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Tele-Sim for Nurse Practitioner Clinical Education: An Online, Real-Time, Educational Innovation Using Simulation and Telehealth for Learning Physical Assessment Skills

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Abstract

Background: Increasing numbers of nurse practitioner (NP) educational programs are being offered online, with little or no face-to-face contact among students and instructors. Students express lack of confidence in their physical examination skills and want live instructor demonstrations, observed practice, and real-time feedback from their clinical instructors.

Significance: NP students need to acquire physical examination skills to increase competency in assessing patients for enhanced clinical judgment and improved patient outcomes.

Purpose/Aims: to improve and measure the competency and confidence in the performance of advanced physical assessment skills of NP students in an advanced health assessment (AHA) clinical course with an innovative learning strategy called Tele-Sim.

Methods for Educational Initiative: Sample was voluntarily recruited from an AHA course for NP students. After completing an IRB approved consent, participants attended four two-hour online synchronous classes using simulated patients in a tele-conferencing format.

Results, Analysis & Implications: Participants demonstrated statistically significant increases in overall student performance & self-efficacy when performing physical exam skills post interactive Tele-Sim. There was a statistically significant improvement in the Tele Sim Students reported a high level of satisfaction with the ease of use and effectiveness for learning physical exam skills using Tele-Sim and 100% of the participants highly recommended that Tele-Sim be offered in future courses. The Tele-Sim study supplemented current research with statistically significant results, providing evidence to support the future use of telehealth and simulation with HSPs to enhance the clinical education of nurse practitioner students.

Keywords: nurse practitioner, clinical education, simulation, telehealth, online education, physical assessment, learner self-efficacy

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Background

The education of nurse practitioners (NPs) has traditionally been provided with didactic classroom teaching, accompanied by clinical experiences where students use critical thinking, and apply their knowledge and clinical judgment to decision-making to solve real-life patient health problems. The clinical experiences are supervised by clinical instructors and preceptors (practicing NPs, physicians, and physician assistants [PA]) and have long been considered essential to NP student learning. The direct-patient clinical practice hours have provided mentored practice that enhance confidence, competence, and aid in the transition and role development of students into trusted graduate professional nurse practitioners (Chen et al, 2017; Robinson-Reilly et al., 2020; Warren et al., 2016; Walters et al., 2022). Over the past several years, numerous barriers obtaining preceptors and finding clinical settings have emerged for NP students, making it increasingly difficult for them to acquire the essential learning opportunities they need (Ainslie & Bragdon, 2018, Warren et al., 2016). Thought leaders and accrediting bodies in NP education have increasingly tried to address the problem by considering the use of simulation to replace or supplement some traditional, direct-patient clinical contact hours. These hours are currently required for eligibility for board certification. The Standards for Quality Nurse Practitioner Education April 2022 report from the National Task Force recommends an increase in the patient contact hours from the current minimum of 500, to 750 total hours required for accreditation and eligibility for certification. Increased clinical hour requirements will put further strain on programs and students obtaining the required clinical hours.

As has been demonstrated in many other professional education programs, simulated clinical experiences in nurse practitioner (NP) education could successfully supplement traditional precepted clinical experiences, by facilitating the acquisition of real-life knowledge, skills, and attitudes, essential to

becoming a practice-ready NP (Rovera et al., 2020; Cook et al., 2008; He et al., 2020; Asakura & Bogo, 2021; Childs-Kean et al., 2020; Heuberger & Clark, 2019). Simulation in the education of professionals requiring high-acuity skills and high levels of real-time judgment was first successfully used in aviation pilot training and has evolved to align with advancing technology (Henry, 2018). Simulation in education has also constantly changed to meet the technological changes in health care. Simulation is widely accepted as a replacement for clinical patient-contact hours in undergraduate nursing and in many other health care professional programs such as medicine, physical therapy, social work, and psychiatry (Rovera et al., 2020; Cook et al., 2008; He et al., 2020; Asakura & Bogo, 2021; Childs-Kean et al., 2020; Heuberger & Clark, 2019). The use of simulation in NP clinical education could similarly facilitate the achievement of student and program objectives by providing real-life clinical experiences which develop student competency and confidence while providing guided practice for clinical decision-making (Jeffries et al., 2019; Kuszajewski et al., 2021; Warren et al., 2016).

Online NP Education

Increasing numbers of NP educational programs are being offered online, with little or no face-to-face or real-time contact among students and instructors (Cipher et al., 2019; Heuberger & Clark, 2019; Mackavey & Cron, 2019; Tartavulea et al., 2018). Though synchronous classes (learner and instructor are in the same place and time) are offered by some universities, many students learn psychomotor skills through video recordings and text reading. This format makes it difficult for students to gain confidence in their physical examination skills before entering clinical settings where they are required to assess real patients. At a large university in the southeastern United States, NP students in asynchronous, online, advanced health assessment courses are required to submit a video to screen their assessment skills after the fourth week of didactic classwork and before beginning 90 hours of clinical experience in primary care sites. Students are precepted in clinical settings and receive a summative clinical evaluation from their preceptors at the end of their experience. These clinical

instructors provide no site visits or formative evaluation during their clinical experience. At the end of the semester, students are required to demonstrate their acquired competency in physical assessment skills by performing a live, detailed, head-to-toe examination on their own Human Standardized Patients (HSP) in the campus simulation lab. Students are graded by their clinical instructor using a reliable, validated, analytical rubric, including electronic documentation of their assessment immediately following their performance. These high-stake assessments, worth sixty percent of their course grade, create much stress, and students often approach the timed performance with low confidence and high anxiety. In post-course student surveys, students often report that they have observed shortcuts and non-textbook techniques in their preceptors' examinations and needed more feedback on their exam skills. Many students express a desire for live instructor demonstrations, observed practice, and real-time feedback from their clinical instructors (Warren et al., 2016). The goal of this DNP project is to determine if an educational initiative using HSPs in online telehealth-style synchronous classes (Tele-Sim) can demonstrate statistically significant changes in student competence and self-efficacy in clinical settings for the achievement of student learning outcomes.

Problem Statement and Purpose

NP students need to learn and practice physical assessment skills with direct instructor observation and feedback before the onset of their clinical experience to increase confidence and competency in assessing patients, leading to enhanced critical thinking, clinical judgment, healthcare management, and improved patient outcomes.

Purpose

The purpose of this project was to improve student competency and confidence in the clinical performance of advanced physical assessment skills by initiating an innovative educational learning strategy utilizing simulation in an online synchronous telehealth-style learning format, further referred to as Tele-Sim.

Objectives and Aims

Aim

The researcher aimed to measure the effects of an educational initiative (Tele-Sim) on the competency and self-efficacy in the clinical performance of health assessment physical examination skills in NP students. Students were taught physical assessment skills in-person with a live, experienced NP, using HSPs in a campus Sim center, accessed online on the videoconferencing platform Zoom. Tele-Sim included student practice on their own HSPs in breakout groups and return demonstrations that were enhanced by psychomotor learning with interactive feedback from their clinical instructor.

Clinical Questions

1. Compared to students in the traditional Advanced Health Assessment (AHA) course format, did students participating in the educational initiative achieve statistically significant changes in:
    a. confidence and self-efficacy performing physical examination skills in the clinical setting, as measured by the L-SES pre and post Tele-Sim?
    b. scores on pre-clinical screening physical examination demonstration videos?
    c. final numerical grades in the AHA clinical course?
2. Compared to students in past cohorts who completed the traditional Advanced Health Assessment (AHA) course format, did students participating in the educational initiative achieve statistically significant differences in:
    a. scores on pre-clinical screening physical examination demonstration videos?
    b. scores on final clinical grades?
3. After participating in the educational initiative, what level of satisfaction did NP students report on the effectiveness and usefulness of Tele-Sim?

Chapter 2

Review of Literature

A review of the literature was conducted between January 2017 to June 2022 in multiple databases. Research articles were identified regarding the use of simulation, telehealth, and online education for nurse practitioners and other health profession students. Understanding that NP students are adult learners with well-developed values of self-efficacy is the key driving concept applied in the planning of this educational initiative.

Adult Learners

NP students are adult learners who come to class with life and professional experiences, and ingrained educational expectations for the modes of delivery for courses. NP students often maintain full-time jobs in nursing, and have families, partners, and responsibilities that the typical undergraduate student may not have. Adjusting educational approaches and strategies for students' needs is necessary and expected of faculty.

Learning Styles

Adult learning theories identifying learning styles are abundant in the research literature supporting the use of unique and real-world learning strategies. Kolb describes four types of adult learners in his Experiential Learning Theory (Kolb, 2014):

1. Diverging- generate ideas, work in groups, listen and read.
2. Assimilating- read, lecture, use analytical models, and integrate ideas into models.
3. Converging- prefer to arrive quickly at specific concrete solutions and create practical applications.
4. Accommodating- learn by experience, trial and error, rely on others for information, and react to their gut rather than logical analysis.

In Amponsah's 2020 paper researching adult learning styles, the author explored the dominant theorists beginning in the 1960s and acknowledges that Malcolm Knowles's seminal work significantly shaped our understanding and the concept of how adults learn (andragogy). The review highlighted the works of other dominant adult learning style theorists including Kolb, Gregoric's 1984 four-channel model which includes: sequential, abstract, abstract random, and concrete random styles, and Honey and Mumford's (1986) styles: activist, reflector, theorist, and pragmatist (Amponsah, 2020).

A literature review by Childs-Kean et al. (2020) on learning styles in health science education included a review of literature on 17 articles using Kolb, Honey and Mumford and the VARK (visual, aural, read/write, and kinesthetic learners) frameworks. The reviewed articles included the use of learning style inventories for adult learners in science programs. The studies were primarily descriptive in nature and did not report on how adult learning styles correlated with educational outcomes. The few studies that did, could not report a significant positive correlation with educational outcomes (grades), nor could they report an increase in learner self-awareness or meta-cognition (Childs-Kean, 2020). One high-quality study used the VARK model to research learning styles in a large population of medical students, nursing students, dental students, and pharmacy students. The researchers' significant findings indicated that most students' learning styles were not permanent, no matter which theorists' labels were applied. Most students adapted and preferred multi-modal educational strategies (Childs-Kean, 2020).

These two literature reviews offer differing analyses regarding the usefulness of identifying adult learning styles and suggest that there may be little value in performing learning style inventories, and conversely imply that faculty must maintain an awareness of adults learning style variances (Amponsah, 2020; Childs-Kean, 2020). In conclusion, developing and delivering multi-modal, student-centered learning strategies will enhance student satisfaction and effectiveness in adult education

courses. A multi-modal educational initiative that allows the students with different learning styles to work together and flourish as a whole, enhances the learning of each individual student.

