A COMPARISON OF EVALUATION METHODS OF INTRAVENOUS CATHETER INSERTION SKILLS IN THIRD-TERM ASSOCIATE DEGREE NURSING STUDENTS

Dara Jones Murray

A dissertation submitted to the faculty of the

Joseph and Nancy Fail School of Nursing

in partial fulfillment of the requirements for the

Doctor of Philosophy in Nursing Education and Administration

William Carey University

August 2021

Approved by Committee:

Elizabeth Mahaffey, Ph.D., Chair

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ABSTRACT

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A Comparison of Evaluation Methods of Intravenous Catheter Insertion Skills in Third-Term Associate Degree Nursing Students

Nursing programs are responsible for ensuring student nurses are competent in performing psychomotor skills before clinical experience to ensure patient safety. Traditional, face-to-face methods of evaluating skills are time-consuming for nursing faculty. However, online video recording tools provide a potential solution to provide a quality evaluation while creating a more efficient process. The purpose of this study was to compare faculty work hours, the number of student errors identified by the faculty, and the number of students achieving a passing score when using an online video recording tool versus the traditional face-to-face approach in the evaluation of peripheral intravenous catheter insertion in third-term, associate degree nursing students. The theoretical framework guiding the research was Kurt Lewin's Change Theory. A review of 37 pre-licensure students' peripherally inserted intravenous catheter skill checklists and faculty timesheets revealed that significant time savings were achieved when faculty utilized an online video recording tool compared to a face-to-face method. There was no statistically significant difference in errors identified by the faculty or student success. Implications of the study include that online video recording tools for psychomotor skill evaluation in pre-licensure nursing students is an effective method to achieve time-savings for faculty with minimal effect on error identification or student success.

DEDICATION

This dissertation is dedicated to my family. To My husband, Matt, who supported this educational endeavor from day one, I may have never enrolled in the first course without your encouragement. To my sons, Cullen, Braden, and Mason, thank you for always forgiving me for the late hours at my desk and the time spent away from home. I love you past the moon and stars.

I would also like to dedicate this dissertation to my partners in this journey. To my precious new friends that I have gained, Jordan, Adele, Mecie, James, and Chris, how could we have ever made it without each other? To Katie Smith, who has been my travel mate, my cheerleader, and most of all, my friend – thank you for always listening and believing in me even when I had doubts.

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Chapter I

INTRODUCTION

Teaching and learning psychomotor skills are areas of nursing education that have evolved tremendously over the decades. Historically, skills such as bathing, administering medications, and inserting intravenous (IV) catheters were considered the primary focus of nursing education programs. However, due to the increasing complexity of today's healthcare environment, nurse graduates must be prepared to do more than perform rudimentary skills. New nurses must acquire the knowledge, skills, and abilities needed to make contextual decisions to complete these skills in varying situations. Nursing students must also have adequate knowledge and training before beginning clinical experiences to ensure patient safety (Chuang et al., 2018; DeYoung, 2015). The content, structure, learning aids, and evaluation methods used to teach clinical skills are vitally important to students' success. Nurse educators are responsible for constructing innovative, student-centered strategies that promote these complex objectives while optimizing time and resources (DeBourgh & Prion, 2017). Research suggests that the adoption of learner-centered, interactive education is essential in enhancing students' knowledge, self-efficacy, and nursing skills performance (Kim & Suh, 2018).

Traditionally, faculty schedule skills evaluations one-to-one in a laboratory setting with an instructor utilizing a skills checklist to score a student's performance. This method necessitates a tremendous amount of faculty work hours. The development of new technologies provides potential solutions for nurse educators to improve skill development and evaluation using innovative and flexible approaches while also creating

a more efficient workflow process. The use of interactive, learner-centered strategies is supported and proven effective in enhancing skill performance, self-efficacy, self-confidence, and student satisfaction (Staykova et al., 2017; Yoo et al., 2010).

Recording practical skills online offers a mechanism for seamless integration into the nursing curriculum. Previous research has indicated that video-assisted skills validation is a successful approach to attaining psychomotor skills (Purpora & Prion, 2017). Nurse educators can use this knowledge as a foundation to improve current procedures related to skill validations. Online video recording tools provide a platform for educators and students to record, edit, and upload video recordings. The online tools are marketed to teach and evaluate skills and provide a more engaging way to refine skills in various educational settings, including nursing and other healthcare-related professions. Many of the platforms function to capture the students' performance and offer additional features that allow feedback, grading, critique, and analytics. Online video recording tools allow faculty to assess students' skills performances online at a time and place convenient for them. There are currently several vendors providing versions of these tools. However, the evidence regarding online recording tools as a medium for students to self-produce, self-evaluate, and ultimately submit to faculty for grading is scarce. GoReact© is the platform that is used for this study (GoReact, 2018).

