this researcher was able to determine the effect prior knowledge had on the outcome, which will support the hypothesis that the use of VLE resulted in a statistically significant change in knowledge of pediatric growth and development concepts (Trochim et al., 2016). Another possible threat was a testing threat which only occurs in a pre-test/post-test design. In this type of threat, the participants might recognize what the

instrument is measuring, making them act differently in the interaction with the intervention, affecting their post-test outcomes (Trochim et al., 2016). Mortality threat, also known as selective attrition, resulting in participants dropping from the study prior to its conclusion, is considered the final possible threat to this study (Trochim et al., 2016). This threat occurred during the Growth and Development Knowledge Assessment pilot addressed earlier. So even though this is accounted for in the participant recruitment, it still represents a threat to the study's internal validity. This researcher attempted to decrease the mortality threat by oversampling with the second appeal to the participants, multiple reminder announcements to completeend-of-study instruments, and the hope that the possibility of winning one of the gift cards in the drawing would motivate them to complete the study instruments.

Implications for Nursing Knowledge and Practice

Since nurse educators are tasked with transforming nursing education, they need to embrace new technologies to teach essential concepts, such as growth and development across the pediatric age span. Nurse educators must be willing to change the way they teach and embrace new strategies to meet the diverse needs of the diverse student nursing population. Thus, the use of interactive strategies like a VLE may appeal to the learning styles of the millennial and GenZ students that are populating nursing school classrooms today.

More research is needed due to the paucity of research in nursing education about teaching growth and development concepts to students in pediatric nursing courses. This study sought to contribute to nursing knowledge related to virtual learning environments by increasing knowledge and student satisfaction and self-confidence in learning, specifically the concepts of growth and development in nursing students in a pediatric theory/clinical course. The two

instruments used in the study have demonstrated evidence of both reliability and validity and assisted in identifying the study outcomes. Further research in learning styles and virtual learning environments is certainly needed in nursing education and, more specifically, in terms of growth and development in the pediatric nursing domain, and this research study is an excellent first step.

CHAPTER FOUR

RESULTS

This chapter will discuss the research study results and analysis of collected data. The overall purpose of this study was to describe the relationship between knowledge change, self-confidence, and satisfaction in learning concepts of growth and development across the pediatric age span using a Virtual Learning Environment (VLE), My Virtual Child[©]. The overall aim was to explore what relationships, if any, exist between knowledge change, satisfaction, and self-confidence in learning concepts of growth and development in a pediatric theory course. The following research questions were addressed:

RQ 1: To what extent does the use of a VLE change pre-licensure nursing students' knowledge of concepts of growth and development in the pediatric population?

RQ 2: To what extent does the use of a VLE impact pre-licensure nursing students' satisfaction in learning concepts of growth and development in the pediatric population?

RQ 3: To what extent does the use of a VLE impact pre-licensure nursing students' self-confidence in learning concepts of growth and development in the pediatric population?

Using a researcher-developed, pilot-tested, Growth and Development Knowledge Assessment pre-/post-test to assess knowledge change in concepts of growth and development and the NLN Student Satisfaction and Self-Confidence in Learning instrument, data were collected in Qualtrics (Qualtrics, Provo, UT). Data were then entered into IBM SPSS[®] Statistics

(version 27) predictive analytic software. Data analyses were performed using a paired *t*-test to assess statistical significance between participants' pre-and post-test scores. Descriptive statistics were used to analyze demographic data, while correlation and linear regression analysis examined the relationships between knowledge change, satisfaction, and self-confidence in learning.

Description of Sample

A total of 240 students in the TBSN, ABSN, and H-ABSN programs enrolled in the pediatric theory/clinical course were invited to participate in the study. Of the students enrolled in the pediatric theory/clinical course, 106 students (44.2%) completed the pre-test in the first week of the fall 2021 semester. Of the 106 students who completed the pre-test, 78 students (32.5%) completed the post-test and NLN survey in week six of the fall 2021 semester. Of the 78 completed post-tests and surveys, 46 were matched pairs. Matching the pairs was completed by identifying and matching the stored IP addresses from the participant pre-test and post-test gift card drawing survey in the password-protected cloud-based survey platform Qualtrics. The gift card survey collected only the participants' email addresses for the purpose of gift card distribution. Although 106 and 78 students participated in the pre-test and post-test, only 69 and 59 participated in the pre- and post-test gift card drawing survey, respectively, which captured the IP address. The researcher matched IP addresses from the pre-test and post-test gift card drawing survey, which resulted in 46 pairs of participants who completed the pre-test, post-test, and NLN Student Satisfaction and Self-Confidence in Learning survey. Utilizing IP addresses for pairing ensured that the participants remained blinded from the researcher. A total of 38 pairs ($N = 38$) were included in the final data analysis, and $N = 56$ participants who were

unmatched were excluded from data analysis. The unmatched participants were students enrolled in the pediatric theory/clinical course who did not complete all three aspects of the study. In analyzing the group of matched participant pairs and unmatched participants, the groups had similar demographics collected when they completed the pre-test, demonstrating that the sample utilized may be representative of the population (see Table 4).

Table 4. Demographic Data

Variable	Matched Participants- N=38				Unmatched Participants N=54			
	N	%	AV	SD	N	%	AV	SD
Pre-test Knowledge Score Groups			16.66	5.518			15.68	4.20
0-10	3	7.9%			3	5.5%		
11-15	10	26.31%			17	31.5%		
16-20	17	44.7%			31	57.4%		
21-25	8	21.05%			3	5.5%		
Gender			…	…			…	…
Female	35	92%			46	85.2%		
Male	3	8%			8	14.8%		
Age Group			22.8	2.36			25.2	4.38
<23	19	50%			21	38.9%		
23-24	8	21.1%			9	16.7%		
>25	11	28.9%			24	44.4%		

Of the initial 46 matched pairs, eight pairs were excluded from the final data analysis due to exclusion criteria of either having children ($N = 5$) or having used the VLE, My Virtual Child©, before ($N = 3$), and one was excluded for not providing demographic data ($N = 1$). After exclusion, there was a total sample of 38 matched pairs. Of the 38 matched pairs, participants ranged from 18-27 years. Females ($N = 35$) comprised 92% of the sample and males only 8% ($N = 3$).

The resultant sample ($N = 38$) was less than the projected sample size of 92 based on a priori G*power analysis. Based on the paired samples' effect size calculated in the SPSS output, the actual effect size of the study was larger than anticipated (Cohen's d = 0.61). Thus, a post hoc G*power analysis utilizing the calculated effect size Cohen's d = 0.61 was run for *the t-test: difference between two dependent means (matched pairs)*, which resulted in a power of 0.97 for $N = 38$. This analysis demonstrates adequate statistical power for the first research question, despite the fact that an *N* less than the original a priori G*power calculations indicated was achieved (see Tables 5 and 6). However, for research questions two and three the post hoc G*power analysis utilizing the F-test linear multiple regression fixed model to assess actual power demonstrated that the sample size of $N=38$ has 45% power to detect $f^2=0.15$ for this aspect of the study.

Table 5. Paired Samples' Effect Size

		Standardizer	Point Estimate	95% Confidence	
				lower	Upper
Post-test score / Pre-test score	Cohen's d	6.129	.605	.256	.948

Table 6. G*Power Post Hoc Analysis Output

Analysis	Post hoc: Compute achieved power
Input: Tail(s)	One
Effect size dz	0.612
α err prob	0.05
Total sample size	38
Output: Noncentrality parameter δ	3.7109772
Critical t	1.6870936
Df	37
Power (1-β err prob)	0.9770892

Note. *t*-tests—means: difference between two dependent means (matched pairs).

A larger sample size was needed for adequate statistical power to be achieved for research questions two and three (see Table 7).

Table 7. G*Power Post Hoc Analysis Output

Analysis	Post hoc: Compute achieved power
Input:	
Effect size f^2	0.15
α err prob	0.05
Total sample size	38
Number of predictors	3
Output: Noncentrality parameter λ	5.7000000
Critical F	2.8826042
Numerator df	3
Denominator df	34
Power (1-β err prob)	0.4474110

Data were collected from a sample of 38 matched pairs who met inclusion criteria. Data collected included pre-test and post-test scores from the researcher-created Growth and Development Knowledge Assessment and satisfaction and self-confidence scores from the NLN Student Satisfaction and Self-Confidence in Learning instrument. Demographic data were collected as part of the pre-test.

Missing Data

Data were reviewed to assess for missing data points. One participant did not provide demographic data and was therefore excluded from the final pairing resulting in $N = 37$. Another participant did not answer the NLN survey questions, and only the pre-test and post-test scores for that individual were used in the analysis.

Research Questions and Findings

RQ 1: To what extent does the use of a VLE change pre-licensure nursing students' knowledge of concepts of growth and development in the pediatric population?

Null Hypothesis 1 (H$_{01}$)

There will be no statistically significant difference in the knowledge of growth and development concepts from the pre-test to the post-test.

To begin the data analysis, a reliability statistics test was performed to ascertain the reliability coefficient of the researcher-created Growth and Development Knowledge Assessment. It was anticipated that the Cronbach's alpha of the pre-test would be similar to the Cronbach's alpha of the pilot study pre-test (see Table 8).

Table 8. Scale Reliability

Pilot Section 001				Pilot Section 002				Dissertation Study			
Pre-test	Pre-test	Post-test	Post-test	Pre-test	Pre-test	Post-test	Post-test	Pre-test	Pre-test	Post-test	Post-test
N	α	N	α	N	α	N	α	N	α	N	A
24	0.825	8	0.0	15	0.908	7	0.457	38	0.853	38	0.30

Further analysis of the Growth and Development Knowledge Assessment included calculated scale reliability in SPSS. These results demonstrate that the pre-test in all instances showed internal consistency with a Cronbach's alpha greater than 0.7. However, in all instances, the post-test reliability coefficient decreased.