Self-Efficacy in Adult Learners

Self-efficacy is a strong determinant of success in adult education, particularly at the graduate level in the healthcare field where success is often measured by patients' health (Bandura,1994). Self-efficacy is defined as "a learner's confidence in their capability to learn specific subjects... which positively correlates with academic achievement and effective learning strategy use" (Kang et al., 2021). Bandura (1994) theorized that self-efficacy is not just situation-specific self-confidence, but self-confidence that the student can apply the skills under challenging circumstances. NPs must acquire a high level of knowledge, skills, and attitudes to apply critical thinking to decision-making and clinical judgments under challenging circumstances that affect their patients' lives. All healthcare educational programs require clinical experiences to provide opportunities for application and mastery of the needed skills, knowledge, and attitudes. Students enter these experiences with varying levels of self-efficacy. NP clinical faculty are charged with facilitating the preparation of students for the demands of their new role in clinical settings and need a strong understanding of how self-efficacy affects student competence and performance.

Bandura (1994) defines self-efficacy as people's beliefs, feelings, thoughts, and motivation about their capabilities to produce levels of success. Describing four main sources of influence, Bandura believes that mastery experiences are the most robust influences to create strong self-efficacy, and that success leads to success. Conversely, failure experiences undermine self-efficacy. Students with wide ranges of beliefs in themselves are present in every classroom. Faculty see students who are strongly confident, high achievers, and those who lack self-efficacy and need constant support. They are also faced with the over-confident student, who lacks effort and knowledge and need understanding and the connection to the outcome produced. Some NP students are highly anxious and lack self-efficacy and

can sabotage their own success with worry. Though adult learners have had a long time to establish their sense of efficacy, they have also well-established fears, anxieties, and doubts about their ability to be successful (Kang 2021). They can identify and label what they see as their inabilities. Bandura (1994) states that people with a strong sense of self-efficacy and self-confidence tend to approach difficult tasks as challenges to be mastered and maintain strong motivation and commitment. They quickly recover from failures or setbacks, believing that they lacked effort or knowledge rather than an innate inability to be successful (Bandura, 1994). Those with lower self-efficacy tend to avoid difficult tasks, viewing them as threats, doubting their ability to complete them, and fear failure. Giving up quickly or slackening efforts leads to the very outcome of failure that they fear.

Self-efficacy through successful mastery experiences can be strengthened by modeling, which provides vicarious experiences and a comparison standard. Social persuasion can mobilize and sustain the effort of the self-doubter (Bandura, 1994). This initiative offers opportunities for students to experience modeling through watching the clinical instructor, receive social persuasion by working in smaller break-out groups, then soak in vicarious experiences by watching others give return demonstrations.

Online Education

In response to the increasing need for more well-educated nurses, including advanced practice registered nurses (APRNS), and a lack of nursing faculty nationally, there has been a twenty-eight percent rise in online programs for graduate nurses over the past decade (American Association of Colleges of Nursing, 2015). According to Seaman et al., (2018) over 1.1 million graduate nursing students participated in distance education in 2016 and the trend is expected to grow (National Council of State Boards of Nursing [NCSBN], 2015). With the flexibility of time and geography, the move to online delivery methods has improved access to the most remote and rural professionals seeking advanced degrees (American Nurses Association, 2017; Seaman et al., 2018).

Online courses are delivered via a myriad of formats, including asynchronous (no live interaction with faculty), synchronous (live face-to-face via videoconferencing), and hybrid (some portion of classes on campus.) These online courses appeal to adult learners such as NP students who often have work and family care responsibilities. NP Graduate nursing education requires students to acquire psychomotor skills through clinical instruction, which is more difficult to deliver and evaluate online. However, the pooled data from the 2009 meta-analysis by Means et al. has convincingly demonstrated that online education is as effective at meeting program, course, and student learning objectives as face-to-face learning. Asynchronous delivery methods such as videos, virtual case studies, and pre-recorded lectures have been shown to be effective in facilitating students to meet required competencies, even though these methods omit live faculty-student interaction and lack immediate feedback (Buterakos & Keiser, 2021; Merritt et al., 2018; Pal et al., 2022; Watari et al., 2020, Phillips et al., 2020). However, nursing students consistently associate opportunities for faculty interactions with online course satisfaction (Cipher et al., 2019; Jezuit et al., 2020; LaManna et al., 2021; Schroeder et al., 2021; Mau, 2022). An integrative literature review on students' perceptions of graduate education by Mau (2002) concluded that course delivery methods for APRNs must be rooted in adult learning theories and must reflect adult student preferences to create courses that encourage student engagement and satisfaction. Every researcher concluded that it is crucial that more research on the method of delivery of graduate nursing education should be published (Cipher et al., 2019; Schroeder et al., 2021; Rojjanasrirat & Rice, 2017; La Manna et al., 2021, Mau, 2022).

COVID-19 Pandemic Effect

The onset of the COVID-19 pandemic in March 2020 caused an abrupt need to switch to online teaching for many universities worldwide. The 2020 paper by Tartavulea et al., describes experiences with switching to an online course format including surveys from 362 professors from 114 universities in 13 European countries. They reported that students were quick to adapt to a mix of synchronous and

asynchronous interactions and assessment methods. However, most strategies represented passive learning, reduced interaction, and limited assessment methods, which moderately impacted the educational process. These strategies reported lower overall effectiveness of asynchronous methods than in face-to-face teaching (Tartavulea et al., 2020). The researchers found the greatest impact factors for success were institutional support, trust in the online system, and perceived effectiveness of the assessment. The researchers highly recommended that faculty use strong student-centered methodology to deliver the most effective online courses, activities and assessments that align with learning objectives (Tartavulea et al., 2020). Encouraging student-instructor interactions and providing collaborative activities where students share their experiences and knowledge increased student satisfaction; however, according to Tartavulea et al. (2020), these interactions were not easy to ensure. Other recent studies since COVID-19 predict that online delivery of graduate courses will continue, but all researchers caution that more study is recommended to evaluate the long-term effectiveness (Tartavulea et al., 2020; Rovers et al., 2020, Quinlan et al., 2021; Kobeissi et al., 2021; Buterakos et al., 2021; De Ponti et al., 2020; Pal et al., 2022).

On-Line Simulation

Simulation (Sim) is defined as an educational method that provides safe learning environments which mimic real-life experiences through scenarios, use of technology, and debriefing, in order to develop confidence and competence in learners (Hough et al., 2019; Henry, 2018). Simulation is frequently used in NP programs in a wide variety of formats; however, most simulation studies reported testing in simulation labs during intensive sessions, with objective structured clinical examinations (OSCEs) or used online virtual case studies or pre-recorded lectures and videos. Little evidence exists on the use of simulation during online synchronous classes. Very few randomized control trials (RCT) studying the use of simulation in NP clinical education were found, even within the systematic reviews (He et al., 2020; Warren et al., 2016). Most were quantitative studies that included subjective evaluation

of student confidence, perceived competence, satisfaction, the usefulness of the simulations, and also surveyed faculty satisfaction with simulated clinical experiences (Chen et al., 2017; Jezuit et al., 2020; Kuszajewski et al., 2021). There was a paucity of evidence reporting objective faculty assessment of student competence and performance measured with reliable, validated evaluation tools. The 2016 Rutherford-Hemming et al. systematic review reported a lack of randomized controlled trials, inadequate sample sizes, few studies using valid measurement instruments, no measured outcomes for transfer of knowledge to clinical environments, and no patient outcome levels were measured. Rigorous scientific studies are recommended in the future, to provide strong quantitative evidence to influence the policy for the acceptance of the use of simulation for direct-patient care clinical hours in NP programs (Rutherford-Hemming et al., 2016; Jeffries et al., 2019). These studies need to evaluate faculty-assessed student competency and include an assessment of patient outcomes.

Student Competency Evaluation in Sim

Research on simulation with outcomes reporting objective evaluations of NP students' competency in clinical skills, diagnosis, and patient management would significantly add to the evidence in support of the use of simulation in the clinical education of NPs. The search of the literature did not reveal a preponderance of evidence to propose the use of simulation to replace direct-patient clinical hours.

Fernandez-Avila et al. (2017) was the only RCT with a moderately large sample (n=160). Their study was blinded to students and used reliable valid tools of measurement to compare the simulation experience to traditional clinical experience, creating a high level and quality of evidence. Although the setting and population tested student physicians in Chile, the study was included, as it was of high quality and the educational method could be applied to NP clinical education.

Most graduate-level clinical courses do not have large enrollments, so pooled data from participants are small. In all studies in this literature appraisal, there were 444 student participants (Fernandez-Avila et al., 2017; Kotchlakota et al., 2020; Kotwal et al., 2020; Merritt, 2020; Quinlin, 2020; Prettyman et al., 2018). Prettyman et al. (2018) and Quinlan (2020) used simulation objective structured clinical evaluations (OSCEs) with rubrics to evaluate student performance and reported high rates of competency. Few studies reported quantitative statistical results on the accuracy of diagnosis and patient management. Four studies used standardized patients, and several used telehealth, incorporating virtual online case studies (Shue-McGuffin, et al., 2021; Prettyman et al., 2018; Quinlan et al., 2020; Fernandez-Avila et al., 2017). The use of pre/post-tests was present in all but three studies. Kotwal et al. (2020) studied one symptom (dizziness) and reported significant improvement in accuracy (from 50% (I) vs. 20% (C) group) comparing simulated clinical education to traditional. Fernández et al., (2017) compared the diagnosis and management of osteoarthritis to rheumatoid arthritis with 88% accuracy in the Sim intervention group compared to the traditional education group (C), documenting only 7.5% diagnostic accuracy. Both groups used student physician participants in primary care settings similar to NP clinical sites, so the results may have limited generalizability to the NP student population.

Satisfaction and Usefulness of Sim

Survey results of the faculty's appraisal of the effectiveness and usefulness of using virtual platforms to evaluate the clinical competencies of students were provided by Luke et al. (2021) who rated effectiveness at 75%-91% and Prettyman et al. (2018) who rated effectiveness at 83%-92%. Both articles surveyed the faculty's perception of the usefulness of the Sim for evaluating diagnostic and clinical skills, but each used unique criteria for communication and used self-developed Likert scales. Prettyman et al., in 2018 used clinical scenarios, objective structured clinical evaluations (OSCEs), and procedures developed and tested by the University's College of Medicine but did not report validity or reliability. Surveys of satisfaction with simulated clinical experiences reported only subjective results, so are at high

risk for bias. All of the articles reported survey results for student satisfaction but used varying criteria for measurement (Kotchalakota et al., 2020; Luke et al., 2021; Merritt, 2020; Prettyman et al., 2018; Shue-McGuffin & Powers, 2021). Kotchalokota et al., (2019) used three validated evaluation tools to measure motivation, satisfaction, and confidence in a small sample size of twenty-one NPs. A study by Luke et al. (2021) documented numerous details about students' self-reporting of competence using telehealth, as well as positive ease of use of the technology. Shue-McGuffin et al. (2021) and Merritt and Prettyman, (2018) also measured high student ratings of self-confidence and satisfaction with the use of Sim. Though student satisfaction and confidence certainly motivate learning, faculty objective evaluation of skills and competencies needed to meet learning objectives is more reliable than student self-perception of their competency.