GoReact© is self-proclaimed as the number one video software for skill development (GoReact, 2018). They offer web-based and application-based video uploads. The tool permits recording and compression of video to take place very quickly. Students use the GoReact© mobile application to record videos and submit them to the platform. The platform automatically compresses the video, so it is easily uploaded to

the student's portfolio when selected. The online video recording tool allows faculty to pause, rewind, and slow down the video, potentially providing a more accurate assessment. Structured workflows facilitate repeated practice, peer-to-peer collaboration, self-evaluation, and grading by faculty. Grading rubrics can be visible to the students so that self-evaluation is possible before the video's official submission. GoReact© also can be integrated into learning management systems for seamless submission and grading of assignments. Highlighted features include time-stamped feedback on the video, recording from phones or cameras, analytics for instructors, and archiving videos (GoReact, 2018).

Statement of the Problem & Significance

The Bureau of Labor Statistics (2020) predicts an additional need for 210,400 new registered nurses each year throughout the next decade. Nursing programs are struggling to meet the demand for new nurses (American Association of Colleges of Nursing, 2019). However, according to the American Association of Colleges of Nursing (AACN; 2019), the nursing faculty shortage is the primary reason nursing programs are turning away qualified applicants. With limited faculty, nursing education programs are now tasked with constructing innovative methods to optimize time and resources. Providing sophisticated pedagogy requires nurse educators to spend a significant amount of time preparing, implementing, and evaluating student learning, which is made more complicated with a limited population of nursing faculty.

State boards and accrediting bodies require Associate Degree in Nursing (ADN) nursing programs to meet the same core standards as baccalaureate programs, including minimum pass rates on the national licensure exam (Accreditation Commission for Education in Nursing [ACEN], 2017). Students enrolled in ADN programs typically

complete the degree in approximately 2 years or roughly half the time spent in a traditional baccalaureate degree program. Therefore, nurse educators in ADN programs experience tremendous time constraints due to a fast-paced and heavily inundated curriculum. Associate degree nursing programs must be resourceful and innovative to allow the most proficient use of time.

The validation of psychomotor skills in pre-licensure nursing students is a tedious and time-consuming process for many nurse educators. Critical skills are often observed one-to-one in an on-campus skills lab. Dependent upon the number of students enrolled in a course, the number of skills to be evaluated, and faculty available to evaluate the skills, this task has the potential to result in entire days spent in the validation laboratory alone. However, new technologies present the potential to transform this tedious process. New cloud-based platforms will allow faculty to evaluate performance-based skills entirely online. Although video as a teaching tool has been used in nursing education for many years, the results of the review of the literature supplied no studies evaluating the effectiveness of online video recording tools for the purpose of psychomotor skills validation.

Purpose of the Study

The purpose of this study was to compare faculty work hours, the number of student errors identified by the faculty, and the number of students achieving a passing score when using an online video recording tool versus the traditional face-to-face approach in the evaluation of peripheral intravenous catheter insertion in third-term, associate degree nursing students.

Hypotheses

The null hypotheses developed for this study are:

$H_{01:}$ There will be no statistically significant difference between the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation.

H_{02}: There will be no statistically significant difference between the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation.

H_{03}: There will be no statistically significant difference in the number of third-term nursing students who pass the peripheral intravenous catheter skill performance validation on the first attempt using an online video recording tool compared to the number of third-term nursing students who pass the peripheral intravenous catheter skill performance on the first attempt using a face-to-face validation.

Theoretical Framework

The theoretical framework for this study is Kurt Lewin's change theory (see Figure 1). The change theory is viewed as one of the most useful approaches in understanding the need for change, working with others to implement change, and assessing the effect of change. Lewin (1951) described this phenomenon by identifying three stages of change: unfreezing, moving, and refreezing.

Unfreezing

Unfreezing is the stage when leaders help others identify the need for change and begin to prepare for change. Nurse faculty must recognize the necessity for implementing innovative strategies to meet the needs of a student-centered environment and improve faculty workflow. Through the exploration and analysis of new technologies, potential solutions may be found. The ongoing challenge with psychomotor skills validation is the vast amount of time required for faculty to perform the evaluations. To follow Lewin's theory, the faculty first must recognize the driving force behind the need for this change is the demand for increased numbers of new nurses (Bureau of Labor Statistics, 2020). This increased demand, coupled with the restraint of limited nursing faculty, necessitates the need for innovation (AACN, 2017). Nursing faculty must be creative and open to the possibility of new ideas to help determine the most impactful strategy to use in the validation of psychomotor skills.

Moving

This second stage focuses on change. Once participants have accepted the need for change, the implementation process can begin. This moving stage is the time when refinements to the new process occur. During this stage, the study group will be introduced to the online video recording tool and tasked with creating, self-evaluating, and ultimately submitting the recording for faculty evaluation. Faculty will evaluate student performance, provide feedback, and data will be collected and analyzed.