It can be postulated that the decrease in the reliability between the pre-test and the post-test in the pilot study is attributable to the loss of participants. Not having a large enough sample will decrease overall reliability. In the dissertation study, the sample size was similar to the pilot study pre-test and the pre-test demonstrated a similar reliability coefficient as the pilot study pre-tests. The post-test however, had a decrease in reliability without a loss of participants. It can be postulated that the post-test means increased, thereby decreasing item discrimination which may account for the lower reliability coefficient noted. Also, since items were testing across multiple

domains of growth and development the inter-item correlations were lowered which can also result in a lowered reliability coefficient (Tobin, 2018; Wells & Wollack, 2003).

Further, Cronbach's alpha can be affected by other factors as well, including but not limited to item difficulty, spread in student scores, and the number of items on the assessment (Tobin, 2018; Wells & Wollack, 2003). The knowledge assessment was a 25-item test which can be considered a small number of items that, by nature, could lead to lower reliability. Additionally, it is expected that the reliability of the pre-test and post-test should be similar as the same group of participants took them and with the same items in the same order.

To assess for any statistically significant change in knowledge from the pre-test to the post-test, a paired *t*-test was utilized. Data analysis demonstrated that the difference between the post-test scores and the pre-test scores was statistically significant ($p = < .001$). Pre-test mean = 16.66; SD 5.518 and post-test mean = 20.37; SD 2.223, demonstrating a positive change in knowledge from the pre-test to the post-test, indicating potential knowledge acquisition from the VLE, My Virtual Child[©] (see Tables 9 and 10).

Table 9. Paired Statistics

	Mean	N	Std Deviation	Std. Error Mean
Pre-test score	16.66	38	5.158	.837
Post-test score	20.37	38	2.223	.361

Table 10. Knowledge Change Descriptive Statistics

	Mean	Std. Deviation	Std. Error	95% Confidence Interval		*T*	df	Sig. (2-tailed)
				lower	upper			
Post-test score/ Pre-test score	3.71	6.129	.994	5.725	1.696	3.72	37	.001

Additional data analysis demonstrated that 73.7% ($N = 28$) improved their post-test scores while 21% ($N = 8$) had decreased scores and 5.3% ($N = 2$) scores remained unchanged.

Figure 4. Knowledge Change Histogram
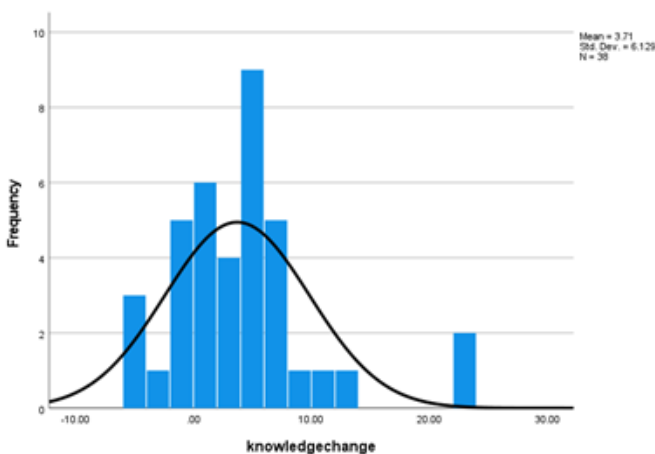
Given these analyses, the H_{01}—that there would be no statistically significant difference in the knowledge of growth and development concepts from the pre-test to the post-test—is rejected.

Research Questions 2 and 3

Correlation and regression analyses were utilized to answer research questions 2 and 3.

RQ 2: To what extent does the use of a VLE impact pre-licensure nursing students' satisfaction with learning concepts of growth and development in the pediatric population?

RQ 3: To what extent does the use of a VLE impact pre-licensure nursing students' self-confidence with learning concepts of growth and development in the pediatric population?

Null Hypothesis 2 (H_{02})

There will be no statistically significant correlation between change in knowledge of growth and development concepts and satisfaction in learning using a VLE to learn pediatric growth and development concepts in a pediatric theory course.

Null Hypothesis 3 (H₀₃)

There will be no statistically significant correlation between change in knowledge of growth and development concepts and self-confidence in learning using a VLE to learn pediatric growth and development concepts in a pediatric theory course.

The NLN instrument assessed students' perceived satisfaction and self-confidence in learning the concepts of growth and development using the VLE, My Virtual Child [©], via targeted items scored on a Likert-type scale from 1 (strongly disagree) to 5 (strongly agree) with 3 identified as neutral. The first five items related to satisfaction in learning, and the remaining eight items related to self-confidence in learning. Each item was summed for a total score, and a mean and SD were calculated (see Table 10). The satisfaction subscale demonstrated $M=17.60$ and SD 4.27, while the self-confidence subscale $M = 29.45$ and SD 5.67.

In addition, a scale reliability coefficient was calculated in SPSS v 27 with a result of Cronbach's alpha 0.847 for the satisfaction subscale and 0.854 for the self-confidence subscale. This is similar to the findings of Jeffries and Rizzoli (2006) of 0.94 and 0.87 respectively for satisfaction and self-confidence, Franklin et al. (2014) of 0.92 and 0.83 respectively, and Unver et al. (2017) of 0.85 and 0.77 respectively—thus, supporting the internal consistency of the instrument.

Table 11. NLN Survey Descriptive Statistics

Item	Mean score	SD	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Satisfaction							
1. The teaching methods used in this simulation were helpful and effective.	3.68	1.21	0%	18.9%	10.8%	40.2%	27%
2. The simulation provided me with a variety of learning materials and activities to promote my learning of the concepts of growth and development.	3.95	1.11	0%	18.9%	21.6%	32.4%	24.3%
3. I enjoyed how my instructor taught the simulation.	3.51	1.07	0%	16.2%	27%	32.4%	18.9%
4. The teaching materials used in this simulation were motivating and helped me learn.	3.68	1.10	0%	24.3%	8.1%	45.9%	24.3%
5. The way my instructor(s) taught the simulation was suitable for the way I learn.	3.51	1.07	0%	16.2%	45.9%	35.1%	18.9%
Self-Confidence							
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	3.78	.886	0%	5.4%	18.9%	32.4%	24.3%
7. I am confident that this simulation covered critical content necessary for the mastery of the pediatric curriculum.	3.51	1.26	5.4%	21.6%	13.5%	29.7%	27%

Table 11. NLN Survey Descriptive Statistics (cont.)

8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting	3.59	1.09	2.7%	18.9%	13.5%	45.9%	18.9%
9. My instructors used helpful resources to teach the simulation	3.51	1.19	2.7%	21.6%	24.3%	24.3%	27%
10. It is my responsibility as the student to learn what I need to know from this simulation activity.	4.11	.614	0%	0%	13.5%	62.1%	24.3%
11. I know how to get help when I do not understand the concepts covered in the simulation.	4.30	.571	0%	0%	5.4%	59.4%	35.1%
12. I know how to use simulation activities to learn critical aspects of these skills.	4.0	.913	0%	10.8%	8.1%	51.3%	29.7%
13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time.	3.54	1.09	5.4%	16.2%	10.8%	54%	13.5%

Overall, the item means for satisfaction ($M = 3.51$-3.95) and self-confidence ($M = 3.51$-4.11) indicated that students were satisfied and felt confident with their learning of concepts of growth and development using the VLE, My Virtual Child©. Additionally, >60% of participants responded agree/strongly agree with their satisfaction and >69% with their self-confidence in learning concepts of growth and development after using the VLE, My Virtual Child©. Summed scores of the subscales for satisfaction and self-confidence demonstrated a mean of 17.60; SD= 4.27 and M=29.45; SD= 5.67 respectively, with a total subscale score range of 12-25 (possible

range 5-25) for satisfaction and 21-40 for self-confidence (possible range 8-40). Further analysis of the items demonstrated some dissatisfaction and lack of confidence related to the instructor's involvement in the VLE. This finding is understandable as this is a self-directed virtual simulation learning environment and the instructor is not involved during the simulation experience. The instructor is only involved once the simulation is completed, and the students have submitted their written assignments to be graded.

Correlation Analysis

Several statistical analyses were performed to assess the relationship between knowledge change and students' perceptions of satisfaction and self-confidence with learning using a VLE. A correlation analysis was conducted first to determine if there was a statistically significant correlation between knowledge change and satisfaction and then between knowledge change and self-confidence. Results demonstrated that the change in knowledge was negatively but weakly correlated with satisfaction ($r = -0.030$, $p = 0.431$) and positively but weakly correlated with self-confidence ($r = 0.121$, $p = .238$) and neither were statistically significant. However, satisfaction and self-confidence were highly correlated ($r = .840$) and statistically significant ($p < .000$) (see Tables 12 and 13).

Table 12. Correlation

		Knowledge change	Satisfaction Score	Self-Confidence Score
Pearson Correlation	Knowledge change	1.000	-.030	.121
	Satisfaction score	-.030	1.000	.840
	Self-Confidence score	.121	.840	1.000
Sig.	Knowledge change	.	.431	.238
	Satisfaction score	.431	.	.000
	Self-Confidence score	.238	.000	.
N	Knowledge change	37	37	37
	Satisfaction score	37	37	37
	Self-Confidence score	37	37	37

Table 13. Confidence Intervals Satisfaction and Self-Confidence

	Pearson correlation	Sig. (2-tailed)	95% Confidence Interval	
			Upper	Lower
Knowledge change: Satisfaction scores	-.030	.861	-.350	.297
Knowledge change: Self-confidence scores	.121	.475	-.211	.428

In assessing for trends in the data, these scatterplots demonstrate that, in general, an increase in knowledge (post-test score minus pre-test score) correlated weakly with both satisfaction and self-confidence in learning concepts of growth and development. This unexpected finding may be related to the fact that the participants did not know their post-test scores when they completed the NLN survey. Perhaps if they knew that their score had increased, it might have had a statistically significant correlation with their perceptions of satisfaction and self-confidence. It is not unexpected that satisfaction and self-confidence are

statistically significantly correlated. It stands to reason that if one is satisfied with their learning, it would naturally lead to self-confidence (see Figures 5 and 6).