Types of Simulation

Several studies used virtual simulation and case studies, which were evaluated with OSCEs or real-time debriefing, some using analytical grading rubrics (Phillips et al., 2020; Prettyman, 2018). Prettyman et al. (2018) described the use of a virtual OSCE as an effective method of evaluating NP student competencies and eliminating the barrier of requiring on-campus participation for distance learners who may be geographically remote. Though the OSCE was a summative evaluation based upon a rubric, it did not quantify outcomes beyond binary (did or did not perform) answers. Physical examination skills were performed through telehealth but were not included in the grading rubric evaluation. Prettyman et al., (2018) reported that 83-92% of faculty found the virtual OSCE easy to use and aided in the evaluation of student competencies. Most students in their study (81%) thought it accurately demonstrated their clinical skills and 89% agreed that the faculty feedback enhanced their learning. Similar results were reported using virtual case studies**.** Moore & Montej (2020), based their research on the evidence that unfolding case studies can narrow the theory-practice gap. Results from their study on the use of virtual case studies reported that 92% of students (students, n=7, cases n=45)

found the simulation usable and scored high value to their clinical learning (mean satisfaction score 4.70/5) and self-perceived ability, with self-confidence score mean 4.72/5 (Moore & Montejo, 2020).

Videoconferencing platforms like Zoom were more prevalent in studies published since the COVID-19 pandemic onset. Rare studies were discovered describing the use of online synchronous delivery to teach and learn psychomotor skills using real-time simulated clinical experiences. The quality of evidence was estimated using the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) instrument (Cochrane Training, 2022). There was a high degree of homogeneity among the selected studies; however, the low level of evidence, moderate to low quality, and small study population numbers, limited the generalizability of the results. Despite these findings, numerous surveys on satisfaction and usability of online simulation for faculty and students reported positive results and recommendations for continued use of simulation in online NP education.

Theoretical Model

Kolb's Experiential Learning Theory, a constructivist educational theory, was the theoretical model chosen for this DNP project (Kolb, 2014). It is well-suited for adult learners with individual learning styles who bring rich life and work experiences to the class, course work, and clinical settings. As seen in Appendix A., Figure 1, the four stages of Kolb's (2014) cycle are sequential and continuous but may be entered at any stage of the cycle. Kolb (2014) believed that the learner's experience is foundational for transforming new experiences into new knowledge and promoting critical thinking. NP students are adults who bring much life and nursing experience to the class, and often juggle full-time work, family, parenting, and financial responsibilities while pursuing their education. Banduras' Theory of Self-Efficacy and Knowles' andragogy were woven throughout the framework of this initiative. Adult learners come with unique and often well-established study practices and strong beliefs in what they need for success. This initiative was strongly student-centered to offer multimodal educational strategies to meet the needs of the adult learner.

Kolb (2014) defines four individual learning styles which respond to the following defined cycles for learners:

1. Concrete Experience-The online telehealth style simulation (Tele-Sim) provided the experience for students to add to their physical examination skills.
2. Reflective Observation-Students watched others perform. heard feedback, and critically reflected on their own performance with return demonstrations and debriefing.
3. Abstract Conceptualization-Students:
    a. used analytical skills and critical thinking to integrate their new skills.
    b. used andragogical knowledge to combine with their experience.
    c. applied clinical judgment for the transformation and creation of new learning by describing and demonstrating symptom-focused exams.
    d. retrieved and applied this new learning in future simulated experiences and clinical precepted settings.
4. Actively Experiment phase- Students:
    a. gained confidence and competence in using skills through practice.
    b. applied experience, new learning, and new skills to assess various patient presentations.
    c. acquired knowledge, skills, and critical thinking to solidify learning for use in future clinical courses and in practice as graduate NPs.

Kolb's Experiential Learning model supported the foundational belief that the learning of psychomotor skills in a hands-on format, with opportunity for practice and immediate feedback, stimulates critical thinking, creates new learning, and develops competency and confidence in student NPs.

Chapter 3

Methodology

This section describes the educational initiative and the methodology used in the project including the setting, the recruitment and consent of participants , IRB approval, and the ethics and human subject protection. The outcomes and measurement tools are fully described with statistical analysis.

Setting

The setting for the project was an online nurse practitioner course in a CCNE accredited graduate program at a large accredited, R2 type research university in the southeastern US. The University had three campuses, rural and urban, but all graduate programs were fully online and accepted students from up to 250 miles from the main campus. The NP program contained tracks for family, acute and primary care adult/gerontology, and psychiatric/mental health studies and accepted new students each fall. The initiative was offered in the graduate-level Advanced Health Assessment course, and successful completion was a requisite for all APRN students before entering their specialty concentration track.

The study population included NP students enrolled in the Advanced Health Assessment clinical course for the Fall 2022 semester who signed the consent before the onset of classes. Participation in the research initiative was voluntary, but data from all students in the course was requested to be used for the control group comparison.

Educational Initiative

An educational initiative was developed for students in the NP programs. This educational initiative allowed consented students to attend telehealth-style (Tele-Sim) synchronous online classes for two hours per week for the first four weeks of the course, where they used simulated patients to practice, demonstrate, and receive immediate live feedback on their physical examination skills. The

instructor discussed the planned Tele-Sim structure in the simulation lab and started the class with a mini-lecture and knowledge check, followed by demonstrating skills on live human simulated patients (student nurses and graduate assistants) who volunteered. Students used Zoom videoconferencing to join the class and recruited their own exam models for simulated patients in remote settings of their choice. Small groups of students were sent to online breakout rooms for practice and to receive peer feedback. Within their breakout room practice time, they rotated roles as a demonstrator, coach, or check-lister. Each role and expectation were defined in the pre-brief at the start of each synchronous class. The clinical instructor electronically rotated through the rooms to monitor progress and accuracy. Students convened in the full class setting for debriefing and summary. Debriefing and end-of-class discussions stimulated critical thinking and provided linkage from the patient's present and past medical history to the application of clinical judgment when choosing which provocative or specialized assessment techniques to perform. Potential differential diagnoses were discussed as they applied to the physical assessment findings. History-taking and documentation were taught in the didactic course and graded assignments for clinical documentation were required in the clinical course, so were mentioned but not practiced in the Tele-Sim sessions. After week four, all students in the course submitted a video demonstrating their exam skills as a course requirement. These videos were graded using a validated rubric by a clinical instructor who was blinded to which students were in the intervention group. Continued participation in the study required students in the intervention group to attend 75% of the sessions in person. If a participant started in the intervention group but was unable to attend at least 75% of tele-sim sessions, their data was not used in the study. Participants could miss up to 25% of the synchronous sessions but they were required to watch the class recording before the subsequent session and submit documentation of completion. Failing to watch the recording resulted in their data being removed from the study; however, all students thoroughly completed the requirements, and all remained in the study.

Two groups of students were used in this study. The intervention group took part in the Tele-Sim experience. The second group received the traditional, educational experience. Grades for all student outcomes were de-identified for data collection and analysis. Students in both groups completed surveys administered pre course and preclinical onset (also post initiative) which coincided with the preclinical requirement for physical exam skills screening videos for all students. Surveys used a Likert scale to measure the self-perceived level of confidence and competence in performing the exam skills on live patients in clinical settings. A post-clinical survey queried participants' satisfaction with and effectiveness of the initiative.

Recruitment

After Institutional Review Board (IRB) approval, recruitment of participants initially occurred online via email and news announcements on the student learning platform (Folio/Desire to Learn) and again during the course orientation. Participation in the study was voluntary. All students had access to the customary educational format used in the course, and no adverse consequences occurred for students who did not choose to participate in the initiative. Only those students who could commit to the requirements of the educational intervention were selected to participate in the intervention group. The students who could not attend the initiative but wanted to participate, were used as controls. The study's goal was to obtain consent from one-half of the students enrolled in the course to make a comparison between control and intervention groups could be made. No exclusions by gender, age, ethnicity, residence, GPA, or level of nursing experience were applied.

Consent

The study was introduced to all the NP students during the orientation for the course by the researcher. Students had the opportunity to have all of their questions about the study answered at that time. Consent forms (Appendix B, Figure 2) were then reviewed by the researcher and were signed electronically following the course orientation. All students in the study (intervention and control

groups) allowed access to their grades as per FERPA and IRB requirements so that the research questions could be answered. The researcher was a faculty member in the course and had access to the grades without the need for additional institutional approvals outside of the IRB (Appendix C, Figure 3).

Ethics and Human Subjects Protection

This DNP project research included student participants who had no real patient interaction but used human simulated patients. Before the initiation of the study, IRB approval from both Georgia Southern University and Georgia College and State University was obtained. All participants signed informed consent forms before the onset of the initiative. It was conducted in an established online educational setting that specifically involved usual legitimate educational strategies that were not likely to (a) adversely impact students' opportunity to learn required educational content or (b) adversely impact the assessment of the educators who provide instruction. The project included research on the comparison of instructional techniques and classroom management methods. There was no external funding, and the researcher had no financial interest or conflict of interest in the outcomes.

Participants' potential benefits included cost-free extra face-to-face clinical lab instruction and feedback, which may have improved their competency in clinical skills and course work. They also had extra access to the instructor for questions and answers.

Educational Outcomes Measured

Two study outcomes were course-required assignments for all students, but only the participants in the intervention completed surveys of self-efficacy for the individual Tele-Sim sessions and for participant satisfaction with the initiative. All consented participants received pre-course, pre-clinical, and post-course surveys of their perceived self-efficacy regarding confidence in the clinical setting and competency in performing physical examination skills. All scores were reported in aggregate so that no individual scores were identified. The outcomes that were measured included:

1. Surveys of both control and intervention groups' self-efficacy and confidence using the L-SES Likert scale were administered:
    - pre-course
    - pre & post each Tele-Sim (4 sessions total)
    - pre-clinical experience (after week four)
    - post-clinical experience/course
2. Grades on student/participant demonstration of exam skills videos, submitted for screening before clinical preceptorships (at approximately week 4) and assessed by a trained and blinded rater using a reliable, internally validated analytical grading rubric.
3. Final AHA clinical course grades for participants compared to the study control group, and grades from a past 2021 cohort control group.
4. Participant Student Satisfaction surveys-post course

Demographic Survey

Demographic data collected included: age, gender, ethnicity/race, year of graduation from BSN program, years and type of nursing experience, other degrees earned, hours of employment/month, financial burden for education, responsibility for others (parents, children, other) and level of personal support.

Learning Self-Efficacy Scale

The measurement tool used for assessing NP student self-efficacy was the Learning Self-Efficacy Scale (L-SES) which was a short, well-developed scale that was initially developed to assess medical students' learning self-efficacy for learning clinical skills. The 12-question scale based on Bandura's self-efficacy theory and Bloom's learning taxonomy addressed the cognitive, affective, and psychomotor domains of clinical learning. Good item discrimination and reliability were reported. The developers of the L-SES tool reported that Cronbach's coefficient was .931 for the 12 questions. The tool, provided in

Appendix D, Figure 4 was internally consistent and reliable and researchers reported that it could be applied to evaluating a broad range of clinical skills (Kang et al., 2020).