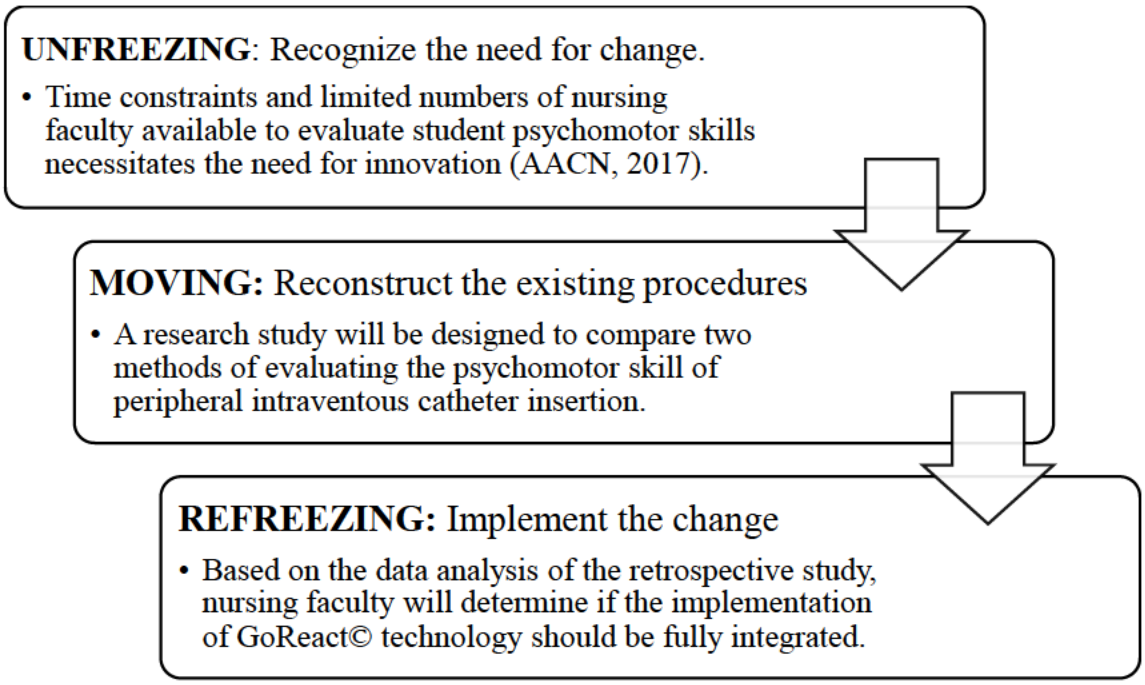
Refreezing

The refreezing step is the last stage in which the changed process can be fully integrated or becomes part of a new norm. Based on this study's data analysis, the nursing

faculty will determine whether this changed process should be fully integrated for student psychomotor skill evaluation. If fully integrated, faculty will continue to monitor, evaluate, and explore the possibility of improving the process. Lewin's Change Theory is a continuous cycle of recognition, change, and implementation of new methods and ideas, making it a seamless framework for applying innovative educational technology.

Figure 1

Adapted from Lewin's Change Theory



Definition of Terms

For the purpose of this study, the following terms are defined:

1. *Associate Degree Nursing Student:* a student enrolled in a nursing program lasting approximately 21 months and culminating with the national licensure exam for registered nurses
2. *Errors:* mistakes made by the student during skill evaluation and identified by faculty
3. *Third-term nursing student:* a student enrolled in the third term of a nursing education program
4. *Face-to-face evaluation:* evaluations taking place with the instructor and student physically in the same location

5. *Faculty work hours:* a measurement of faculty time spent evaluating PIVC insertion skill
6. *Online video recording tool:* a cloud-based tool designed for education preparation that allows students and faculty to upload video, share feedback, and evaluate performances
7. *Peripheral intravenous catheter insertion:* Psychomotor skill
8. *Student success:* student achievement of skill as evidenced by the skill checklist
9. *Validation of skill:* verification of a student's ability to successfully perform a psychomotor skill

Assumption

The assumption of this study is that the data provided to the researcher is accurate.

Summary

Nurse graduates must be prepared before performing practical skills in the clinical setting to ensure patient safety (Chuang et al., 2018; DeYoung, 2015). Evaluating practical skills online offers a mechanism for seamless integration into the nursing curriculum and may further benefit nursing education by providing an improvement to the process of skills validation. Nursing faculty have a responsibility to adapt methods and procedures to meet the competencies needed to provide safe patient care and provide a solid foundation to prepare nursing students for the clinical setting (Kim & Suh, 2018).

GoReact© video software allows the recording of skills online and offers a grading platform for faculty to evaluate and provide feedback. Although nurse educators widely use video recording for teaching and assessment, the evidence supporting online

video recording tools as a means of assessing psychomotor skills appears nonexistent. Therefore, it is pertinent to explore the implementation of innovative methods, such as cloud-based recording tools, for psychomotor skill evaluation.

Nursing programs are challenged with constructing innovative methods to optimize time and resources. New technologies present the potential to transform teaching and evaluating psychomotor skills while potentially saving educators' valuable time. Evidence shows that student-produced videos are useful in evaluating nursing skills (DeBourgh and Prion, 2017; Marquez-Hernandez et al., 2019, Purpora & Prion, 2017). Research suggests that a nursing faculty shortage, combined with increased workloads and lack of flexibility, will contribute to difficulty filling faculty positions (Bittner & Bechtel, 2017).