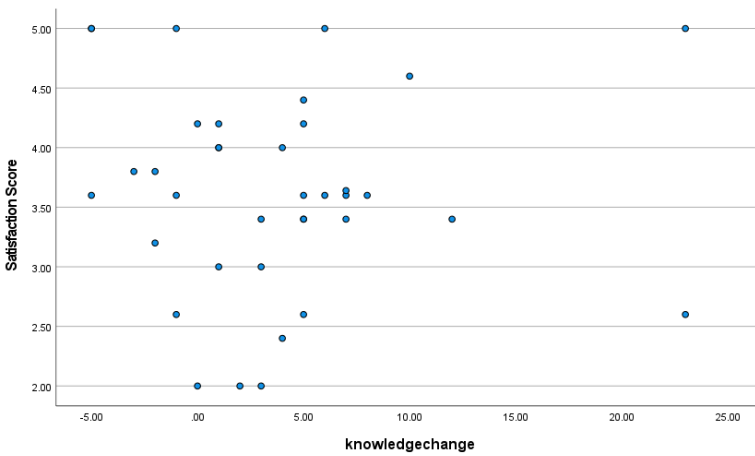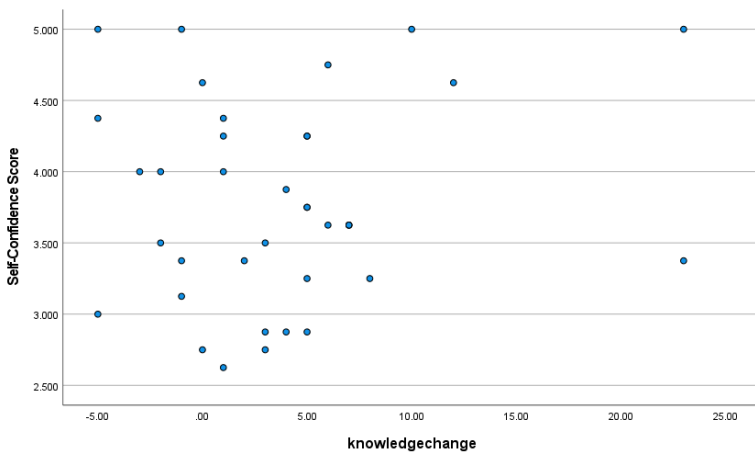Figure 5. Correlation Scatter Plot: Satisfaction

Figure 6. Correlation Scatter Plot: Self-Confidence

Regression Analysis

Next, a regression analysis was performed to assess for a correlation between the independent variable knowledge change and the dependent variables satisfaction or self-confidence, utilizing the parameter estimates with a 95% confidence interval (see Tables 14 and 15).

$$Y_{satisfaction} = \beta_0 + \beta_1(Knowledge\ Change) + \epsilon$$

$$Y_{confidence} = \beta_0 + \beta_1(Knowledge\ Change) + \epsilon$$

Table 14. Model Parameter Estimates—Satisfaction

Parameter	β	Std. Error	t	Sig.	95% Confidence Interval	
					lower bound	upper bound
Intercept	3.632	.166	21.839	<.001	3.295	3.970
Knowledge change	-.004	.023	-.176	.861	-.051	.043

Note. Dependent variable: satisfaction; computed using alpha = .05.

Table 15. Model Parameter Estimates—Self-Confidence

Parameter	β	Std. Error	t	Sig.	95% Confidence Interval	
					lower bound	upper bound
Intercept	3.729	.137	27.194	<.001	3.451	4.008
Knowledge change	.014	.019	.722	.475	-.025	.053

Note. Dependent variable: self-confidence; computed using alpha = .05.

Thus, for each 1 point of knowledge gain (a positive change from pre-test to post-test), satisfaction will change by -0.004. For each 1 point of knowledge gain (a positive change from pre-test to post-test), self-confidence will change by 0.014. The model summary demonstrated a weak non-significant correlation between knowledge change and satisfaction and self-confidence (R^2 = .001/.015). Therefore, surprisingly, knowledge change is not a good predictor of satisfaction or self-confidence in learning using a VLE.

A second multiple regression analysis was done, adding age as a covariate to assess to what extent knowledge change impacts satisfaction or self-confidence in learning while controlling age. Initially, gender was an additional covariate to be evaluated. However, given

there were only three males in the sample, adding gender would not add to the explanation of variance (see Tables 16 and 17).

$$Y_{satisfaction} = \beta_0 + \beta_1(Knowledge\ Change) + \beta_2(Age) + \epsilon$$

$$Y_{confidence} = \beta_0 + \beta_1(Knowledge\ Change) + \beta_2(Age) + \epsilon$$

Table 16. Model With Age Parameter Estimates—Satisfaction

Parameter	β	Std. Error	t	Sig.	95% Confidence Interval	
					lower bound	upper bound
Intercept	2.516	1.408	1.786	.083	-.346	5.378
Knowledge change	.005	.023	-.216	.830	-.053	.042
Age	.049	.061	.798	.430	-.076	.173

Note. Dependent variable: satisfaction; computed using alpha = .05.

Table 17. Model With Age Parameter Estimates—Self-Confidence

Parameter	β	Std. Error	t	Sig.	95% Confidence Interval	
					lower bound	upper bound
Intercept	2.730	1.159	2.355	.024	.374	5.086
Knowledge change	.013	.019	.674	.505	-.026	.052
Age	.044	.050	.868	.392	.022	.868

Note. Dependent variable: self-confidence; computed using alpha = .05.

Therefore, given these models, the parameter estimates confidence intervals demonstrated for satisfaction, 95% CI [-.076 .173] $R^2 = .019$ and for self-confidence, CI [-.059 .146] $R^2 = .036$. The model summary demonstrated that age was weakly correlated to knowledge change, satisfaction, and self-confidence ($R^2 = .019/.036$), signifying that by adding age as a

covariate, the predictability of satisfaction or self-confidence with learning in a VLE was not improved. Thus, while controlling for age, knowledge change did not have a statistically significant impact on satisfaction or self-confidence in learning the concepts of growth and development in a VLE.

It can also be postulated that while the change in knowledge is not a good predictor of satisfaction or self-confidence in learning, the post-test scores alone might be. Perhaps some participants had high pre-test scores and thus lower change in knowledge scores. Therefore, additional regression models were run to see if the post-test scores alone, rather than knowledge change, would be a better predictor of satisfaction or self-confidence in learning (see Figures 7 and 8).

Post-test scores did not significantly predict satisfaction (p=.560) or self-confidence (p=.91) with learning concepts of growth and development as postulated. Thus, it can be concluded that the post-test scores alone (R^2 .012/.000) were a no better predictor of satisfaction or self-confidence in learning than knowledge change. Therefore, based on the outcome of the regression analyses, the H_{02} and $H_{03,}$ there would be no statistically significant correlation between change in knowledge of growth and development concepts and satisfaction or self-confidence in learning concepts of pediatric growth and development using a VLE, fail to be rejected.

Assessing for equally distributed residuals on the P-Plot demonstrated that the residuals were equally distributed, identifying that no random variable is taking on a value equal to or less than the change in knowledge score and that all scores are well fit to the regression line.

Figure 7. Residual Assessment for Regression Model Using Knowledge Change and Satisfaction
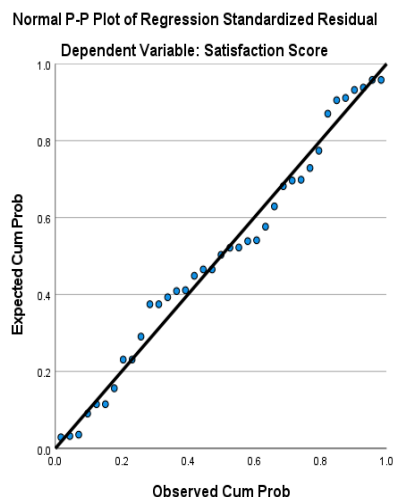
Figure 8. Residual Assessment for Regression Model Using Knowledge Change and Self-Confidence
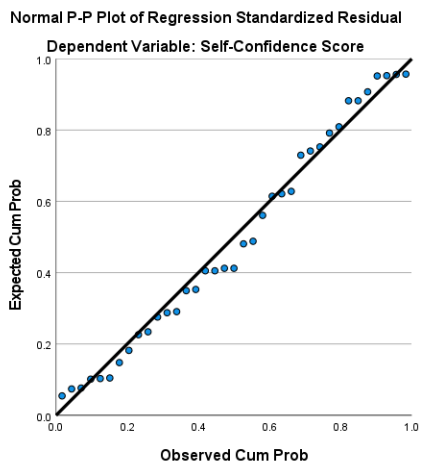
Assessment for the homoscedasticity assumption included reviewing a scatter plot of the predicted and residual values. Homoscedasticity means "having the same scatter" (Statistics How To, n.d.). For it to exist in a data set, the points must be the same distance from the line. The scatterplot does have the most data points scattering around the 45-degree line, which supports the assumption of homoscedasticity (see Figures 9 and 10).