Grading Rubrics

Reliable analytical grading rubrics had long been in use for evaluation of student clinical performance in the graduate program's AHA clinical course and consistently demonstrated internal validity when used for grading required clinical assignments. They were developed by a task group, including this researcher, in collaboration with all clinical faculty and approved for use by the graduate faculty committee in 2019. This study did not use grades for the end-of-semester live physical exam demonstrations for outcome measures of the same student participants. Using the rubric to grade and evaluate students' minimal competence in performing physical exam skills through a video recording was required for all clinical instructors before allowing participation in clinical preceptorships. This grading rubric (Appendix E, Figures 5) was used with all cohorts in the study and provided control group data used in comparison to the intervention group.

The rater for the video demonstration was a faculty member who had past experience evaluating students using the grading rubric. Though the rater was a faculty member, the identity of students participating in the initiative was blinded. Students were asked to keep their participation in the initiative private from other students and faculty.

Student Satisfaction Survey

Surveys revealing student satisfaction with the initiative, including ease of use (usability,) usefulness/relevance, effectiveness at increasing competency and confidence were administered post initiative and post clinical experience. This survey consisted of five sections including: ease and usability (8 questions), time and effort (3 questions), effectiveness and contribution to learning (10 questions),

instructor effectiveness (6 questions) and content (11 questions) and concluded with two open-ended questions soliciting suggestions for improvement (Appendix F, Figure 6).

Risk of Bias

Since the researcher was a clinical instructor for two course sections whose students were randomly assigned, the identity of those who were both in the intervention and the control group were evident. The other course sections had experienced NP faculty grading the face-to-face final physical examination performances, but the post initiative/pre-clinical videos were graded by a trained, experienced blinded clinical instructor. All faculty in the course were blinded to the identification of students in the intervention group to avoid bias. All participants were asked to keep their role in the study private from other students and faculty to keep the faculty graders blinded. Tele-Sim classes were synchronous; however, they were recorded by the researcher and saved in secure password-protected files so that students who missed large portions of a class or an entire session were able to view the recorded Tele-Sim content. No participants missed more than 25% of the entire Tele-Sim so were not excluded from the study.

Statistical Analysis of Clinical Research Questions

The clinical research questions listed below were analyzed as follows:

Clinical Question One

Compared to students in the traditional Advanced Health Assessment (AHA) course format, do students participating in the educational initiative achieve statistically significant changes in:

a. confidence and self-efficacy as measured by the L-SES when performing physical examination skills in the clinical setting pre and post Tele-Sim sessions? Group scores on the L-SES were compared, using a paired sample t-test to answer this clinical research question.

b. scores on pre-clinical screening physical examination demonstration videos? Group scores on the preclinical screening physical examination demonstration videos were compared using an independent samples t-test to answer this clinical research question.

c. final numerical grades in the AHA clinical course? Group scores on the numerical course grades were compared, using an independent sample t-test to answer this clinical research question.

Clinical Question Two

Compared to students in past cohorts who completed the traditional Advanced Health Assessment (AHA) course format, do students participating in the educational initiative achieve statistically significant differences in:

a. scores on pre-clinical screening physical examination demonstration videos? To answer this clinical research question, group scores on the preclinical screening physical examination demonstration videos were compared using an independent sample t-test.

b. scores on final clinical grades? To answer this clinical research question, group scores on the final clinical course grades were compared using an independent sample t-test.

Clinical Question Three

After participation in the educational initiative, what level of satisfaction do participants report on the effectiveness and usefulness of the Tele-Sim? To answer this clinical research question, a student satisfaction survey was completed by the intervention group and descriptive statistics were analyzed.

Chapter 4

Results

The results from this Tele-Sim educational intervention pilot study for the clinical education of Nurse Practitioners (NP) are presented here. One of the study's aims was to measure statistically significant changes in NP students' competency and self-efficacy when performing health

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assessment skills after participation in a live, online Tele-Sim. Findings include descriptive information regarding the study participants. Data screening was performed prior to conducting the statistical analyses. Data were initially collected within the Qualtrics Survey system maintained through Georgia Southern University's servers. The study variables were examined for missing or irregular data. Any discrepancies noted were verified using the participant's original data within Qualtrics. The data files were then exported from Qualtrics to SPSS version 28 and downloaded for analysis to a secured, password protected computer.

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Measurement instrument

A reliable and valid measurement instrument, the Learner Self-Efficacy scale (L-SES), was used to collect data from three domains (Kang et al., 2019). All instruments were completed electronically so IP addresses from each survey were used to match names with results, which was possible due to the small sample size of nine participants and ten controls. The only missing data identified from some of the survey instruments occurred when some participant's names were errantly omitted from some of the surveys.

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Demographics

All participants were nurse practitioner students in the Advanced Health Assessment Course at the same university. There were 26 students enrolled in the course. Nine students agreed to participate in the initiative and 10 agreed to be the controls. All students in the control group agreed to have their grades used in the study, but not all completed the demographic surveys. Participants were all women with a mean age of 36.2 years, with most students identifying as Black (47.6%). Only two students reported military experience. The years of nursing experience ranged from two to twelve years and the mean hours worked per month was 92.67 (*SD* = 22.99). Most participants reported being fully financially responsible for their education (47.6%), with 23.5% having some financial support, and 17.6 % had full scholarships (see Table 1 for additional demographic data).

Table 1

Demographic of Participants in Tele-Sim Intervention

	TS Participant group				TS Control group			
	Mean	SD	*n*	N %	Mean	SD	*n*	N %
Age	28.00	2.83	6		36.50	6.80	6	
Race/Ethnicity								
Black			6				4	
White			2				3	
Asian			1				0	
Years Nursing Experience	6.22	3.07			6.71	3.82		
Current hours worked /month	125.33	32.33	3		79.20	53.97	5	
Degree other than BSN								
Associate			0				1	
Undergrad			3				1	
Graduate			0				2	
Financial Support for Education								
Self-Financed			7	77.8%			3	42.9%
Partially Financed			1	11.1%			2	28.6%
Fully Financed			1	11.1%			2	28.6%
Future practice goal								
Family Practice			0				1	
A/G Primary Care			0				0	
A/G Acute Care			0				2	
Pediatrics			1				0	
Women's Health			2				0	
Psych Mental Health			2				1	
other			1				0	

Note. A/G - adult/gerontology

Central Tendency

Examination of all continuous variables for central tendency was conducted and the variables were found to be normally distributed in this study. Unique identifiers were assigned to participants, controls, and past cohorts. The Learner Self-Efficacy Scale (L-SES) measurement tool was used for this study contained three domains (cognitive, affective, and psychomotor) with four questions

within each domain (Kang et al., 2019). Initial computations of variables from the L-SES instrument were analyzed and demonstrated that each of the four Tele-Sims pre and post L-SES survey scores were normally distributed based on Fisher's Exact skewness and kurtosis statistics and met the assumptions of the clinical research questions (Tabachnick, 2001).

Reliability

The reliability of the L-SES instrument reported by the authors (Kang et al., 2019) demonstrated high content validity and consistent reliability. The reliability of the L-SES in this study was acceptable during each of the Tele-Sim Sessions and throughout the clinical course with a Cronbach's alpha ranging between .83 (PreTS) and .97 (PreTS4). Table 2 details the statistics for each session.

Table 2

Reliability of the L-SES for the Participants of the Tele-Sim Intervention

Variable	α	Variable	α
Pre-AHA Course	.83	Post AHA Course	.93
Pre AHA Course Cognitive	.99	Post Course Cognitive	.87
Pre AHA Course Affective	.84	Post Course Affective	.75
Pre AHA Course Psychomotor	.52	Post Course Psychomotor	.79
Pre TS1 (Respiratory & Abdomen)	.93	Post TS1	.94
Pre TS1 Cognitive	.92	Post TS1 Cognitive	.89
Pre TS1 Affective	.84	Post TS1 Affective	.82
Pre TS1 Psychomotor	.67	Post TS1 Psychomotor	.88
Pre TS2 (Cardiac & HEENT)	.84	Post TS2	.91
Pre TS2 Cognitive	.95	Post TS2 Cognitive	.88
Pre TS2 Affective	.84	Post TS2 Affective	.77
Pre TS2 Psychomotor	.74	Post TS2 Psychomotor	.79

Variable	α	Variable	α
Pre TS3 (Neurological & Musculoskeletal)	.86	Post TS3	.89
Pre TS3 Cognitive	.90	Post Cognitive TS3	.97
Pre TS3 Affective	.89	Post Affective TS3	.67
Pre TS3 Psychomotor	.58	Post Psychomotor TS3	.91
Pre TS4 (Complete Systems)	.97	Post TS4	.94
Pre TS4 Cognitive	.96	Post TS4 Cognitive	.77
Pre TS4 Affective	.97	Post TS4 Affective	.99
Pre TS4 Psychomotor	.90	Post TS4 Psychomotor	.72

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Pre TS Intervention	.83	Post TS Intervention	.93
Pre TS Cognitive	.99	Post TS Cognitive	.87
Pre TS Affective	.84	Post TS Affective	.75
Pre TS Psychomotor	.52	Post TS Psychomotor	.79

Table 3 shows Pearson's correlations of the major variables with results shown in the main demographic variables (age). There was a moderately negative correlation (r = -.69, p < .01) between age and video grades and age and course grade. (r =-.63, p< .05). As participant's age increased, both the video grade score and course grade decreased.

Table 3

Pearson's Correlations Tele-Sim for Variables Age and Video Grades N 32 (after omitting grade <82) sig .070

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1) Age	*r*	--														
	N	12														
2) Current hours work/mo	*r*	-0.136	--													
	N	10	12													
3) Video grade	*r*	-.690**	-0.395	--												
	N	12	12	19												
4) Course Grade	*r*	-.628*	-.225	.469*	--											
	N	12	12	19	19											
5) Pre Course LSES Total	*r*	0.310	0.310	-0.360	-.523*	--										
	N	11	11	15	15	15										
6) Pre TS1 Total Resp Abd	*r*	-0.253	0.253	0.177	-.661	0.727	--									
	N	5	5	7	7	7	7									
7) Post TS1 Total	*r*	0.375	0.017	0.325	-.043	0.164	0.731	--								
	N	6	6	8	8	8	7	8								
8) PreTS2 CV HEENT Total	*r*	-0.619	0.523	0.435	-.397	0.398	0.451	-0.098	--							
	N	7	7	9	9	9	7	8	9							
9) Post TS2 CV.HEENT Total	*R*	0.237	-0.074	-0.039	.029	-0.149	0.535	.742*	-0.305	--						
	N	7	7	9	9	9	7	8	9	9						
10) Pre TS3 Total N/ MSK	*r*	-0.472	0.471	0.133	-.816**	0.641	.876**	0.197	.713*	-.140	--					
	N	7	7	9	9	9	7	8	9	9	9					
11) Post TS3 Total	*r*	.356	.035	.305	.353	.367	.438	.367	.066	.435	.139	--				
	N	7	7	9	9	9	7	8	9	9	8					
12) Pre TS4 H2T Total	*r*	0.330	0.298	-0.510	.170	.544	.909*	0.552	-0.210	0.339	0.356	0.619				
	N	7	6	8	8	8	6	7	8	8	8	8	8			
13) Post TS4 Total	*r*	-0.046	-0.116	-0.044	.343	0.518	.815*	.714*	-0.197	0.654	0.246	0.354	.850**	--		
	N	7	7	9	9	9	7	8	9	9	9	9	8	9		
14) Pre Clinical Total	*r*	-0.142	0.268	-0.200	.076	0.269	.816*	.722*	-0.257	.813**	0.072	0.654	.817*	.896**	--	
	N	11	11	16	16	14	7	8	9	9	9	9	8	9	15	
15 Post AHA Course Total	*r*	0.322	0.295	-0.563	-.395	0.472	0.808	0.439	-0.292	0.544	0.138	.806*	.946**	.908**	.950**	--
	N	5	5	7	7	7	5	6	7	7	7	7	6	7	7	7

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

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Analysis of the Clinical Questions

The purpose of this study was to determine if Tele-Sim educational intervention would create statistically significant changes in student clinical grades, demonstration videos and self-efficacy on their performance of physical exam skills in an advanced health assessment course.