The purpose of this study is to compare faculty work hours, the number of student errors identified by the faculty, and the number of students achieving a passing score when using an online video recording tool versus the traditional face-to-face approach in the evaluation of peripheral intravenous catheter insertion in third-term, associate degree nursing students. Lewin's Change Theory is the guiding framework for the study. This framework provides a suitable approach in understanding the need for change, working with others to implement change, and assessing the effect of change.

Chapter II

LITERATURE REVIEW

Chapter II aims to review the literature on the use of video-recorded critical skill validations of undergraduate students enrolled in associate degree and baccalaureate degree nursing programs. No current literature was found to contain research regarding the effectiveness of face-to-face psychomotor skills evaluation in nursing education. This review is divided into the following sections: (a) student-produced skill videos, (b) web-based skill evaluations, (c) video-enhanced skill performance, and (d) faculty workload issues.

Student-Produced Critical Skill Videos

Purpora and Prion (2018) conducted a quantitative, cross-sectional study on third-semester nursing students following the completion of a student-produced video of head-to-toe assessment. The study's purpose was to explore nursing students' perceptions of the value of student-produced videos as a learning strategy. No theoretical framework was identified. The study's sample included students enrolled in an applied assessment and nursing fundamentals course. The location of the study was a university in the western United States. Of the 80 students enrolled in the course, 72 participated, for a 90% response rate. Students were allowed to place themselves in groups of three. After videotaping, the student could review, erase, reshoot, and then submit the video if they were satisfied with the result. A faculty member then graded the video and provided personalized feedback to each student.

A 34-item Likert-like survey developed by the researchers was conducted in two parts, focus groups and survey development (Purpora & Prion, 2018). The researchers

divided the items into four subgroups: (a) Process and Outcome, (b) Feedback and Review, (c) Support and Confidence, and (d) Barriers to Learning. The researchers performed a factor analysis and stressed the exploratory nature. Factors were identified with loadings of .5 or higher and interpretability. All factors had positive correlations, ranging from .21 to .49. Face validity was used to determine item loadings on each factor related to learning. Cronbach's alpha was calculated for each subgroup and ranged from acceptable to strong (Factor 1 Process and Outcome: $\alpha = .89$; Factor 2 Feedback and Review: $\alpha = .91$; Factor 3 Support and Confidence: $\alpha = .80$; and Factor 4 Barriers to Learning: $\alpha = .77$; Purpora & Prion, 2018).

The study findings suggest that student-produced video is viewed as valuable and meaningful by students and a practical approach to learning head-to-toe assessment in baccalaureate nursing programs (Purpora & Prion, 2017). These findings can be generalized to fundamental level nursing student populations. Limitations of this study were recognized and reported. Researchers list convenience samplings, sample size, preliminary reliability, and face validity of the survey subgroups and possible social desirability bias as study limitations. The researchers suggest further research to discover additional opportunities and potential for this pedagogical strategy.

In a similar study, Lewis et al. (2020) assessed appropriateness, effectiveness, and student satisfaction with implementing a novel strategy—Video Assessment of a Clinical Skill (VACS). No theoretical framework was identified in the study. Participants were recruited using purposive sampling and consisted of all students enrolled in a third-year clinical practice unit ($n = 1,277$). The setting was a Bachelor of Nursing program located in a large Australian university.

Members of the research team created a pre-survey and post-survey. A review of the literature was conducted to ensure that each item in the survey was based on research evidence. This study was the first implementation of either survey tool. No validity or reliability statistics were provided. The pre-survey consisted of demographic data, administrative data, and student reflections on the previous Objective Structured Clinical Assessments (OSCA). The student reflection portion of the survey consisted of 17 items with a Likert scale of 1 to 7, where 1 associated with *strongly disagree* and 7 associated to *strongly agree*. The post-survey required students to rate the VACS feedback's usefulness on a scale of zero – 10, zero as not useful at all, and 10 as extremely useful. The post-survey also allowed for open-ended feedback from the students (Lewis et al., 2020).

A cross-sectional survey design was used. The pre-survey was administered during week 1 of the course, and the post-survey was administered during week 12. Researchers used thematic analysis, and a semantic approach to coding was implemented due to the brief responses written by participants on the open-ended questions. Comments were read and re-read by two authors independently to focus on topics of interest. Common categories were identified to create themes and subthemes. Findings were classified into three major themes: flexibility and reflexivity, editing and repeated attempts, and working together. In general, students rated feedback as useful, with a median rating of 6 on a scale of zero to 10. The study's findings supported that students value the areas of flexibility and reflexivity, video editing, repeated attempts, and working with peers and instructors (Lewis et al., 2020).

The study suggests that students accept video assessment of clinical skills as a useful strategy for an assessment of clinical skills and in recognizing the strengths and weaknesses of skill performance. Researchers discuss two limitations of the study. Due to the study design, there was a limited exploration of the students' experiences. The second limitation was due to the use of only one cohort of students at one institution. Researchers recommend further research using a longitudinal design across institutions to enhance the understanding of acceptability, utility, and satisfaction of video assessment of clinical skills in diverse cohorts of nursing students. The study supports the video assessment of clinical skills in third-semester nursing students. No bias was identified by the researchers (Lewis et al., 2020).