Figure 9. Homoscedasticity for Regression Model Using Knowledge Change and Satisfaction
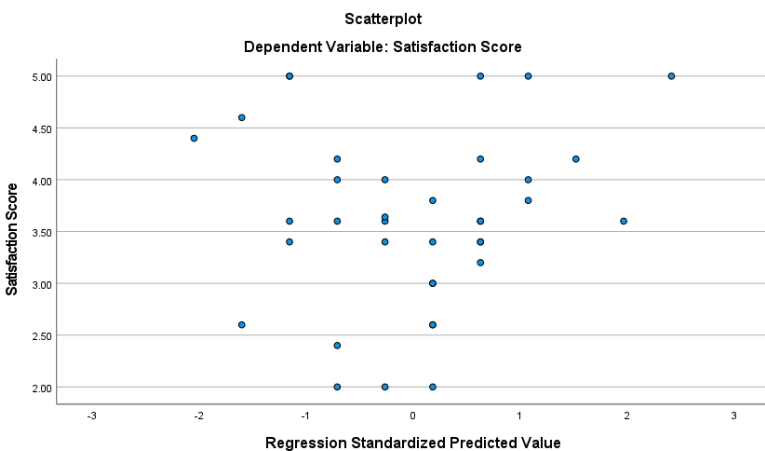
Figure 10. Homoscedasticity for Regression Model Using Knowledge Change and Self-Confidence
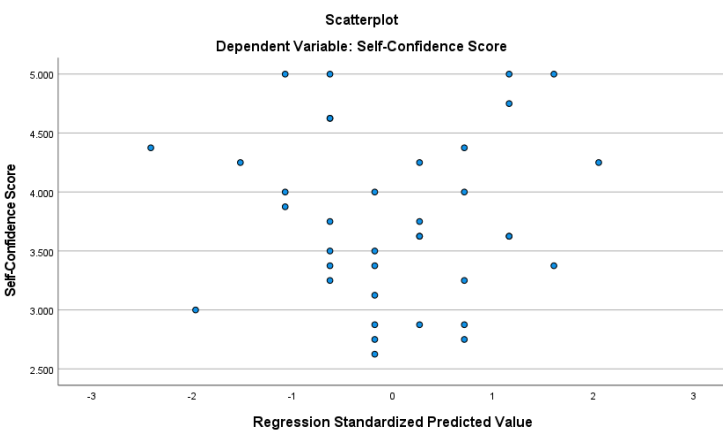
The randomly distributed data demonstrated in the scatter plot also supports the assumption of homoscedasticity of the sample.

Conclusion

This data analysis demonstrates a statistically significant difference between pre-test knowledge and post-test knowledge scores utilizing the researcher-created Growth and Development Knowledge Assessment. However, the analyses do not demonstrate a statistically

significant correlation between knowledge change and satisfaction or self-confidence in learning the concepts of growth and development in the My Virtual Child$^{©}$ VLE. The data demonstrate that despite not being significantly correlated to a change in knowledge, the participants were mostly satisfied (M=3.61; >60% of participants responding agree/strongly agree) and felt confident (M= 3.78; > 69% of participants responding agree/strongly agree) with their learning using the My Virtual Child$^{©}$ VLE. The data further demonstrate that age had minimal impact on knowledge change, satisfaction, or self-confidence in learning concepts of growth and development using a VLE.

CHAPTER FIVE

OVERVIEW

This chapter will discuss the study findings, limitations, strengths, nursing education

implications, and recommendations for future research related to the effectiveness of the VLE,

My Virtual Child©, on several variables. Additional discussion of the convergence and

divergence with extant literature pertaining to the variables studied will be presented. The first

variable, knowledge acquisition, was demonstrated in the knowledge change score from a pre-

test to a post-test. The second and third variables, students' perceived satisfaction and self-

confidence in learning the concepts of growth and development, were analyzed using a

correlation and regression analysis. This study was important to conduct as the use of technology

in nursing education has burgeoned in the past two decades, and even more so since the arrival of

the pandemic in 2020. There remains a paucity of research on the effectiveness of VLEs to

achieve learning outcomes. Even less research has been conducted on nursing students'

knowledge acquisition of the concepts of growth and development across the pediatric age span,

with only two studies spanning 32 years (Ahmed & Richardson, 2013; Gillis, 1990). Knowledge

of growth and development is critical in preparing students to provide developmentally

supportive care to pediatric patients.

VLEs are an active educational strategy grounded in experiential learning theory that

provides an alternative learning environment for nursing students. Active learning strategies

grounded in experiential learning theory consist of students actively engaging in their learning

(Shin et al., 2015). Active learning in the form of VLEs provides a computer-based immersive

experience for the participants to experiment with information to obtain an outcome (Shin et al.,

2015). These learning environments aim to prepare students to engage in the same types of

situations or conditions that they would find in the actual clinical setting. Goldschmidt (2014)

identified that VLEs are a fun and creative way to improve learning and build upon experiences

and appear to be "promising for expanding knowledge, behavior and skills" (p. 283).

Nevertheless, there remains a paucity of literature on the effectiveness of these VLEs in

achieving expected outcomes related to effectiveness in learning. The literature review

demonstrated a variety of uses exist for VLE in higher education and nursing education, in

particular (Brannan et al., 2016; Herron et al., 2019; Hill, 2017; Shin et al., 2015). This study is

essential to nursing education as nurse educators in the 21st century use more technology and

technological platforms to teach nursing students.

The current demographics in nursing education indicate that most students are in the Gen

Z age group. This includes individuals born between 1996 and 2015 (Mensik, 2018). Gen Z

students have grown up with technology, and while they are not inherently digital natives, they

are the most technologically advanced of the digital immigrant population (Chicca &

Shellenbarger, 2018; Roehling et al., 2011; Towle & Breda, 2014). These Gen Z students can

shift their attention rapidly from one technology to another, which results in students with low

tolerance levels for boredom and a heightened need for constant interactivity (Chicca &

Shellenbarger, 2018; Roehling et al., 2011; Towle & Breda, 2014). Hampton and colleagues

(2020) found that GenZers "prefer intrapersonal learning… and they do not like to be lectured at

and want to be involved in their learning" (p. 160). The studies discussed in Chapter Two

demonstrate that for both the millennial and Generation Z students, active learning via a virtual learning environment supported their desired preference of how to learn the material in the educational setting, which was postulated to lead to an increase in knowledge, satisfaction, and self-confidence in learning.

The My Virtual Child© is a VLE, grounded in the experiential learning framework, in which a student raises a virtual child from birth to eighteen years of age. During the use of this program, the student makes 296 parenting decisions that impact the developmental outcome of the virtual child. The parenting decisions are based on the students' understanding of the concepts of growth and development and their ability to apply their knowledge to informed parenting decisions. According to the creator of this VLE,

> …at each age, the student will hear about various milestones the child has attained, specific problems the child is having, or experiences that occur in the family or the school or community environment, and the student will be able to make decisions about how to parent the child. (Manis, 2011, p. 6).

This interactive virtual learning environment, created for psychology students and used in a pediatric nursing theory/clinical course for this study, was postulated to be a creative student-centered active learning experience that would assist pediatric nursing students in their knowledge acquisition and subsequent positively perceived satisfaction and self-confidence in learning concepts of growth and development. The My Virtual Child© VLE has been used at the study university since 2014. The researcher searched for an interactive way for students enrolled in the pediatric theory/clinical course to learn growth and development concepts of growth and development and incorporated this VLE into the course curriculum. However, as with all VLEs, this researcher did not know the effectiveness of the use of this VLE and was thus led to design this study.

As discussed previously, there are no research studies in the literature about the use of this particular virtual learning environment with nursing students enrolled in a pediatric theory/clinical course, and limited studies of this VLE, My Virtual Child[©], in other disciplines (Anderson et al., 2015; Naude & Botha, 2017; Symons & Smith, 2014; Zimmerman, 2013). Thus, the overall purpose of this study was to explore what relationships, if any, exist between knowledge change, self-confidence, and satisfaction in learning concepts of growth and development across the pediatric age span using a Virtual Learning Environment (VLE), My Virtual Child[©] in a pediatric nursing theory/clinical course.

This cross-sectional descriptive correlational study utilized a researcher-developed Growth and Development Knowledge Assessment pre-test/post-test and the NLN Student Satisfaction and Self-Confidence in Learning instrument. The researcher-developed test demonstrated evidence of reliability in both the pilot study and this study. The NLN instrument demonstrated evidence of reliability in the original work cited by the authors of the instrument and a reliability study conducted by Franklin et al. (2014). Confidence in the reliability of the instruments supported their use in this study. The convenience sample of 38 matched pairs garnered from the possible participant pool of students enrolled in the pediatric theory/clinical course was representative of the population as demonstrated by the demographics presented previously of both matched and unmatched participants.

Discussion of Research Questions, Hypotheses, and Findings

Summary of Findings

The pre-test results ($M = 16.66$; SD 5.518) and post-test results ($M = 20.37$; SD 2.223) demonstrated a positive change in growth and development knowledge from the pre-test to the

post-test, indicating potential knowledge acquisition from the VLE, My Virtual Child©. Data analysis for this study using a paired t-test demonstrated that the change in growth and development knowledge score from the pre-test to the post-test was statistically significant (p = < .001). Additional data analysis demonstrated that 73.7% ($N = 28$) of the participants improved their post-test scores while 21% ($N = 8$) had decreased scores and 5.3% ($N = 2$) scores remained unchanged.

Correlation analysis of the independent variable, knowledge change, and the dependent variable, satisfaction, was negative ($\beta = -.004$) and weakly correlated, while self-confidence was positive ($\beta = .014$) and weakly correlated. However, neither demonstrated a statistically significant correlation ($p = 0.431$ / $p = 0.238$, respectively) between knowledge change and satisfaction or self-confidence in learning concepts of growth and development in the VLE. However, the correlation between satisfaction and self-confidence in learning was demonstrated to be positive, strong, and statistically significant ($p < .000$). An unexpected finding was a non-significant correlation between knowledge change and satisfaction and self-confidence in learning. It can be postulated that the participants did not know their post-test scores when completing the NLN Student Satisfaction and Self-Confidence in Learning Survey and that not knowing that their scores improved may have negatively impacted their perceived satisfaction and self-confidence to a degree.

Regression analysis demonstrated that change in knowledge (independent variable) was not a good predictor of satisfaction or self-confidence (dependent variables) in learning concepts of growth and development in a VLE. The model summary demonstrated a weak positive correlation between knowledge change and satisfaction and self-confidence ($R^2 = .001/.015$ respectively).