Clinical Question 1

Compared to students in the traditional Advanced Health Assessment (AHA) course format, do students participating in the educational initiative achieve statistically significant changes in:

a. confidence and self-efficacy as measured by the L-SES pre and post Tele-Sim when performing physical examination skills in the clinical setting?
d. scores on pre-clinical screening physical examination demonstration videos?
e. final numerical grades in the AHA clinical course?

Clinical Question 1.a

A paired-samples t-test was used to determine whether there was a statistically significant difference between the pre and post scores for the Tele-Sim participants L-SES overall, and for content-specific sessions. The session differences ranged from a low mean of 31.67, (*SD* 5.48) to a high mean of 43.13 (*SD* 5.41). See Table 4 for each session's statistics. For Tel-Sim sessions three and four there were statistically significant increases in the L-SES overall scores from pre sessions to post sessions. Participants in this study gained confidence and self-efficacy from pre to post sessions.

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Table 4

Paired Samples t-Test: Pre and Post Tele-Sim Sessions and Overall Tele-Sim

Sessions	Pre	Post			
			t	df	*p*
Tele-Sim #1 Pre & Post Respiratory & Abdominal	36.14 (6.90)	41.43 (5.91)	-2.92	6	.03
Tele-Sim #2 Pre & Post Cardiovascular & HEENT	34.67 (4.90)	40.11 (5.67)	-1.91	8	.09
Tele-Sim #3 Pre & Post Neurological & Musculoskeletal	31.67 (5.48)	42.33 (5.78)	-4.34	8	< .01
Tele-Sim #4 Pre & Post Head to Toe & Wrap up	38.00 (6.93)	43.13 (5.41)	-3.94	7	< .01
Pre & Post Tele-Sim Course	35.14 (5.64)	42.00 (4.76)	-3.36	6	.02

Clinical Question 1.b

An independent-samples t-test was performed on the scores of the pre-clinical screening physical examination demonstration videos between the control and intervention groups. There was no statistically significant difference between the students in the TS intervention (*M* 92.58, *SD* 4.32) and the control group (*M* 86.35, *SD* 14.78), $t(17) = 1.22$, $p = .24$. For the participants in this study there were no differences in the grades of the pre-clinical screening videos.

Clinical Question 1.c

An independent t-test was performed on the final clinical grades between the control and intervention groups. There was no statistical difference between the students in the TS intervention (*M* 95.02, *SD* 1.83) and the 2022 control group (*M* 92.85, *SD* 2.84), $t(15.4) = 1.96$, $p = .068$; however, it was approaching significance. For the participants in this study there were no statistical differences between the grades of the pre-clinical final clinical grades.

Clinical Question 2

Compared to students in past cohorts who completed the traditional Advanced Health Assessment (AHA) course format, do students participating in the educational initiative achieve statistically significant differences in:

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1. scores on pre-clinical screening physical examination demonstration videos?
2. scores on final clinical grades?

Clinical Question 2.a

An independent t-test was used to test the hypothesis that participants in the Tele-Sim achieve statistically significant differences on the demonstration video grades between the intervention group and the past year 2021 cohort group. There was no statistical difference between the students in the TS intervention (*M* 92.58, *SD* 4.32) and the past 2021 cohort group (*M* 89.64, *SD* 8.3), *t* (20.38) = 1.11, *p* < .28. in the AHA clinical course. In this study, the participants in the Tele-Sim scored similarly to the past 2021 cohort on their video grades.

Clinical Question 2.b

An independent t-test was used to test the hypothesis that participants in the Tele-Sim achieve statistically significant differences on the final clinical grades between the intervention group and the past year 2021 cohort group. There was no statistical difference between the students in the TS intervention group (*M* 95.02 *, SD 1.83*) and the past 2021 cohort group (*M* 93.08, *SD* 3.02), *t(20) 1.64, p* = .117. In this study, the participants in the Tele-Sim scored similarly to the past 2021 cohort on their final course grades.

Clinical Question 3

After participating in the educational initiative, what level of satisfaction do NP students report on the effectiveness and usefulness of Tele-Sim? The nine NP students reported a very high level of satisfaction with the usefulness and effectiveness of the Tele-Sim, meeting one of the aims of the study. They reported very high levels of agreement (satisfaction) with the effectiveness and usefulness of Tele-Sim (70 % rating highly effective, 30% effective). The nine participants completed the survey and rated satisfaction with the usefulness of the technology very high (70%) or high (30%), and the effectiveness of several variables, at very high (50 -70%) or high (30-50%), with no rating less than high. The ratings for

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student attained knowledge were very high (90%) and high (10%) and students reported their confidence in performing physical assessment skills in clinical settings and in choosing specialized exam techniques as very high (70%) or high (30%). The students rated the effectiveness of the instructor as very high in all areas ranging from (90% to 80%). Students suggested the duration of future sessions from two hours (30%) to one hour (60%), and one student wanted one and one-half hours. Some students reported some difficulty procuring an HSP at home but rated the effectiveness/contribution of demonstrations on HSP as high (30%) or very high (70%). The students rated their competence pre Tele-Sim as somewhat low (40%) or gave a neutral response (50%), with only 10% rating their competence as very high. The post Tele-Sim student ratings of their competence performing physical exam skills were high (70%) or very high (30%). The overall satisfaction with the Tele-Sim was very high (90%), or high (10%) and recommendations for offering it to future cohorts was very high or high (10%). Table 5 reports the participant satisfaction survey results in specific areas.

Table 5

Participant Satisfaction Survey Results

Variables	Very high	High	Neutral	Somewhat low	Very low
			%		
Effectiveness/Usefulness					
Breakout rooms	50	50	0	0	0
HSPs	70	30	0	0	0
Instructor demos	70	30	0	0	0
Student return demonstrations	60	40	0	0	0
Ease in use of technology	70	30	0	0	0
Ease in finding HSP	40	40	0	20	0
Instructor Effectiveness					
Knowledge	90	10	0	0	0
Organization/timeliness	90	10	0	0	0
Stimulating student engagement	90	10	0	0	0
Providing demonstrations	90	10	0	0	0
Feedback provided	80	20	0	0	0
Cultural sensitivity	90	10	0	0	0
Student level of confidence & competence performing exam skills					
Knowledge gained	80	20	0	0	0
Clinical setting confidence	70	30	0	0	0
Choosing specialized exam skills	70	30	0	0	0
Pre Tele-Sim competence	10	0	50	40	0
Post Tele-Sim competence	30	70	0	0	0
Overall satisfaction & recommendation	90	10	0	0	0
Effectiveness meeting course objectives	60	40	0	0	0

Note. HSP-human standardized patient; breakout rooms were electronic within Zoom Teleconferencing

A dependent samples t-test was used to test the hypothesis that there was a statistically significant difference between the pre and post Tele-Sim scores for students' assessment of their competence performing physical examination skills. On this Likert scale, lower numerical scores represented higher levels of rating of their competence. The research hypothesis was supported. A significant increase in student perceived competence in performing physical examination skills was demonstrated from pre-course (M 3.20, SD .92) to post course (M 1.70, SD .48), $t(9) = 5.582$, $p < .001$. Participants rated themselves as having a very high or high level of competence after participating in the Tele-Sim.

Conclusions

The results from this study were analyzed to answer the clinical questions proposed in an educational intervention called Tel-Sim, and its effect on student grades and participant-reported competence and self-confidence performing physical examination skills. The participants were graduate nurse practitioner students in an Advanced Health Assessment course. The main demographic variables from this study, reported all participants were women, 48% were Black with a mean age of 36 years. Participants reported two to twelve years of nursing experience and worked 79-120 hours per week. Most students were totally responsible (48%) for financing their graduate education, with only some (17%) having full scholarships or other outside funding. The reliability of the Tele-Sim overall and for each individual content-specific session results were acceptable. There was a statically significant difference between the students' reported self-efficacy from pre to post Tele-Sim, demonstrating significant improvement post Tele-Sim.

There was no statistically significant difference among the participants video grades or final clinical course grades compared to the 2022 control group or the past 2021 cohort group who did not receive the Tele-Sim educational intervention. The student satisfaction survey results indicated a very high or high level of satisfaction with the effectiveness of the components of the Tele-Sim and all measures of the instructor's effectiveness. Students reported very high (90%) or high (10%) attainment of knowledge in performing physical examination skills post course. The students also reported very high (90%) or high (10%) recommendations for offering the intervention to future AHA course cohorts and the same levels of overall satisfaction with the Tele-Sim.

Chapter 5

Discussion

Tele-Sim was initiated with the purpose of improving student competency and confidence in the clinical performance of advanced physical assessment skills for nurse practitioner (NP) students by applying an innovative learning strategy. Using an online, interactive, simulated, telehealth-style learning format, Tele-Sim was created. Increasing numbers of NP educational programs are offered online, often with little or no face-to-face contact among students and instructors (Seaman et al., 2018; Prettyman et al., 2018; Cipher et al., 2019; Heuberger and Clark, 2019; Mackavey & Cron, 2019).