DeBourgh and Prion (2017) conducted a mixed-methods descriptive study to explore students' perceptions of deliberate practice and self-recording skills performances. The researchers specifically studied changes in confidence and self-efficacy. Ericsson et al.'s (1993) deliberate practice concept was used as the study's conceptual model. A convenience sample of 102 baccalaureate nursing students enrolled in an adult medical-surgical course were described as the study participants. No inclusion or exclusion criteria were reported. All students enrolled in the class chose to complete the study's two surveys. The study took place in a 4-year nursing program in an urban setting on the West Coast of the United States.

The researchers created survey tools following a comprehensive literature review. Face validity was established by inviting nine former students who had previously enrolled in this course and experienced the student-directed video validation of psychomotor skills and six students from previous terms who served as teaching assistant

video reviewers to review the survey the cognitive interview technique. The survey was ultimately categorized into five sections: deliberate practice, confidence and self-efficacy, collaboration and team skills, peer review and support, and satisfaction with the process (DeBourgh & Prion, 2017).

Quantitative data were analyzed by the researchers using SPSS software. For each item on the Likert-type surveys, simple percentages, means, and standard deviation scores were calculated. Survey A contained four open-ended questions in which a thematic review was conducted. Three additional open-ended questions were added to Survey B along with one additional quantitative question. Passing rates for video submissions (n = 102 for each skill performance) were calculated using simple percentages. Pass rates were reported as follows: first video, 93.1%; second video, 98%; and third video, 95%. Cohen's d statistics revealed a small to moderate effect size resulting from the student-directed video validation method. Increased confidence following the third recording (d = 0.40) and the impact of performance order (d = 0.48) were the two most significant effect sizes. In addition, narrative comments from the open-ended questions revealed a theme of improved self-confidence in the performance of the skills and overall satisfaction with the process of instruction and evaluation.

The implications of this study suggest that student-produced video recording has a positive impact on students' perceptions of confidence and self-efficacy in skill performance (DeBourgh & Prion, 2017). The study's limitation was the convenience sampling of students from only one university on the West Coast of the United States. Generalizability to different educational settings is limited. Researchers suggest further research be conducted to correlate the acquisition of skills using this method to the

performance of the skill in an actual clinical setting. The growing complexity of healthcare forces educators to craft reliable, student-centered learning. Researchers report that the study design using students from only one cohort may have potentially resulted in sampling bias, recall bias, and response bias.

Using a pretest-posttest design, Yoo et al. (2010) conducted a research study to investigate the benefits of self-evaluation using student-produced videos of Foley catheter insertion. No theoretical framework was identified. Researchers recruited 40 sophomore students in a nursing fundamentals course for the study. Students were divided into a control group and a study group with 20 students in each group. To assign students to each group, the researchers ranked the pretest scores then placed students with even-numbered positions in the rank in the control group and odd-numbered positions in the experimental group. The setting was a 4-year nursing program in the Kyung-gi province in Korea. Researchers assessed student competence through the implementation of a performance checklist developed explicitly for this study. Student communication skills were evaluated using the Communication Assessment Tool (CAT) initially created by Makoul et al. (2007). Learning motivation was measured using a translated version of the Instructional Material Motivation Survey (IMMS) designed by John Keller (1987). The post-testing consisted of the competency checklist, the CAT, and the IMMS. The post-testing was conducted 8 weeks after the pretest.

Data were analyzed using a paired *t*-test analysis. Significant differences were identified between the experimental group and the control group. Students in the experimental group had higher scores in competency ($p < .001$), communication skills ($p < .001$), and learning motivation ($p = .018$; Yoo et al., 2010). The mean between the

pretest and posttest in skills competency was identified as -12.5 in the control group and -6.9 in the experimental group. Researchers attribute the smaller difference in the experimental group as being due to students recalling and performing the procedures better than the control group. For communication skills, the control group's mean score was +0.8 and +5.4 in the experimental group, suggesting the experimental group unremittingly improved communication skills. The mean difference for the control group was -1.3 and +4.5 for the experimental group regarding learning motivation. Researchers suggest that this indicates the learning motivation of the experimental group improved at the posttest.

Implications suggest that when students contribute to the learning process through review and reflection, the overall competence in skills is enhanced. Researchers recognized that the generalizability of this study might have been limited due to the small sample size from only one institution and the evaluation of only one skill. Researchers suggested that future research include replication of the teaching method using other skills to allow greater generalization. No bias was apparent in this study (Yoo et al., 2010).

In a similar study, Watts et al. (2009) evaluated the ability of first-year nursing students to self-evaluate video recording of psychomotor skills. The purpose of this study was to describe the process implemented to incorporate self-assessment into psychomotor skill development in freshman nursing students. No theoretical framework was identified. The study took place in an unnamed western Canadian school of nursing. A total of 86 second-semester nursing students were introduced to the concept of self-assessed video skill performance and were scheduled to perform a video assessment of a dressing change

using an aseptic technique at the end of the semester. Students were allowed approximately 1 month of preparation before the video performance. Training included an instructor-led demonstration, video demonstration, and practice with a peer. Faculty provided a checklist for students that served as a guide to the skill performance and self- and peer-rating. The checklist, consisting of six categories of items, outlined the steps of the dressing change procedure. Each of the six categories included one to four items. Each item was rated using a dichotomous response scale. Students were allowed one opportunity to video. Immediately following the video performance completion, students reviewed videos and assessed their performance using the checklist provided during practice sessions. Students submitted the video to the instructor after the self-assessment was completed (Watts et al., 2009).