Overall data analysis demonstrated that despite the change in knowledge being statistically significant, it was not significantly correlated to satisfaction or self-confidence. However, satisfaction and self-confidence were significantly correlated with each other. Satisfaction scores demonstrating a strong and statistically significant positive correlation with self-confidence is an expected finding. When students feel satisfied with their learning, they are more likely to feel self-confident (Smith, 2018). Additionally, the change in knowledge from the pre-test to the post-test was statistically significant, indicating that participants increased their knowledge of the concepts of growth and development after completing the VLE, My Virtual Child[©].

Discussion of Findings: Knowledge Change

RQ 1: To what extent does the use of a VLE change pre-licensure nursing students' knowledge of concepts of growth and development in the pediatric population?

Null Hypothesis 1 (H_{01}). There will be no statistically significant difference in the knowledge of growth and development concepts from the pre-test to the post-test.

Kyaw and colleagues (2019) conducted a meta-analysis of thirty-one studies to evaluate the effectiveness of virtual reality, identified as participant interaction with any form of virtual technology ranging from computer-based to individually worn headsets, in pre-and post-registration health professions education. Their findings demonstrated post-intervention increases in knowledge scores [SMD] = 0.44; CI 95%, 0.18-0.69; $I^2 = 49\%$ demonstrating moderate certainty evidence (p. 5). Likewise, Anderson et al. (2015) found that the participants ($N = 66$) in their study had a statistically significant ($p = .000$) change in knowledge on the post-test from the pre-test related to the VLE My Virtual Child[©] used with sophomore, junior, and

senior high school students. Anderson et al. concluded that "[they] all benefited from the *MVCs* experiential learning pedagogy" (p. 38). Similarly, Wiese et al. (2021) found that the participants ($N = 90$) in their study comparing a live and virtual disaster simulation demonstrated a statistically significant increased post-intervention knowledge score ($p < .001$) for those in the virtual disaster simulation.

As with these study outcomes in the literature, the post-test scores of this study after the VLE intervention were statistically significant for a change in knowledge score ($p = < .001$). Conversely, Zimmerman (2013) found no statistical difference in the exam scores ($N = 50$) post My Virtual Child© intervention when compared to the participants' ($N = 50$) previous semester exams in which the VLE was not used. Similarly, Hanson and colleagues (2020) found no statistical difference in the pre- to post-intervention knowledge score when comparing two types of VLEs for pharmacology learning ($p = 0.977$) for mean improvement scores. Thus, it can be postulated that the VLE provides a less stressful environment that potentially increases participants' interaction and engagement with the elements of the VLE, allowing for "in situ" problem solving, leading to an increase in post-intervention scores (Kolb, 1984; Goldschmidt, 2014).

Satisfaction and Self-Confidence

RQ 2: To what extent does the use of a VLE impact pre-licensure nursing students' satisfaction in learning concepts of growth and development in the pediatric population?

RQ 3: To what extent does the use of a VLE impact pre-licensure nursing students' self-confidence in learning concepts of growth and development in the pediatric population?

Null Hypothesis 2 (H$_{02}$). There will be no statistically significant correlation between

change in knowledge of growth and development concepts and satisfaction in learning using a VLE to learn concepts of pediatric growth and development in a pediatric theory course.

Null Hypothesis 3 (H$_{03}$). There will be no statistically significant correlation between change in knowledge of growth and development concepts and self-confidence in learning using a VLE to learn concepts of pediatric growth and development in a pediatric theory course.

In nursing education literature related to satisfaction and self-confidence in learning, the two concepts are typically assessed together using a combined instrument such as the NLN Student Satisfaction and Self-Confidence in Learning instrument. It is not easy to discuss one concept without the other, and it appears that perceived satisfaction with learning may influence the student's perceived self-confidence. A study by Smith and colleagues (2018) concluded that when learning is valued nursing students tend to be satisfied with their learning. VLEs assist nursing students with engaging in their learning in a new and more experiential way, leading to improved satisfaction and self-confidence with learning. Liu and Hou (2021) assessed undergraduate nursing students' post-intervention satisfaction and self-confidence ($N = 98$) using the NLN Student Satisfaction and Self-Confidence in Learning instrument after implementing multidisciplinary teaching methodologies, including virtual game-based learning. These authors found a non-statistically significant increase in both satisfaction and self-confidence scores post-intervention in the experimental group.

However, Khasawneh and colleagues (2021) found a statistically significant correlation ($p < .001$) between student satisfaction and self-confidence ($N = 370$) in their descriptive, cross-sectional, correlational study evaluating the efficacy of simulation. Similar to Khasawneh and colleagues (2021), this study demonstrated a statistically significant correlation between

satisfaction and self-confidence in learning concepts of growth and development utilizing a VLE, My Virtual Child$^©$ ($p = < .001$). Although this study did not find a statistically significant relationship between knowledge change and satisfaction and self-confidence in learning, it remains an important study in describing the relationship between satisfaction and self-confidence with learning after using a VLE, which was statistically significant. As discussed in Chapter Four, it can be postulated that this study failed to find statistical significance between the knowledge change and satisfaction and self-confidence in learning as the participants did not know their post-test scores before completing the NLN Student Satisfaction and Self-Confidence in Learning survey. The way the study was designed, the NLN survey questions immediately followed the post-test. This design was intentional to avoid survey fatigue. However, it may have inadvertently affected the relationship between knowledge change and satisfaction and self-confidence with learning.

The use of Kolb's (1984) Experiential Learning Theoretical framework to underpin this study supported the study findings related to knowledge acquisition, and perceptions of satisfaction and self-confidence in learning the concepts of growth and development. An important aspect of the Experiential Learning Theory is that of active experimentation through concrete experiences—use of the VLE My Virtual Child$^©$—followed by reflective observation and abstract conceptualization, which occurred during the self-directed reflection which served as a form of debriefing in this study. The reflections of the participants about their virtual child were documented through abstract conceptualization in the course assignment entitled the Growth and Development Profile. Another essential component of the Experiential Learning Theory is the individual's preferred way of learning which was not specifically addressed in this

study and could be added to a future study. The intersection of the learning environment with the individual's learning preference determines how knowledge is acquired and processed for deep learning. It is the recommendation of this researcher that any future studies assessing any aspect of VLE use for learning be underpinned by the Experiential Learning Theory.

Study Limitations

All research has inherent risks or threats to validity. The single group design was utilized to reduce threats to internal validity. However, given the small sample size and lack of statistical significance, there is a threat to the internal validity of this study.

Another possible threat was the testing threat which only occurs in a pre-test/post-test design. In this type of threat, the participants might recognize what the instrument is measuring, making them act differently in the interaction with the intervention, affecting their post-test outcomes (Trochim et al., 2016). It is not possible to ascertain whether this threat existed or not as the objective of the use of the VLE was to acquire knowledge. The post-test scores of the participants reflected the following breakdown: 73.7% increased, 21% decreased, and 5.3% remained unchanged. This would suggest that the testing threat did not exist in this study.

Mortality threat, also known as selective attrition, results in participants withdrawing from the study before its conclusion and is considered another possible threat to this study (Trochim et al., 2016). Despite all the efforts of the researcher to minimize the mortality threat, a loss of participants occurred between the pre-test and post-test/survey portion of the study. One hundred and six participants completed the pre-test, and only 78 participants completed the post-test. However, only 38 were matched pairs. This loss of participants threatens the study's internal validity due to a smaller than proposed sample size.

A fourth threat to the internal validity of this study is the history threat. During the six weeks that the participants raised their virtual child, they were also completing assigned textbook readings about growth and development and attending clinical experiences. During the clinical experiences, the participants were interacting with pediatric patients across the pediatric age span, which could have impacted their interactions within the VLE, leading to a history threat.

A final threat to this study is an instrumentation threat. This type of threat relates directly to the instrument used, in this case, the NLN Student Satisfaction and Self-Confidence in Learning instrument. This instrument was created to assess students' perceived levels of satisfaction and self-confidence with their learning in a simulation environment. Most simulations are facilitated by faculty. However, in this study, the VLE, My Virtual Child[©], is a virtual simulation. Virtual simulations are most often self-directed learning experiences, as is My Virtual Child[©], with the student participating in the simulation experience without guidance or direction from faculty. This instrument includes four items related to the instructor's involvement in the simulation. Two items are on the satisfaction subscale, and two are on the self-confidence subscale. There is no scoring option 'not applicable' for participants to choose. They may choose 'undecided' as the neutral option resulting in lower mean scores for those items. This researcher attempted to limit this instrumentation threat by specifying in the directions that participants' responses are related to a self-directed virtual simulation experience.

A small sample size results in a threat to external validity in the lack of generalizability of the study findings. While the demographics represented in the sample appeared to represent the population of nursing students taking a pediatric theory/clinical course, the small sample size could limit generalizability. Despite the small sample size, this study's findings remain

important to nursing education in terms of evaluating the effectiveness of a VLE on knowledge

acquisition and students' perceived satisfaction and self-confidence in learning.

Two biases, central tendency and acquiescence, are inherent in the use of Likert-type

scale surveys. The central tendency bias means that most participants completing a 5-point

Likert-type scale tend to shy away from choosing either extreme, which could introduce some

variation (Waltz et al., 2017). This bias did not seem to occur in this study, as the self-confidence

scale had three items that had scores at both extremes (see Table 11).

Table 11. NLN Survey Descriptive Statistics

Item	Mean score	SD	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Satisfaction							
1. The teaching methods used in this simulation were helpful and effective.	3.68	1.21	0%	18.9%	10.8%	40.2%	27%
2. The simulation provided me with a variety of learning materials and activities to promote my learning of the concepts of growth and development.	3.95	1.11	0%	18.9%	21.6%	32.4%	24.3%
3. I enjoyed how my instructor taught the simulation.	3.51	1.07	0%	16.2%	27%	32.4%	18.9%
4. The teaching materials used in this simulation were motivating and helped me learn.	3.68	1.10	0%	24.3%	8.1%	45.9%	24.3%
5. The way my instructor(s) taught the simulation was suitable for the way I learn.	3.51	1.07	0%	16.2%	45.9%	35.1%	18.9%

Table 11. NLN Survey Descriptive Statistics (cont.)