NP students need to acquire physical examination skills to increase competency, but students express a need for more confidence in choosing and a lack of competence performing these skills (Cipher et al., 2019; Luke et al., 2021). Many NP students want live instructor demonstrations, observed practice, and real-time feedback from their clinical instructors (Warren et al. 2016; Prettyman et al., 2018 Jezuit et al., 2020; LaManna et al., 2021; Schroeder et al., 2021;). The Advanced Health Assessment (AHA) course at the researcher's university offers fully asynchronous learning, and ninety hours of clinical preceptorship ending with an in-person, on campus, summative performance evaluation. Some NP online programs have an on-campus intensive where students learn and practice physical exam skills and are then evaluated face-to-face. This is quite effective, but costly for programs in faculty time and compensation, and in both time and travel for students learning from remote locations. NP candidates can currently choose from programs with a variety of educational strategies including asynchronous classes, synchronous classes facilitated with teleconferencing, required campus visits, intensives or evaluations, face-to-face clinical preceptorships, or a combination of these and other learning modalities (George et al., 2021; He et al., 2021; Cipher et al., 2019; AACN, 2015). As adult learners who often have jobs, families, and other responsibilities, NP student candidates' choices are influenced by their individual learning needs (Cipher et al., 2019; Mau, 2022).

Tele-Sim Format

The four Tele-Sim sessions were facilitated by a course instructor who presented content on six different body systems, with each two-hour session presenting two anatomical-specific systems per session. The format included instructor demonstrations on human standardized patients (HSPs) in the health science simulation center, student practice in electronic breakout rooms, return student demonstrations to the entire participant group on their home/own HSP (human standardized patients) and a debriefing with interactive discussions. These included when to choose to apply specific or provocative examination techniques and examples of interpretation of abnormal findings. Each participant joined the Tele-Sim sessions by logging on with Zoom teleconferencing while the instructor had three zoom rooms to visualize the instructor exam demonstrations from different camera angles. HSP volunteers, who were students in the School of Nursing undergraduate Health Assessment course, presented to the Health Science Simulation Lab in person, and were pre-briefed with a discussion of their role and provided a demonstration of each technique that would be used for their examination. They received no extra credit for volunteering. Logistics were managed by a graduate assistant, who also monitored the chat room and provided the links for the pre and post L-SES surveys.

IT and Personnel Requirements

Today's learners are comfortable using click-to-learn teaching methodologies and adapt to online technology quickly, so the unique format of the Tele-Sim was less of a barrier for them (Posey, Pintz, Zhou, Lewis, & Slaven-Lee, 2020). For the students to have multiple views of the instructor's demonstrations, three cameras and three Zoom connections were required. That necessitated a person to adjust and switch the cameras and focus as needed. Information technology (IT) personnel were assigned to help with initial set up and loan of the cameras, and a graduate assistant was assigned who also used the chat feature to provide the link to the L-SES surveys set up in Qualtrics and manage the camera angles. The use of breakout rooms was planned so that students could learn from and

collaborate with each other without instructor oversight. Breakout room practice was less necessary for the small number of participants in this study but would be an advantage with a larger number of participants in future sessions.

Diversity

The small number of participants in this study did represent diverse backgrounds (six Black, one Asian, three White) but all were women. Though there were men in the cohort, no male students consented to be in the study. Though these populations are underrepresented in the School of Nursing, inclusion of Hispanic, Asian, male gender and older HSPs in Tele-Sim could make a more diverse sample in future Tele-Sim studies. There were no language barriers in the participant group, but if present in future studies, closed captioning could be applied to the instructor presentations in the online environment. The inclusion of diverse HSPs by gender and body type was intentional so participants would experience examination of different body types present in real-life patients. BSN Health Assessment course students were highly interested in the NP role and volunteered to be SPs enthusiastically, because they wanted to supplement their course content and learning. This provided a valuable shared interprofessional experience for both NPs and undergraduate students.

Environment for Participants and their HSPs

Participants reported some difficulty in recruiting their own HSPs who would be available when the student required. Therefore, when students presented without a patient, an effort was made to place them in groups with those with a home HSP patient. This required aspect of the Tele-Sim would need to be explained earlier in the recruitment process in future studies. Participants were able to adjust cameras for effective assessment of their return performances and used sofas, tables, and other furniture to practice their skills.

Student Self-Efficacy

Student participants completed a twelve question, three domain pre and post Learner Self-Efficacy Scale (L-SES) survey for each session, as well as pre and post clinical and course surveys, and a final student satisfaction survey. There was a statically significant difference between the students' reported self-efficacy from pre to post Tele-Sim, demonstrating significant improvement post Tele-Sim. Those who had less confidence in their physical exam skills may have had increased incentive to participate, thus demonstrating more significant improvement in self-efficacy. Completion of the surveys was delayed for some participants who arrived a bit late or left a bit early from the sessions. If students missed one class, they were allowed to listen to the recorded session to continue participating in the research.

The participants from the psych/mental health track may have had less experience applying their basic health assessment skills in their field of nursing, so perceived less self-efficacy. Raynor et al. (2021), published results of their research using telehealth and SPs in simulated OSCEs for psych/mental health nurse practitioner (PMHNP) students' clinical evaluations. They reported that using a telehealth format and simulated standardized patients gave online students a "hands on" experience and successfully demonstrated achievement of professional competencies. Those students who participated reported that the feedback on their performance from multiple sources (instructor, peers, SPs, and self-assessment), developed improved self-awareness and self-efficacy through reflection and discussion, which are essential components of simulation debriefing (Raynor et al., 2021).

Nurse practitioner programs and faculty are responsible for incorporating new and innovative teaching methods into the students' clinical education (Bobek et al., 2022). The study by Bobek et al. (2022) provided opportunities to NP students to conduct virtual patient visits to practice their new physical assessment skills in a telehealth environment. Their research found that using an online telehealth environment created a positive and meaningful experience in their participants'

clinical education in learning health assessment skills. Though research by Bodek et al. in 2021 added positive outcomes to the current research evidence on blending simulation and telehealth in NP teaching/learning strategies, they recommended that more research be completed to determine best practices for teaching specifically in a telehealth environment. The Tele-Sim study supplemented current research with statistically significant results, providing evidence to support the future use of telehealth and simulation with HSPs to enhance the clinical education of nurse practitioner students.

Research comparing face-to-face to telehealth style simulated experiences, underscored the effectiveness and importance of using technology-based teaching and learning modalities to augment clinical experiences, to evaluate student competencies and to prepare online NP students for successful transition to clinical practice (Posey et al., 2020). Chrostowski and Tietze (2022), who implemented online OSCEs for NP clinical education during the pandemic, also found that the use of a telemedicine simulations (including a telemedicine cart) can help prepare students for competent, safe, clinical practice in their future careers. Adding telehealth modality to simulation for clinical evaluation and education of NP students allows for flexibility in online programs and provides immediate in-the-moment feedback from faculty and patients (SPs), which is greatly valued by students (Sudhir, 2021). In a mixed method research study by George et al., (2021), the use of OSCES to evaluate history taking and physical assessment skills for NP students using undergraduates as SPs, reported positive student outcomes and student satisfaction. They reported benefits of using undergraduate students, as was included in the Tele-Sim, for both student and faculty groups. This intraprofessional collaboration between the student groups increases both NPs and undergraduate nursing students' exposure to safe simulated clinical experiences, better preparing them for direct patient care (George, et al., 2021). Immersing students into telehealth melds technology into their respective curriculums and could aid/facilitate students in meeting program competencies. These additional research findings on the usefulness and effectiveness of combining telehealth and simulation in the clinical education of NP

student competency and self-efficacy, add to the findings of the Tele-Sim research study and support the recommendations for the use of Tele-Sim teaching methodology in future NP clinical courses and education.

Course Grades

All students in the AHA course were required to submit screening videos before beginning their clinical preceptorship. These were graded by the clinical instructors with an analytical rubric. An experienced clinician who was not teaching the 2022 cohort agreed to be a blinded rater for both control and participant groups. The participants' video grades and final course grades were also compared to past cohort grades from 2021. Though there was no statistically significant difference between the Tele-Sim participants' video grades or final clinical course grades and the 2022 or 2021 cohorts, it is hypothesized that the multiple graders in the past cohorts may have affected the grading. This course has several clinical sections and various faculty are often assigned by need each semester. All course assignment grades were based on analytical rubrics, though research has yet to been done, the use of the rubrics over time by multiple faculty has produced results that are reliable. Due to time restraints, data from control groups from past cohorts was limited to grades, though demographic data retrieval is possible. In future research, attempts to ensure inter-rater reliability and compare demographic data are highly recommended.

Student Satisfaction Survey Results

The NP student participants reported a very high level of satisfaction with the usefulness and effectiveness of the Tele-Sim. They reported the instructor demonstrations and the use of HSPs as the most effective components that enhanced their learning. Some students reported difficulty with the requirement of procuring their own HSP. There were delays in the IRB (Institutional Review Board) approval process, necessitating the late contact of students for obtaining information and consent,

which coincided within only one week of the onset of the Tele-Sim sessions. Recruiting participants one month before the start of classes would have provided a more ideal time for students to find HSPs. Participants rated both their level of knowledge attained from the Tele-Sim and the instructor effectiveness as very high (Table 5). Their confidence in performing physical assessment skills and in choosing specialized exam techniques in clinical settings was reported by participants as very high or high. Students suggested the duration of future sessions to be from one to two hours, which should be considered in future research planning. The overall student/participant satisfaction with the Tele-Sim and recommendations for offering it to future cohorts was very high, supporting future use in the NP program. An outcome that was not measured, but later reported to the researcher contributed to a program outcome, is that a positive relationship was built among the student participants and has continued into their next courses.

Strengths

Tele-Sim is an impactful experiential learning opportunity for online students using a multi-modal approach. The infusion of technology into every aspect of teaching requires traditional faculty to apply creativity to their traditional teaching strategies while embracing today's rapidly changing learning environments. Tele-Sim meets current NP student needs by offering a more traditional simulation experience with HSPs combined with online face-to-face instructor demonstrations, and high-level student/instructor interaction through the use of teleconferencing. The use of breakout rooms encouraged role modeling, peer support, partnering and relationship building among online students that is usually challenging to achieve. The extremely high scores on all aspects of the final student satisfaction survey for all aspects of the Tele-Sim and the statistically significant improvement in the Learner Self-Efficacy Scale post sessions are compelling evidence that supports expanding Tele-Sim use in future NP courses.

Limitations

The AHA course for the research included 26 enrolled students, so with nine participants and ten controls, the small number would not produce data that is generalizable to similar populations and courses. The Tele-Sim sessions needed to be concluded ideally by week five, before students submitted their performance videos which were required before beginning their clinical preceptorships. There were some initial time barriers with recruiting due to limited access to students before the semester began and conflicts in the students' schedule. The research evidence would have been stronger if the research was a randomized control trial, however, the IRB ruled that randomization may give an unfair advantage to those who wanted to participate but were randomized to the control group.

Implications Recommendations for the Future

Recommendations include continued replication of the study in future cohorts to obtain larger numbers of participant data. Obtaining earlier recruitment and consent will allow completion of the Tele-Sim prior to the video performance requirement and before students begin their clinical preceptorships. Using breakout rooms would have been more effective with a larger number of participants, but the student satisfaction survey results support their usefulness in future Tele-Sims. The pre-training of all clinical instructors will increase interrater reliability and create valid statistical results when comparing course and video grades.