After completing the video performances, 40 of the 86 student videos were randomly selected and analyzed by the researchers (Watts et al., 2009). Researchers completed a two-stage analysis of the videos. An experienced faculty member completed the first phase of analysis using the same checklist provided to the students. The preparation and recording categories on the checklist were excluded from the analysis. A total of 19 items were evaluated. The faculty member assessed whether students had correctly performed the skill and identified incidents of contamination or other violations not recognized by the student. For the second stage, a second faculty member evaluated the video performance using the checklists completed by students and faculty. The second analyst compared the number of incidents identified. While both students and faculty identified contaminations, the faculty consistently observed higher numbers of

violations. The number of contaminations observed by students ranged from zero to seven per student with a mean of 2.9.

In contrast, the number of contaminations observed by faculty ranged from zero to 12 per student with a mean of 6.3. Researchers report that by comparing every category of the checklist, the faculty identified approximately two to three times more violations than students. The most significant discrepancies between faculty and students were associated with the sterile field, swab disposable, and new dressing applications. The most significant agreement was correlated with gloving and inappropriate placement of forceps (Watts et al., 2009).

This study's implications demonstrate the value of using videotaping in the evaluation of students' performance of psychomotor skills (Watts et al., 2009). However, the discordance between the students' perceptions and the faculty's assessments validate that it is crucial for faculty to continue to evaluate student performance of psychomotor skills. No recommendations were made for future research. Researchers did not report any limitations of the study. No bias was identified in the study.

Web-Based Skill Evaluations

In 2019, a group of researchers at the University of Almeria in Spain developed a web-based tool to evaluate clinical skills in nursing students (Marquez-Hernandez et al., 2019). The purpose of the study was to design, develop, and implement a tool to evaluate psychomotor skills in nursing students. No theoretical framework was identified. The sample comprised 250 nursing students in the second year of the degree program. Inclusion criteria included being enrolled in an adult nursing course and not being an

exchange student. The setting was the Health Sciences Department at the University of Almeria, Spain.

The research design was divided into two phases: tool development and usability testing. Initially, a group of nursing and computer science experts developed a web-based tool for skills evaluation. The development of the scale used in the tool was based on a literature review of existing research. Ultimately, the scale contained 12 items that were divided into two categories: content and technical features. The scale utilized a Likert scale from 1 to 5, where one was *totally inadequate*, and five was *completely adequate*. The researchers did not provide validity and reliability for the tool. Nursing supervisors and computer experts created the website. Following the development of the website, the researchers implemented a pre-experimental approach. Students were randomly placed in an experimental group and a control group. The experimental group was evaluated using the web-based tool, and the control group was assessed in the traditional method using a paper record (Marquez-Hernandez et al., 2019).

Students took a knowledge test before evaluating the skills and showed no statistically significant differences between the groups ($U = 2442.5$, $z = -1.136$, $p = 0.256$). Descriptive analysis was used to calculate means and standard deviations (Marquez-Hernandez et al., 2019). Researchers compared quantitative and qualitative variables using the nonparametric Mann-Whitney U test. The experimental groups' highest score was for subcutaneous injection (1.78 ± 0.98), and the lowest score was intramuscular injections (1.56 ± 3.75). The highest score for the control group was intramuscular injection (1.72 ± 0.88), and the lowest was bladder catheterization (1.20 ± 1.04). A significantly higher number of errors were recorded in the experimental group

than the control group ($p = 0.003$). The study also revealed that a more significant amount of time was spent evaluating the control group ($SD = 1.46$) than the experimental group ($SD = 1.68$; $p = 0.003$). Student satisfaction was also significantly higher in the experimental group ($p = 0.000$).

In summary, this study provided evidence that a web-based tool for evaluating nursing skills is an effective strategy. The findings can be generalized to undergraduate nursing students enrolled in courses containing a clinical skill component. The study's limitations included convenience sampling, a possibility of social desirability bias, and the absence of literature on the subject. Researchers suggest future research aimed at student learning and evaluation using the web-based tool and incorporating new clinical skills. This study validates using a web-based tool to evaluate clinical skills in nursing students to improve student satisfaction, reduce time spent evaluating, and assess more accurately (Marquez-Hernandez et al., 2019).

Ostovar et al. (2018) conducted a quasi-experimental research study in 2018 to compare the effects of oral debriefing and video-assisted debriefing) on student learning outcomes. Researchers used Simulation Framework (Jeffries, 2005) as the theoretical framework of the study. All first-year nursing students were invited to participate. However, seven students were excluded based on previous clinical experience. The sample was 50 first-year nursing students at the Tabriz University of Medical Sciences in Sydney, Australia (Ostovar et al., 2018).