Self-Confidence							
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	3.78	.886	0%	5.4%	18.9%	32.4%	24.3%
7. I am confident that this simulation covered critical content necessary for the mastery of the pediatric curriculum.	3.51	1.26	5.4%	21.6%	13.5%	29.7%	27%
8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting	3.59	1.09	2.7%	18.9%	13.5%	45.9%	18.9%
9. My instructors used helpful resources to teach the simulation	3.51	1.19	2.7%	21.6%	24.3%	24.3%	27%
10. It is my responsibility as the student to learn what I need to know from this simulation activity.	4.11	.614	0%	0%	13.5%	62.1%	24.3%
11. I know how to get help when I do not understand the concepts covered in the simulation.	4.30	.571	0%	0%	5.4%	59.4%	35.1%
12. I know how to use simulation activities to learn critical aspects of these skills.	4.0	.913	0%	10.8%	8.1%	51.3%	29.7%
13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time.	3.54	1.09	5.4%	16.2%	10.8%	54%	13.5%

A final bias that could be present when utilizing a Likert-type scale is acquiescence bias, in which participants tend to agree with the items presented (Waltz et al., 2017). Analysis of the instrument's scores also does not demonstrate this bias, as most items' scores were distributed across four of the five rating options resulting in a normal distribution.

Strengths

An essential strength of this study lies in the creative alternative learning strategy for nursing students enrolled in a pediatric theory/clinical course to engage with and apply the concepts of growth and development across the pediatric age span. The IOM (Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, 2011) has called upon nurse educators to transform nursing education and incorporate active learning strategies into the classroom to meet the needs of the current generation of students filling higher education classrooms, the GenZers. Nurse educators are beginning to embrace more active learning strategies, including VLEs, without knowing their potential to achieve learning outcomes. This study provided nursing students enrolled in a pediatric theory/clinical course with an alternative active learning strategy for learning concepts of growth and development. The NLN Satisfaction and Self-Confidence survey results demonstrated that overall, the students felt satisfied and self-confident in learning the concepts of growth and development after using the VLE.

Additionally, the participants' post-test scores demonstrated a statistically significant positive change in knowledge, indicating knowledge acquisition over the use of the VLE time frame of six weeks. This finding is important to support the effectiveness of a VLE such as the My Virtual Child[©] in learning the concepts of growth and development across the pediatric age span. Further, nursing students enrolled in a pediatric theory/clinical course must use their

knowledge of growth and development to provide developmentally supportive nursing care in the clinical setting. Engaging in a VLE brings the concepts to life in a way that words on a page cannot. The students can watch videos within the VLE that demonstrate the concepts in action, further reinforcing the concepts and appealing to the learning styles of the current demographic in higher education, the GenZ student.

Another strength lies in the exclusion criteria of being a parent. This researcher felt that having children could introduce unintentional bias into raising the virtual child, and through this exclusion criteria, this bias is limited. A third strength is that it provided participants with a unique preview of what being a parent and raising a child would be like. Additionally, since pediatric nurses provide family-centered care, it also gives students insight into caring for the whole family. A fourth strength is that the participants were representative of the larger population of nursing students enrolled in a pediatric theory/clinical course in this university.

This study can positively impact future nursing students enrolled in their pediatric nursing course to engage in an active learning strategy to learn the concepts of growth and development across the pediatric age span. As far as this researcher can ascertain from a literature search, this VLE has not been studied in a nursing student population enrolled in a pediatric theory/clinical course. Further, in discussions with the publisher representative, it does not appear that any other nursing program in the United States is using this creative, active learning strategy to teach concepts of growth and development across the pediatric age span in a pediatrics theory/clinical course. Finally, this researcher was privileged to have a phone call with Dr. Manis, the creator of My Virtual Child[©], and discuss the use of this interactive VLE outside

of the discipline of Psychology, specifically in pediatric nursing theory/clinical course (personal communication, May of 2020).

Conclusions

Given the ongoing paucity of literature evaluating the effectiveness of VLEs in nursing education, this study is a first step in evaluating one VLE, My Virtual Child$^{©}$. This study examined the effectiveness of the VLE in participant knowledge change from a pre-test to a post-test, along with their perceived satisfaction and self-confidence with learning the concepts of growth and development in a pediatric nursing theory/clinical course. There was a statistically significant change in knowledge from the pre-test to the post-test, demonstrating knowledge acquisition about the concepts of growth and development across the pediatric age span achieved by working through the VLE, My Virtual Child$^{©}$. Although the correlation between knowledge change and participants' perceived satisfaction and self-confidence with learning was not statistically significant, it was still positively correlated, albeit weakly. Further, satisfaction and self-confidence were significantly correlated, which is an important finding. This study demonstrates that nursing students in a pediatric nursing theory/clinical course can utilize an active learning strategy to learn the concepts of growth and development. This type of active learning would support their likely divergent learning style. As discussed in Chapter Two, a divergent learner prefers interactive, hands-on learning (Kolb, 1984), which can occur in a VLE.

Implications for Nursing Practice

Nursing education aims to graduate practice-ready students. An important component to being practice-ready in pediatric nursing is knowing the concepts of growth and development and utilizing this knowledge in providing developmentally supportive care to patients (SPN,

2017). The challenge for nurse educators is to create curricula and learning experiences that not only support students' acquisition of knowledge but their satisfaction and self-confidence with learning, so they are ready and able to translate that knowledge to their clinical practice (Chicca & Shellenbarger, 2018; Hampton & Keys, 2017; Mensik, 2018; Williams, 2018). Nursing curricula that support the development of confident graduates who can transfer their knowledge to their clinical practice will be primarily based on experiential learning (Herron et al., 2019). This type of curricula for the student demographics of the tail end of the millennials and the current GenZers supports their learning styles and motivation to learn (Brannan et al., 2016). To transform nursing education, nurse educators must stop teaching as they were taught, focusing on covering content; and instead focus on new approaches that motivate the GenZ student and beyond to be an active participant in their learning (Benner et al., 2010; IOM, 2011). This study can contribute to the literature on the efficacy of active learning strategies such as a VLE to assist nursing students in learning career- necessary concepts in a new and meaningful way. This study can further inform nurse educators about an active learning strategy to help students learn the concepts of growth and development across the pediatric age span.

Implications for Future Research in Nursing Education

As there remains a paucity of research on the effectiveness of VLEs for teaching essential concepts in all aspects of education, further research is needed. Nurse researchers have a growing concern that there is not enough research relating to evidence-based nursing education strategies being undertaken. As O'Lynn (2018) pointed out, it has been over a decade since the IOM called for the radical transformation of nursing education. Nurse educators are wondering if evidence-based teaching strategies and educational research are a myth rather than a reality. There

continues to be a paucity of high-quality evidence to support nursing education teaching strategies, and the necessity for nurse educators to engage in rigorous high-quality education-focused research linking the science of nursing education and the science of learning remains critically important (O'Lynn, 2018).

A new literature search to identify recent studies in this area found only four articles published between 2017 and 2022 related to the effectiveness of VLEs, and no further studies about the My Virtual Child[©] were identified. This continuing paucity of literature demonstrates the need for further research on the effectiveness of VLEs in nursing education. One clear gap in the literature is an instrument designed specifically for assessing the efficacy of VLEs. This researcher and others had to adapt an instrument explicitly made for in-person simulations and provide directions for understanding the items as they applied to the VLE, which could hinder the participants' authentic input. In the future, a grounded theory research approach could be utilized as the first steps to develop an instrument specific to assessing effectiveness of VLEs. This type of a research study would create interview questions to ask participants, from which themes via coding would emerge and lead to item development for an instrument. This type of research study would seem to be the next step in developing an instrument to assess the efficacy of the VLEs being used more frequently in nursing education.

An alternative to designing a grounded theory study to begin instrument development could be the use of the Clinical Learning Environment Comparison Survey. This tool was created to answer the question, "What learning needs of undergraduate nursing students were perceived to have been met better in the traditional clinical environment and which were met better in the simulated clinical environment" (Leighton, 2015, p. 45). This instrument could be

used to evaluate the effectiveness of this VLE in comparison to the pediatric clinical

environment. According to the author, "this tool is a valuable tool for instructors to use to learn if

their teaching strategies… are effective" (Leighton, 2015, p. 48). While the My Virtual Child$^{©}$

could not replace pediatric clinical, it could undoubtedly be used as an adjunct to clinical,

especially in times of necessary remote learning, such as during the COVID-19 pandemic when

in-person classroom and select clinical education had to convert to online learning rapidly.

Replication of this study is needed with a larger sample size with built-in matching of the

participants within the survey platform to assess for a potentially positive and statistically

significant relationship between knowledge change and satisfaction/self-confidence in learning

the concepts of growth and development, which was not identified in this study, possibly due to

the smaller than expected sample size. It would also be important to design a quasi-experimental

study. There could be a comparison between a control and intervention group to assess for a

statistically significant relationship. Further, knowledge acquisition of growth and development

concepts could be evaluated in a longitudinal study design for knowledge retention across time,

especially close to the licensing exam, NCLEX. This could strengthen the research design of the

study.

As nursing students and nurses are expected to transfer their knowledge to their clinical

practice, an instrument that assesses knowledge transfer would be most helpful. A tool exists

within the discipline of human resources, to determine the transfer of knowledge within

knowledge-intensive organizations, the Learning Transfer System Inventory (LTSI) developed

by Holden (2000). This author purports that nursing is a knowledge-intensive profession and

would benefit from an objective measure of knowledge transfer. "Research shows that typically

less than 20 percent of the skills and knowledge acquired in training [education] result in workplace changes" (Deller, 2022). This finding identifies a need to develop a way to measure the transfer of knowledge in nursing practice.