It can be assumed that individual faculty style, communication and approach will likely have some effect on future outcomes, but if provided minimal technical support, the actual teaching will be more like traditional formats and comfortable for faculty. An unplanned benefit of the research is that it may better prepare Nurse Practitioner students to use telehealth in their future practice. This research should be replicated in future courses to increase the strength of the evidence.

Future Advanced Health Assessment Courses

The positive research results from this innovative teaching/learning method will influence the faculty to initiate and incorporate Tele-Sim teaching methods in future online AHA clinical courses at this university. As a positive effect, use of Tele-Sim will provide experience and improve student Nurse Practitioner performance when using telehealth with their patients and interprofessional communication with colleagues. Collection of research data should be continued in future cohorts to provide evaluation of course and program outcomes and provide valuable feedback for improving Tele-Sim. A strong attempt to increase inter-rater reliability should be made by holding a rubric training session before the course begins and making attempts to include consistent clinical faculty from year to year. Most importantly, improved self-efficacy in performing physical examination skills may lead to enhanced clinical judgment by NP students and ultimately, improved patient outcomes.

Applications Outside NP Programs/Interprofessional Course Application

Other programs could appropriately apply the Tele-Sim format to teach performance skills in various courses that are offered online. This could include courses that teach skills like suturing, bandaging, casting, and other procedures. Tele-Sim could also be applied in programs that require hands-on or objective assessments like physical and occupational therapy, speech therapy, audiology, and athletic training. Tele-Sim could even be utilized in interprofessional courses to learn Tele-Health techniques.

Conclusion

Tele-Sim proved to be a highly effective innovation in teaching physical exam skills and improved online NP student learning, competence, and self-efficacy. There was a statically significant difference between the students' reported self-efficacy from pre to post Tele-Sim, demonstrating significant improvement post Tele-Sim. Students reported a high level of satisfaction with the ease of

use and effectiveness for learning physical exam skills using Tele-Sim and 100% of the participants highly recommended that Tele-Sim be offered in future courses. Educators should be challenged to ensure that students do not lose connection with the live teacher as online education is expanded. Telehealth has forever changed healthcare and Tele-Sim may do that for online nurse practitioner education.

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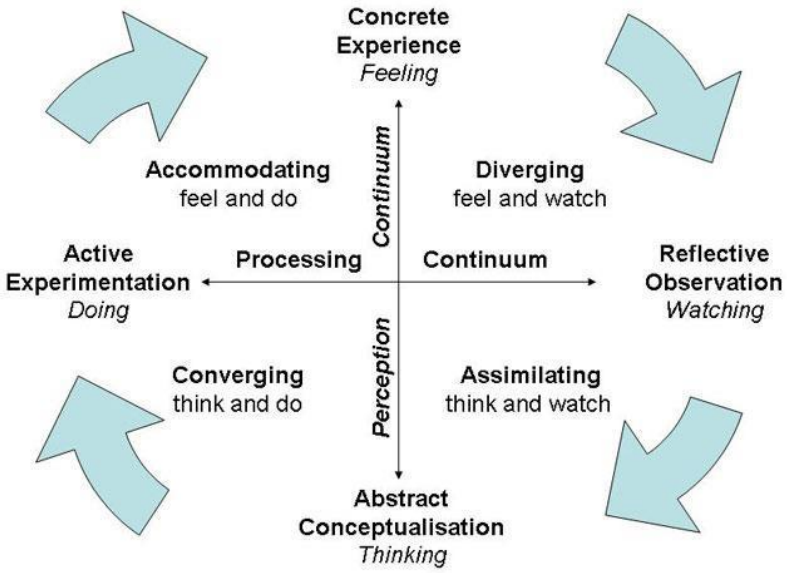
Appendix A

Figure 1

Kolb's Learning Theory Cycle



Appendix B

Figure 1

Consent form

COLLEGE OF Waters College of Health Professions)

DEPARTMENT OF (School of Nursing)

Informed Consent
for
Tele-Simulation Nurse Practitioner Clinical Education Health Assessment skills

1. My name is Kathleen (Kat) Tremblay, and I am an Assistant Professor in the School of Nursing (SON) in the Waters College of Health Professions (WCHP) at Georgia Southern University. I plan to perform research with graduate students in a graduate level advanced health assessment clinical course.

Purpose of the Study: The purpose of this research is to improve student competency in the clinical performance of advanced physical assessment skills by initiating a learning strategy utilizing online simulated telehealth-type learning format.

Aims:
To evaluate the effects of an educational initiative for students in the Advanced Health Assessment clinical course by adding online synchronous (live) classes for two hours each week for the first 4 weeks of the clinical course. Students will learn and practice physical assessment skills using telehealth style format using HSPs and student return demonstration before the onset of their preceptorship (clinical experience.

2. **Procedures** to be followed: Participation in this research will include:
    a. attending synchronous (live online) classes-2 hours/week for 4 weeks on Tuesdays (time TBA)
    b. providing your own location (at home or in health care setting-not during your work hours)
    c. instructor demonstrations on human simulated patients in the Armstrong Campus Simulation Building using telehealth format.
    d. providing opportunities for students (you) to practice in small groups using electronic Breakout rooms.
    e. give return demonstrations and receive immediate interactive feedback.
    f. Pre and post participation surveys on learning, confidence, and satisfaction

3. **Discomforts and Risks**:
    a. **Inconvenience**-Must attend synchronous classes for 2 hours for 4 weeks in a row at the beginning of the course and prior to starting precepted clinical experiences.
        i. dates on Tuesdays (designated graduate course day)

ii. time in evenings-TBA by student group preference

b. Must obtain a human simulation patient on whom to practice and demonstrate.
c. Internet use: Must have a camera and audio able to participate in ZOOM meetings.
    i. Must have internet strength and access able to support Zoom classes.
    ii. Virtual (internet based) synchronous classes We are careful to ensure that the information you voluntarily provide to us is as secure as possible; however, you must be aware that transmissions over the Internet cannot be guaranteed to be completely secure. Your confidentiality will be maintained to the degree permitted by the technology being used. You will be subject to the privacy policy of the Zoom.

4. Benefits:
    a. The benefits to you as a participant include...
        i. Observing live demonstration of necessary physical examination skills by experienced FNP-learn through modeling.
        ii. Time to practice in small groups in breakout rooms, receive social support and encouragement through peer feedback.
        iii. Immediate and personalized feedback on your skills performance-non graded
        iv. Increased competency and confidence in performing physical exam skills before clinical preceptorship.
        v. Increased knowledge in selecting and performing special exam techniques.
        vi. Time for questions and individualized feedback from instructor
        vii. Sim clinical hours (TBD)

    b. The benefits to society include providing educated NPs with high-quality physical assessment knowledge and skills to apply to clinical judgement and reasoning. leading to improved patient outcomes
    c. Improved clinical skills for future NPs when assessing patients, leading to increased competency when differentiating diagnoses and applying EB treatment plans.
5. Duration/Time required from the participant:
    a. Preparation for class by viewing Bates Videos and studying text (as required of all students in course)
    b. Plus 2-hour synchronous classes for the first 4weeks of the AHA clinical course.
6. As required of all course students-prior to starting the clinical experiences, you will submit a Video demonstration of your physical assessment skills for pass/fail grading.
    a. Grading will be done using an analytical rubric by one instructor who will be blinded to students' names and any other personal identifiers.
    b. Grades will be posted on Folio by a 2nd blinded faculty member.

7. Statement of Confidentiality
    a. Only researchers and course faculty will have access to participants' information.
    b. Data will it be stored on Desire-to-Learn student learning platform (Excel spreadsheet) as "Grades."
    c. Data will be maintained in a secure location for a minimum of 3 years following completion of the study.

8. Future use of data:
    a. English is the language used:
    b. Deidentified or coded data from this study may be placed in a publicly available repository for study validation and further research. You will not be identified by name in the data set or any reports using information obtained from this study, and your

confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions."

9. Right to Ask Questions: Participants have the right to ask questions and have those questions answered. If you have questions about this study, please contact the researcher named above or the researcher's faculty advisor, whose contact information is located at the end of the informed consent. For questions concerning your rights as a research participant, contact Georgia Southern University Institutional Review Board at 912-478-5465 or irb@georgiasouthern.edu.

10. Compensation: Incentive to participate is additional clinical instruction include

    a. Credit for clinical hours
    b. Extra clinical instruction without extra tuition or lab fees
    c. Direct contact and feedback from experienced clinical instructor
    d. There are no anticipated additional costs as a result of participation in the research.

11. Voluntary Participation: Students in the AHA course do not have to participate in this research; you may end your participation at any time by notifying the lead researcher, by not returning the survey instrument or other options. You do not have to answer any questions that you do not want to answer. If you end your participation in the study, you will continue to be enrolled in the traditional course without penalty ro lo9ss of grades.
12. Penalty: There is no penalty for deciding not to participate in the study; You may decide at any time to not participate further and may withdraw without penalty or retribution.

13. HIPAA: N/A
14. FERPA:
    We ask that you allow us to look up your course grades so we can analyze the data compared with the intervention group. We will use your course required video physical exam demonstration grades, end of semester head to toe performance grades, didactic course grades and pre and posttests and surveys in the data analysis. We would like to use the data for this study and in future scholarship but will remove your name and any other identifiers from the data before using it as part of the study. Only the Primary Investigator (Kat Tremblay) will have access to the data collected for this study. **You will not be identified by name in any reports using information obtained from this study.**

15. Focus Group:N/A

16. If the study involves deception, the following statement must be included: "Because the validity of the results of the study could be affected if the purpose of the study is fully divulged to me prior to my participation, I understand that the purpose of the study cannot be explained to me at this time. I understand that I will have an opportunity to receive a complete explanation of the study's purpose following my participation in the study."

17. You must be an enrolled master's level student to participate in this research study.

You will be given a copy of this consent form to keep for your records. This project has been reviewed and approved by the GS Institutional Review Board under tracking number H_____.

Title of Project:

Principal Investigator: (Kathleen A Tremblay, Armstrong Campus, ktremblay@georgiasouthern.edu; (978)501-0344-mobile and text

Research Advisor: (Name, campus telephone and university email address)

Select **one** of the options.

Please select an option below to indicate whether or not you agree to participate in this research:

[ ] Yes, I have read the terms above and consent to participate in this research.
[ ] Yes, I have read the terms above and consent to having my survey results and grades used in the research, but do not want to participate in the Tele-Sim educational initiative.
[ ] No, I do not consent to participate in this research.

Appendix C

Figure 3

IRB application

GEORGIA SOUTHERN UNIVERSITY
RESEARCH INTEGRITY

Institutional Review Board (IRB)

Application for Research Approval – Exemption 1

Please submit this protocol to IRB@georgiasouthern.edu in a single email; scanned signatures and official Adobe electronic signatures are accepted. Applications may also be submitted via mail to the Research Integrity office, PO Box 8005.