The study's instruments included the satisfaction and self-confidence in learning scale (SCLS) and an observational checklist (Ostovar et al., 2018). The SCLS was utilized to assess the students' self-confidence and satisfaction. The observational

checklist consisted of 33 items and was constructed using the course textbook. Six faculty members teaching in the nursing fundamentals course confirmed the validity of the tool. Faculty comments were applied to the final version. The researchers used Cohen's kappa to test the reliability of each item. Values ranged between .6 and 1 (M = .88). The SCLS was completed by participants immediately following the experience. The researchers state that the validity and reliability of the SCLS tool were confirmed; however, the statistical data were not provided. This tool comprised 13 items, five measuring student satisfaction, and eight measuring self-confidence. The SCLS tool was translated into Farsi and back into English to compare similarities between the two versions. Six experienced nursing faculty members then assessed the questions for clarity and made the needed revisions. Researchers used a test-retest method to test the reliability of the scale. Cronbach's alpha calculated for the self-confidence component was .95, and the student satisfaction component was .90 (Ostovar et al., 2018).

All students participated in a baseline simulation to insert an intravenous catheter and administer intravenous fluids (Ostovar et al., 2018). The participants in the control group received oral debriefing, and the students in the intervention group received video-assisted debriefing. One week later, the students repeated the simulation with data collected regarding their performance, self-confidence, and satisfaction. Data were analyzed using SPSS software. Researchers used paired *t*-tests and independent *t*-tests to compare the two groups. A *p*-value of .05 was considered significant. No significant statistical difference in any category was identified between oral debriefing and video-assisted debriefing in the study results. Both oral debriefing and video-assisted debriefing methods were found to have a significantly positive impact on outcomes. The study also

suggested the potential for improved readiness of nursing students entering clinical experiences.

The findings confirm the effectiveness of simulation and debriefing in improving clinical skills, self-confidence, and satisfaction of students. Video-assisted debriefing participants displayed better performance in patient identification, communication, and investigation of critical symptoms. The findings can be generalized to the fundamental level nursing student population. Researchers recognized the primary limitation of the study as the possibility of being under power to detect the differences between groups (Ostovar et al., 2018). Additional limitations included the inclusion of only one university and that the variables were only measured once due to a time limitation. Researchers suggest future studies to evaluate new approaches to debriefing to enhance the effectiveness of simulation-based education. There was no bias identified in the study.

Video Enhanced Skill Development

Darban et al. (2019) conducted a quasi-experimental study to compare the effects of video-assisted and instructor-led skill demonstration in undergraduate nursing students. No theoretical framework was identified. The sample comprised 56 undergraduate students of nursing, anesthesiology, and operating room. Inclusion criteria were being a freshman at the institution and being enrolled in a clinical principles and skills course. The exclusion criterion was the absence in greater than two sessions of the course. The study was conducted at the Iranshahr University of Medical Sciences. The sample was divided into a video-prepared group and a supervised training group (Darban et al., 2019).

Instrumentation included a demographic form and a clinical skills checklist (Darban et al., 2019). The researchers developed these tools based on research objectives and a literature review. The demographic tool included eight items concerning individual and educational information. The validity of the demographic instrument was assessed through the calculation of the Content Validity Ratio and Content Validity Index. The content validity index, as the mean of content validity ratios, was reported as equal to 1. The reliability of the checklist was evaluated using the inter-rater agreement. The Pearson correlation coefficient was .87 for the vital signs measurement, .92 for intravenous catheterization, and .89 for oxygen therapy and suction.

Statistical analysis was conducted with SPSS software. Researchers calculated the mean and standard deviation, and an independent *t*-test was used to compare the two groups. The findings of this study indicated a significant difference ($p < .05$) in the mean total score of clinical skills in the intervention group (17.0 ± 0.4) and the control group (15.8 ± 0.7). The students in the intervention group showed improved practical learning.

Implications of this study suggest that practice-based learning in small groups will increase nursing students' knowledge and skills, which in turn enhances the quality of patient care they will provide. These findings can be generalized to undergraduate nursing student populations. However, researchers recognized the study's limitations to include sampling from one faculty, small sample size, and the absence of long-term measurement. The researchers suggest future research with a larger sample size in various disciplines and different practical courses. Additionally, the researchers suggested repeating the study with a more extended follow-up period. No bias was identified in this study (Darban et al., 2019).

In a 2019 qualitative descriptive study, researchers explored undergraduate nursing students' perceptions of the effectiveness of web-based learning to facilitate clinical skill development (Barison et al., 2019). Researchers did not identify a theoretical framework. The study used a convenience sample of 26 undergraduate nursing students from three nursing schools in northern Italy. Inclusion criteria were enrollment in the second year of nursing school, the passage of all previous exams, and access to the internet. Participation was voluntary.

Following clinical experiences in the course, focus groups were conducted in each of the three locations (Barison et al., 2019). The researchers used the Bales Grid (Bales, 1970) to observe participants' behaviors and interactions with one another. The focus groups were examined using qualitative content analysis. The transcripts from the focus groups were read independently by two different researchers. The findings revealed that web-based learning was effective in supporting students' knowledge and could be useful in reducing the theory-practice gap. Additionally, researchers suggest that web-based learning would be helpful as a training method for experienced nurses.