Summary

This study represents a first step in attempting to quantify the effectiveness of a VLE in achieving learning outcomes. More specifically, knowledge changes, along with satisfaction and self-confidence in learning concepts of growth and development. This study demonstrated a statistically significant positive change in participants' knowledge and a statistically non-significant, negative but weak relationship with satisfaction and a weakly positive relationship with self-confidence in learning the concepts of growth and development utilizing a VLE. Further research is needed to validate these findings and expand upon them as the use of technology in nursing education will likely only continue to accelerate.

APPENDIX A

VARIABLES AND MEASUREMENTS OF THE STUDY

Variable	Measurement	Data Collection Method	Statistical Analysis
Individual Characteristics	Demographics	Qualtrics Pre-Test first questions	Descriptive statistics
Knowledge	Growth and Development Assessment Knowledge Test Pre- and Post-Test	Qualtrics link provided to students via course management system for course	t-test correlation
Satisfaction with Learning	NLN Survey- Student Satisfaction and Self-Confidence in Learning	Qualtrics link provided to students via course management system for course for self-report	t-test correlation regression analysis
Self-Confidence with Learning	NLN Survey- Student Satisfaction and Self-Confidence in Learning	Qualtrics link provided to students via course management system for course for self-report	t-test correlation regression analysis

APPENDIX B

GROWTH AND DEVELOPMENT KNOWLEDGE ASSESSMENT INSTRUMENT

Completion of this instrument implies consent to participate in this research study
Please complete the following demographic questions: This information will be used to
accurately describe the sample of the study and investigate any correlations between age
and gender with the outcomes of the study.

Age:

Gender (that you identify with)   M   F   Other

Do you have children?   Yes   No

If yes, how many?

Have you ever completed a My Virtual Child assignment in a previous course? Yes   No

Directions: Choose the best answer for each question.

1. A 3-year-old is scheduled for a tonsillectomy in a few days. The nurse is preparing the
    patient for pre-operative teaching. Which strategy should the nurse use to provide education
    to this child?

    a. Provide a detailed video that shows the surgery and then discuss the patient's feelings
    b. Engage in conversations about the procedure and encourage patient to discuss their
        feelings
    c. Describe the procedure with pictures and other written material and assess understanding
    d. Use picture books and puppets and repeat explanations as needed based on child's
        questions

2. A mother brings her 8-month-old infant into the clinic for a well-child visit. Which
    statement made by the mother would raise concern for the infant's safety and demonstrate a
    need for further education?

    a. "Yesterday I threw away all of our house plants"
    b. "We have a gate at the bottom of the stairs in the family room"
    c. "I use a hot steam vaporizer when he has a cold"
    d. "He rides in a rear-facing car seat"

3. A first-time mother visits the clinic for a well-child visit and asks the nurse what type of toys
    would be best for her 18-month-old. What is the nurse's most appropriate response?

    a. Movies, computer games and board games
    b. Push-pull toys, large balls, and wooden puzzles
    c. Marbles, dress-up clothes and card games
    d. Video games, remote control truck and playdoh

4. During a well-child visit, a mother is discussing the care of her 15-month-old. Which statement by the mother demonstrates a need for further teaching regarding growth and development?

   a. "She is not potty trained"
   b. "She speaks in 2-3- word sentences"
   c. "She loves to play with her play kitchen"
   d. "She likes push pull toys"

5. The nurse is planning the care for a hospitalized adolescent. In considering the patient's psychosocial needs, the nurse knows the adolescent will be most concerned with?

   a. Becoming industrious
   b. Establishing identity
   c. Achieving intimacy
   d. Creating relationships

6. The nurse is preparing a pre-school aged child for an immunization. Based on growth and development principles, which intervention is most appropriate?

   a. Allow the patient to administer the injection to an anatomically correct doll
   b. Coordinate the patient watching a peer receive the injection
   c. Suggest diversionary activities like singing
   d. Have the parents explain the process to the patient

7. A 16-year-old admitted with a diagnosis of acute appendicitis is hospitalized following surgery for an appendectomy. Considering the patient's cognitive and psychosocial development, which nursing intervention is most appropriate?

   a. Allow the family to bring in the child's favorite board game
   b. Encourage the parents to room-in with the child
   c. Encourage the child to rest and read
   d. Allow the child to participate in activities with other individuals in the same age group when the condition permits

8. A clinic nurse assesses the communication patterns of a 5-month-old infant. The nurse determines that the infant is demonstrating appropriate achievement of developmental milestones if the infant:

   a. Uses simple words like "mama"
   b. Uses monosyllabic words
   c. Uses babbling and cooing sounds
   d. Links syllables together

9. The nurse is teaching a 10-year-old child about their impending heart surgery. Considering cognitive and psychosocial development of the child, which strategy would be best for the nurse to use?

   a. Provide a verbal explanation just prior to the surgery
   b. Provide the child with a booklet to read about the surgery
   c. Introduce the child to another child who had heart surgery three days ago
   d. Explain the surgery using a model of the heart

10. While planning nursing care for a hospitalized adolescent, the nurse understands that the greatest concern experienced by patients of this age is?

   a. Ineffective pain management
   b. Altered body image
   c. Restricted physical activity
   d. Separation from family

11. A nurse is planning to give their 7-year-old nephew a birthday present. Given the child's age, which would be the most appropriate gift?

   a. Wooden shapes puzzle of their favorite animals
   b. Dress up clothes that includes only male oriented characters
   c. Board game that can be played with several friends
   d. Puzzle with 2000 pieces of their favorite cartoon character

12. In developing a plan of care for a hospitalized preschooler, a nurse recognizes that it is most important to consider:

   a. The child may believe the hospitalization is a punishment
   b. It is very important for the child's peers to visit and be included
   c. Incorporating play activities with other children as permitted
   d. Multiple ways to protect the child's privacy and independence

13. The parents of a 2-year-old child ask the nurse how best to assist the child to accomplish developmental tasks at this age. What is the nurse's best response?

   a. "Make sure the child's siblings insist that the child share their toys during playtime"
   b. "Since the child understands the word 'no', use this word frequently to establish rules"
   c. "Ask grandparents and other childcare providers to follow your home schedule as able"
   d. "Attend to the child quickly during temper tantrums and provide reassurance"

14. The mother of a 19-month old asks the nurse how to safety-proof the home. What should the nurse recognize as the most effective means to prevent accidental poisoning?

    a. Keep the Poison Control Center phone number near the phone
    b. Store poisons out of the house in the garage or shed
    c. Scan the home from the child's eye level and remove accessible toxins
    d. Tell children where the toxic substances are and to not go there

15. A mother of a 4-year-old child requests information about expected growth and development of their child. Which characteristics should the nurse discuss?

    a. Needs 2 naps per day
    b. Likes stacking toys
    c. Plays with imaginary friends
    d. Uses only 2 words in a sentence

16. A nurse is teaching a 10-year-old child with diabetes how to check blood glucose levels. Which teaching strategy would be the most effective method for learning? Have the child:

    a. Watch a video about the procedure
    b. Read a pamphlet about diabetes mellitus
    c. Create a poster with healthy food choices
    d. Perform the procedure after watching the nurse

17. A nurse is planning quiet activities for hospitalized adolescents. Which is the best age appropriate choice?

    a. Board games
    b. Arts and crafts
    c. Role playing
    d. Video games

18. A child takes a toy from another child causing the second child to cry. The first child seems surprised by the second child's reaction. These behaviors are typical of which age group?

    a. Preschool
    b. Infant
    c. Adolescent
    d. School Age

19. Which statement by the nurse is appropriate to describe something of a medical nature to a 4-year-old child?

    a. "You have a germ that is going to make you feel sick for a few days, and then you will get better. You did not get sick because you pushed your brother off of the slide."
    b. "Having your blood drawn will hurt on your hand and you need to stay very still. Then I will put a band-aid on it"

c. "I need you to hold still. I am going to take your blood pressure now, no talking or moving."

d. "It is time to take you to get a CAT scan of your tummy. Can you get into the wheelchair please?"

20. A 9-year-old child is scheduled for bone surgery on their left leg in 6 weeks. Which might be most helpful for the nurse to do as a way to help the patient emotionally deal with the surgery?

   a. Talk to child's parents privately about how he is handling the thought of surgery.
   b. Refrain from mentioning the surgery prior to it occurring.
   c. Remember that his nonverbal expressions may not match his verbal communication.
   d. Suggest having the cast signed by his friends and saving it when it is removed.

21. An 8-year-old client is going to have an appendectomy. Which statements made by the nurse would be most appropriate?

   a. "You need to wee-wee in the cup"
   b. "It's time to go to the operating room. Would you like to ride in the wheelchair or on the stretcher?"
   c. "All children have told me that they are scared of being put to sleep for surgery."
   d. "It's better not to cry and to save all of your strength for after surgery?"

22. In planning developmentally appropriate care for an 8-year-old child with Acute Lymphocytic Leukemia it is most important for the nurse to?

   a. Schedule a nap in the child's daily routine while hospitalized
   b. Discuss inanimate objects and their capabilities to prevent the child from thinking they can come alive
   c. Educate the child on safety measures in response to anticipated feelings of invincibility
   d. Arrange for a teacher or classmate to bring homework assignments to the hospital

23. What would the nurse do to provide the most developmentally appropriate care for a 14-year-old child?

   a. Inform the client of the hospital's visitation policy encouraging them to ask friends to come and visit.
   b. Keep the parent in the room whenever performing a physical examination on a client of the opposite sex.
   c. Discuss any procedures that could leave scars and ways that the appearance of the scars can be minimized with the parents only
   d. Tell the client ahead of time when tasks or procedures are scheduled to occur to establish the authority of the nurse and provide structure.