Principal Investigator	
PI's Name: Kathleen A. Tremblay	Phone: 978 501-344
Email: ktremblay@georgiasouthern.edu (Note: Georgia Southern email addresses will be used for all correspondence.)	Department: School of Nursing College: WCHP
Primary Campus: ☐ Statesboro Campus ☒ Armstrong Campus ☐ Liberty Campus	
☒ Faculty ☐ Doctoral ☐ Specialist ☐ Masters ☐ Undergraduate ☐ Other:	
Georgia Southern Co-Investigator(s)	
Co-I's Name(s): Kari Mau F (By each name indicate: F(Faculty), D(Doctoral), S(Specialist), M(Masters), U(Undergraduate), O(Other))	Email: kmau@georgiasouthern.edu (Note: Georgia Southern email addresses will be used for all correspondence.)
Personnel and/or Institutions Outside of Georgia Southern University involved in this research:	
Sallie Coke	☐ IRB Approval Attached *(Reliance agreements not available on exempt protcols.)*
Krystal Canady	☐ IRB Approval Attached *(Reliance agreements not available on exempt protcols.)*

Project Information	
Title: Telehealth-Style Simulated Clinical Educational Initiative in an Online Graduate Nurse Practitioner Course	
Number of Subjects (Maximum) 20 or half of enrolled students	
Will you be using monetary incentives (cash and/or gift cards)? ☐ Yes ☐X No	
School(s)/Location(s) where data will be collected: HPAB Simulation suite Armstrong Campus and online.	
☒ Self-funded/non-funded ☒ Internal Georgia Southern Internal Source: If possible	☐ External Funding (*You are responsible for duplicate or additional approval submissions required by funders.)* Funding Source: ☐ Federal ☐ State ☐ Private ☐ Contract Funding Agency: Grant Number: 39G Grant Title: ☐ Same as above Enter here: ☐ Funding application scope of work attached

Compliance Information

Do you or any investigator on this project have a financial interest in the subjects, study outcome, or project sponsor? (A disclosed conflict of interest will not preclude approval. An undisclosed conflict of interest will result in disciplinary action.). ☐ Yes ☒ No (If yes attach disclosure form)

Certifications

I certify that the statements made in this request are accurate and complete, and if I receive IRB approval for this project, I agree to inform the IRB in writing of any emergent problems or proposed procedural changes. I agree not to proceed with the project until the problems have been resolved or the IRB has reviewed and approved the changes. It is the explicit responsibility of the researchers and supervising faculty/staff to ensure the well-being of human participants.

_____ _____
Signature of Primary Investigator Date

_____ _____
Signature of Co-Investigator(s) Date

By signing this cover page, I acknowledge that I have reviewed and approved this protocol for scientific merit, rationale, and significance. I further acknowledge that I approve the ethical basis for the study.

If faculty project, please have department chair sign; if student project, please have research advisor sign:

Kathleen A Tremblay _____ _____
Typed/Printed Name Signature Date

IRB

Appendix D

Figure 4

L-SES

Learner Self-Efficacy Scale (L-SES)

Participants should rate their agreement on each of the following statements. Please be honest about your rating on the date you are completing.

Domain/No.	Item	Disagree <----------> Agree 1	2	3	4
Cognitive					
1	I can recall how to perform **advanced physical examination skills** *"the clinical skill*."	1	2	3	4
2	I understand the content of **advanced health assessment applying physical examination skills** "the clinical skill" and can demonstrate it to others.	1	2	3	4
3	I can verbally explain the purpose and principle of performing **advanced physical examination skills** "the clinical skill."	1	2	3	4
4	I can verbally explain the sequence and interrelationship between each step.	1	2	3	4
Affective					
5	*I think I *(will or do)* spend more time on the **Advanced Health Assessment clinical** (AHA) course than on others.	1	2	3	4
6	*I think I *(will or have) gain(ed*) more in the **AHA clinical** course than in others.	1	2	3	4
7	I tend to pay more attention to information related to the **AHA clinical part** off the course.	1	2	3	4
8	I tend to actively look for information related to the course. **AHA clinical** course.	1	2	3	4
Psychomotor					
9	I can precisely imitate the instructor's steps and actions of advanced **physical examination skills** "the clinical skill."	1	2	3	4
10	I can smoothly complete the performance steps of **advanced physical examination skil**ls "the clinical skill."	1	2	3	4
11	I try to monitor my **advanced physical examination skills** "clinical skill" for improvements.	1	2	3	4
12	I try to monitor my "clinical"exam -**advanced physical examination skills performance** and make proper adjustments as needed.	1	2	3	4

Users can replace the quoted phrases with target clinical skills.

PLOS ONE | https://di.org/10.1371/journal.pone.0209155 January 7, 2019, 11 / 11

"Clinical skills" wording will be omitted before administering survey to participants.

**Since this will also be given as a pre-course survey, the addition of "will" has been added to some questions.*

An electronic version will be created in Qualtrics for student administration.

Appendix E

Figure 5

Video Grading Rubric (converted from Excel)

STUDENT:						
General Approach (10)	**Assessed Area correctly**	Needs Improvement		**Reports correctly**	Reports incorrectly	**TOTAL Earned**
Introduce self- Address pt by surname Wash/sanitize hands before & after exam. Ensure patient comfort, **privacy,** & safety. Give **explanation** for exam. **Use correct terminology** **(10)**	**8**	6		**2**	1	
Head & Neck						
Eyes-Inspect & pupil reaction (bilat.) **(5)**	**3**	2		**2**	1	
Mouth-use light & depressor **(5)**	**3**	2		**2**	1	
Lymph nodes-palpate and name **at least 8** bilat. **(10)**	**8**	6		**2**	1	
Carotids-palpate & auscultate **(5)**	**3**	2		**2**	1	
Thyroid-Palpate -posterior method **(10)**	**8**	6		**2**	1	
Chest (30)						
Posterior thorax -percuss bilaterally **(5)**	**3**	2		**2**	1	
Posterior thorax- auscultate breath sounds **(10)**	**8**	6		**2**	1	
Anterior thorax-auscultate-breath sounds **(5)**	**3**	2		**2**	1	
sitting **(10)**	**8**	6		**2**	1	
Abdominal Exam (25)						
Inspect abdomen: contour, symmetry, scars, etc. **(5)**	**3**	2		**2**	1	
Auscultate 4 abdominal quadrants & aorta **(5)**	**3**	2		**2**	1	
Percuss 4 abdominal quadrants & lower liver. edge **(5)**	**3**	2		**2**	1	
Abdomen- light palpation **(4)**	**2**	2		**2**	1	
Abdomen- deep palpation w liver **(6)**	**4**	2		**2**	1	
Faculty:				**Date:**		**0**
Comments: <80%=Fail				**7/13/2022**		**Pass= ≥80%**

Appendix F

Figure 6

Student Satisfaction Survey

Tele-Sim Participant/Student Satisfaction Survey

Survey Questions for participants extracted from Qualtrics.

Q1-5 Ease & Usability of Tele-Sim	Very High (1)	High (2)	Neutral (3)	Somew hat low (4)	Very low (5)
Usability of technology requirements (Zoom, breakout rooms, links) (1) Usefulness & Quality of viewing simulated patient demonstrations (2) Usability of Breakout rooms for practice & peer support (3) Ease in demonstrating your exam skills from home/office (4) Ease in obtaining an HSP (your patient) (5)					

Q6-8 Student Level of Effort and Time	Much more than Expected (1)	Somewha t more than Expected (2)	Neither more or less than expecte d (3)	Somew hat less than expecte d (4)	Much Less than expected (5)
What level of effort did you put into the classes? (1) Time required to prepare for classes compared to other classes was:_ How much time should be allowed for each Tele-Sim session? [ ] 2 hours [ ] 1.5 hours [ ] 1 hour [ ] other					

Q9-17 Effectiveness and Contribution of Tele-Sim to Learning Physical Examination Skills & Techniques	Excellent (1)	Good (2)	Average (3)	Poor (4)	Terrible (5)
Level of skill/knowledge (competence) performing physical exam techniques **at the start of Tele-Sim** (1) Contribution of Tele-Sim to your level of competence **at the end of Tele-Sim** (2) Level of self-efficacy/confidence in performing exam techniques **in the clinical setting** (3) Contribution to learning with the **use of different HSPs** for instructor demonstrations (4) Effectiveness of **practicing with classmates** in breakout rooms (5) Contribution to learning of having the **opportunity to demonstrate skills** to classmates (6) Effectiveness of **instructor feedback** & debriefing to your learning (7) **Contribution** of Tele-Sim to your competency in performing physical exam techniques for your **final course demonstration.** (8)					
Effectiveness of Tele-Sim in **meeting course competencies** and learning objectives (9) Level of skill/knowledge (competence) performing physical exam techniques at the start of Tele-Sim Contribution of Tele-Sim to your level of competence at the end of Tele-Sim Level of self-efficacy/confidence in performing exam techniques in the clinical setting Contribution to learning with the use of different HSPs for instructor demonstrations. Effectiveness of practicing with classmates in breakout rooms Contribution to learning of having the opportunity to demonstrate skills to classmates.					

Effectiveness of instructor feedback & debriefing to your learning Contribution of Tele-Sim to your competency in performing physical exam techniques for your final course demonstration. Effectiveness of Tele-Sim in meeting course competencies and learning objectives	

Q18-25 Skill and Responsiveness of Instructor	Strongly Agree (1)	Somewhat agree (2)	Neither agree nor disagree (3)	Somewhat disagree (4)	Strongly disagree (5)
Instructions were clear and organized (1) Instructor was **knowledgeable** (2) Instructor was an **effective demonstrator** and **role model** (3) Instructor stimulated **student engagement** (4) Instructor **effectively used time** during sessions (5) **I felt encouraged** and supported by the instructor (6 Instructor accommodated and adjusted for **my learning style** (7) Instructor demonstrated **cultural sensitivity** (8)					

Q26-33 Tele-Sim and Student Learning Objectives: ***As a result of participation in the Tele-Sim Educational Initiative***	Strongly Agree (1)	Somewhat agree (2)	Neither agree nor disagree (3)	Somewhat disagree (4)	Strongly disagree (5)
I am **more confident** in performing physical examination skills on patients in the clinical setting (1) I am **more competent** in performing exam skills and reporting the findings. I am better able to **choose which exam techniques to apply** when assessing various patient presentations (3) I have gained more knowledge at selecting and **performing specialized or provocative exam techniques** when indicated (4) **I had ample opportunity to demonstrate** my learning during Tele-Sim sessions (5) I felt **comfortable asking questions** in class (6)I **Received enough feedback** and attention in Tele-Sim sessions (7)					

Q34-37 Future Recommendations & Satisfaction	Strongly Agree (1)	Somewhat agree (2)	Neither agree nor disagree (3)	Somewhat disagree (4)	Strongly disagree (5)
I w**ould recommend the use of the Tele-Sim format** to teach physical assessment skills in future AHA courses. (1) Tele-Sim **should be an optional choice** for future AHA clinical courses. I am **overall satisfied** with the Tele-Sim initiative. (3)					

I greatly appreciate your continued participation in the Tele-Sim DNP research project.

Participants' questions were exported from Qualtrics survey.