24. A 2-year-old child is having a well-child checkup. What type of play would the nurse expect this child to enjoy?

    a. Riding a bicycle
    b. Putting together a 100-piece puzzle with two or three friends
    c. Playing simple games with two to three other children at the same time
    d. Using play pots and pans to cook a meal for their stuffed animals

25. The pediatric nurse is preparing a teaching plan for parents about providing a safe environment for children. Which information should the nurse include in the plan?

    a. Young children should be left alone to explore their environment.
    b. Toddlers learn to sense danger and avoid it.
    c. Young children can be independent after being taught about unsafe environments.
    d. Children's growth and developmental accomplishments may put them at risk for injury or accidents.

APPENDIX C

STUDENT SATISFACTION AND SELF-CONFIDENCE IN LEARNING INSTRUMENT

Instructions: This questionnaire is a series of statements about your personal attitudes about the instruction you receive during your simulation activity. Each item represents a statement about your attitude toward your satisfaction with learning and self-confidence in obtaining the instruction you need. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the numbers that best describe your attitude or beliefs. Please be truthful and describe your attitude as it really is, not what you would like for it to be. This is anonymous with the results being compiled as a group, not individually.

Mark:

1 = STRONGLY DISAGREE with the statement
2 = DISAGREE with the statement
3 = UNDECIDED - you neither agree or disagree with the statement
4 = AGREE with the statement
5 = STRONGLY AGREE with the statement

(See following table. © Copyright, National League for Nursing, 2005)

Satisfaction with Current Learning	SD	D	UN	A	SA
1. The teaching methods used in this simulation were helpful and effective.	○ 1	○ 2	○ 3	○ 4	○ 5
2. The simulation provided me with a variety of learning materials and activities to promote my learning the medical surgical curriculum.	○ 1	○ 2	○ 3	○ 4	○ 5
3. I enjoyed how my instructor taught the simulation.	○ 1	○ 2	○ 3	○ 4	○ 5
4. The teaching materials used in this simulation were motivating and helped me to learn.	○ 1	○ 2	○ 3	○ 4	○ 5
5. The way my instructor(s) taught the simulation was suitable to the way I learn.	○ 1	○ 2	○ 3	○ 4	○ 5
Self-confidence in Learning	**SD**	**D**	**UN**	**A**	**SA**
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	○ 1	○ 2	○ 3	○ 4	○ 5
7. I am confident that this simulation covered critical content necessary for the mastery of medical surgical curriculum.	○ 1	○ 2	○ 3	○ 4	○ 5
8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting.	○ 1	○ 2	○ 3	○ 4	○ 5
9. My instructors used helpful resources to teach the simulation.	○ 1	○ 2	○ 3	○ 4	○ 5
10. It is my responsibility as the student to learn what I need to know from this simulation activity.	○ 1	○ 2	○ 3	○ 4	○ 5
11. I know how to get help when I do not understand the concepts covered in the simulation.	○ 1	○ 2	○ 3	○ 4	○ 5
12. I know how to use simulation activities to learn critical aspects of these skills.	○ 1	○ 2	○ 3	○ 4	○ 5
13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time.	○ 1	○ 2	○ 3	○ 4	○ 5

APPENDIX D

STUDY INFORMATION AND CONSENT LETTER

Dear MCN 374 Nursing Students,

Prior to enrolling in the Bachelor of Science in Nursing (BSN) program, you completed a Developmental Psychology course. In this course, you were introduced to the concepts of child growth and development. One of the main competencies of Pediatric Nursing as determined by the Society of Pediatric Nurses is knowledge of growth and development across the pediatric age span and the ability to apply this knowledge in the clinical setting with the intent to enhance developmental outcomes for children. Nursing students need to apply evidence-based theoretical knowledge to clinical practice. In this theory course; Family II: Care of the Child and Family you will expand upon that knowledge gained in your developmental psychology course and learn to apply these concepts to clinical practice. In your clinical rotation, you will use this knowledge to perform developmental assessments on the patients you care for.

One of the aims of this study project is to determine if using a virtual learning environment, My Virtual Child$^{©}$ is effective in assisting students with knowledge acquisition and retention and will be assessed using a Growth and Development Assessment Instrument in a pre-test-post-test design. Additionally, this study also aims to ascertain student satisfaction and self-confidence with their learning of the concepts of growth and development after using the virtual learning environment assessed by the completion and analysis of the NLN Student Satisfaction and Self-Confidence with Learning Survey Instrument.

Data will be collected during week 1 and week 6 of the course. You will be asked to complete these same questions before and after raising your virtual child. The activities related to the study will be completed at the student's own pace within a 24-hour period. Participation in the study will require you to answer survey questions: (1) demographic questions about yourself; (2) 25 multiple choice questions related to child growth and development concepts and (3) completion of the NLN Survey related to your experience with the virtual learning environment, My Virtual Child$^{©}$. It should take you no longer than 30-45 minutes to answer these questions for both the pre-assessment and the post-assessment and NLN survey.

The gathering of information for this study offers no foreseeable risks to you. Benefits of participating in the study include the opportunity to provide data related to the effectiveness of using a virtual learning environment, My Virtual Child$^{©}$ with knowledge acquisition and retention as well as student satisfaction and self-confidence with learning. *Upon completion of the Growth and Development Assessment knowledge test, pre-assessment students will be offered the opportunity to sign up for a drawing for one of 15 $10.00 gift cards. Upon completion of the post-assessment of the Growth and Development Assessment knowledge test and the NLN Student, Satisfaction and Self-Confidence with Learning Survey Instrument students will again be offered the opportunity to sign up for a drawing for one of 10 $15.00 gift cards.*

Your permission allows us to include your de-identified data in the reporting of information to colleagues in nursing and education. All information gathered will be kept completely confidential, and information included in any reports will be grouped so that no individual can be identified. No names will be included in the reporting of data. All data will be kept locked in the offices of the researchers and stored on a secure computer server. Upon completion of the study, data will be shredded or deleted.

Participation in this study is completely voluntary. You may choose to withdraw from the study at any time. You may choose not to answer any of the questions. Whether you choose to participate, or not, neither your grade in this class nor your status as a student at Loyola University Chicago will be affected.

Completing any of the assessment instruments demonstrates your consent to be included in the study as a participant.

If you have any questions or would like further information about this study, please contact me at:

lrobbins1@luc.edu

APPENDIX E

IRB APPROVAL LETTER

Investigator **Kostovich, Carol**

LU Number **215111**

Title **Effectiveness of a Virtual Learning Environment on Pediatric Nursing Students' Knowledge Acquisition, Satisfaction and Self-Confidence with Learning Growth and Development Concepts**

Date of Review **08/04/2021**

Reason **45CFR46.104(d)(2) Category Test survey, interview edu test**

Comments **The project meets the criteria for Exemption category 45 CFR 46.104(d)(2)(i-ii). Research only includes interactions involving educational tests, surveys, interviews, public observation if the following criteria is met: (i) Recorded information cannot readily identify the subject (directly or indirectly/linked); and (ii) any disclosure of responses outside of the research would not reasonably place subject at risk (criminal, civil liability, financial, employability, educational advancement, reputation).**

This project has been determined to be EXEMPT from IRB review.There are no reporting requirements associated with this project.The Full Board will review this determination on 08/18/2021.If the Board disagrees with this action, you will be notified by 08/25/2021.

Cynthia C Tom

Cynthia C. Tom, MA, CIP
Director, Human Research Protection Program
Loyola University Chicago Health Sciences Campus

REFERENCE LIST

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Laura M. Robbins-Frank received her BSN in 1985 from Loyola University Chicago. After working as a neonatal intensive care nurse, she pursued a master's degree in the Pediatric Clinical Nurse Specialist track at Loyola University Chicago completing that degree in 1992. In 1999 she completed the Neonatal Nurse Practitioner post-master's certificate at Rush University. Dr. Robbins-Frank obtained several certifications to further her knowledge and expertise including, certified pediatric nurse, certified neonatal nurse, neonatal resuscitation instructor, pediatric advance life support instructor, certified clinical nurse specialist, and advanced practice nursing license. During Dr. Robbins-Frank's thirty-eight-year career she has worked in several neonatal and pediatric intensive care units at several hospitals and spent ten years as a Neonatal-Pediatric Clinical Nurse Specialist at Hinsdale Hospital and Advocate Good Samaritan Hospital. While working in the NICU at Loyola University Medical Center Dr. Robbins-Frank served as a frequent preceptor for newly hired nurses as well as a permanent day shift charge nurse for the 50-bed unit during the sixteen years she worked in the unit. In 2005 Dr. Robbins-Frank entered academia.

Dr. Robbins-Frank has been teaching undergraduate nursing students including both traditional and accelerated students since 2005 at several universities including Lewis University, Aurora University, Chamberlain College of Nursing, and Loyola University Chicago. Most recently Dr. Robbins-Frank has served as the Founding BSN Program Director at Loyola University New Orleans where she started the undergraduate pre-licensure nursing program in

2021 and currently teaches in the program. Dr. Robbins-Frank has a passion for teaching Foundations of Nursing Practice, Pediatric Nursing, and Pharmacology and has done so over the past sixteen years.

Dr. Robbins-Frank has presented at twenty-six conferences over the past thirty years. She has presented both locally and nationally on neonatal, pediatric, and nursing education topics. The latest presentation included a poster on the basis of her dissertation at the National League for Nursing National Summit conference in San Diego, California in 2017. Additionally, Dr. Robbins-Frank wrote the chapter "Cardiac Structural Disorders" (2019) in Sorenson, M., Quinn, L., and Klein, D., *Pathophysiology: Concepts of Human Disease*. New York: Pearson. Further, she has been a frequent reviewer for both Elsevier and Pearson publishers for nursing content.

Dr. Robbins-Frank has earned the privilege of being inducted into the Sigma Theta Tau Honor Society as well as the Jesuit Alpha Nu Honor Society.