These findings can be generalized to undergraduate nursing students enrolled in courses containing a clinical component. Researchers cite a small sample size as the only limitation to the study (Barison et al., 2019). The researchers suggest future studies to explore web-based learning and blended learning approaches, thus supporting the need for research related to a web-based application for learning practical skills. The researchers identified no bias.

Similarly, Chuang et al. (2018) performed a study aimed to compare the effects of skills demonstrations when provided via smartphone video and DVD. The purpose was to

examine how video skill demonstrations affected students' skill competency and confidence level. The researchers identified no theoretical framework. The study included a convenience sample of 43 nursing students. Inclusion criteria were that the student must be 20 years of age or older, enrolled in a Fundamentals of Nursing Practicum course, owned a smartphone, and provided consent to participate in the study. The exclusion criterion was withdrawing from the course. Students were randomly assigned to the intervention group and comparison group by assigning a number to each participant and then drawing from a sealed box. The numbers were ranked based on the order of the drawing. Participants drawn on odd number ranks were assigned to the intervention group, while those drawn on even number ranks were assigned to the comparison group. The setting of the study was a university in Taiwan.

Researchers utilized a randomized controlled study design. Instrumentation included demographic information, catheterization skills and knowledge quiz, a confidence scale, a skill performance evaluation for catheterization, and a satisfaction questionnaire. The catheterization and knowledge quiz consisted of true-false and multiple-choice 25 items. Seven experts evaluated the content validity for the quiz with an average content validity index of 1.0. The test-retest reliability for the quiz was acceptable at (r = 0.7). Grundy's Confidence Scale was used to measure the students' confidence related to skills performance (Grundy, 1993). The scale had good validity with a content validity index of 1.0 when reviewed by the same seven experts and good internal consistency (a = 0.91). The skill performance evaluation was developed from an existing checklist at this university. Seven raters were trained to use the tool resulting in a very good inter-rater reliability of .943. The final tool, an instrument to gauge the level of

student satisfaction, was developed by the researchers and consisted of a five-point scale with 17 items. The satisfaction instrument was reported to have good validity with an average content validity index of 1.0 when reviewed by the same seven experts and a good internal consistency (a = .95; Chuang et al., 2018).

Both groups of students received a traditional, in-person demonstration for urinary catheterization in the skills laboratory and a DVD containing a recorded skills demonstration. In contrast, only the intervention group additionally received a video file containing a recorded skills demonstration downloaded to their smartphone. For the intervention group, findings revealed that the average scores increased from the baseline at 2-weeks post-intervention. Baseline scores for the urinary catheterization skills and knowledge quiz, skill performance evaluations, and the confidence scale were, respectively, 17.48 (SD = 2.72, 77.16 (SD = 16.12), and 13.2 (SD = 4.26) to 20.59 (SD = 2.2), 92.05 (SD = 5.21), and 19.18 (SD = 2.7). Using a paired t-test, analysis also revealed significant differences in the intervention group and the comparison group on the post-test (t = -8.845, p = < .001), on the skills performances (t = -7.471, p = < .001), and on the confidence scale (t = -10.843, p = < .001). The ANCOVA showed a statistically significant difference in urinary catheterization knowledge (F = 4.219, p = .04) and skills (F = 6.739, p = .013). However, there was no statistically significant difference in the students' confidence level (F = 2.201, p = .142; Chuang et al., 2018).

Implications of this study suggest that providing students access to a recorded skill demonstration on their smartphones in addition to face-to-face demonstration is significantly effective in increasing knowledge and skill performance (Chuang et al., 2018). This data confirms that the usage of smartphones as a learning approach is suitable

and may improve student learning outcomes in relation to psychomotor skills. Researchers cite the convenience sample from one university as a limitation to the study. Due to this limitation, the generalizability of the study may also be limited. Researchers suggest further research to explore the possibility of students in the intervention group sharing smartphone videos with the comparison group and strategies to prevent it, such as performing the study at multiple schools. The findings from this study are relevant to this research. It confirms that video demonstration and smartphones are appropriate for the acquisition of psychomotor skills in nursing students.

In 2018, Kim and Suh conducted a randomized control group pretest-posttest study designed to evaluate the effects of an interactive mobile application on developing nursing skills. Knowledge, self-efficacy, and skills performances were the dependent variables. Keller's 1987 Attention, Relevance, Confidence, Satisfaction (ARCS) model provided the theoretical framework used for the study. The study's sample included 72 senior students enrolled in a school of nursing in Seoul, Korea. Inclusion criteria were voluntary agreement to participate and previous nursing simulation experience. Students who did not have access to a smartphone were excluded from the study. The sample size had an effect size of 0.5 and an alpha of .05. The 72 participants were randomly assigned to an experimental and a control group. Following the voluntary withdrawal of six participants, the final sample size was 66, with 34 in the experimental group and 32 in the control group (Kim & Suh, 2018).

The experimental group was given the newly designed mobile application, and the control group was given existing nursing skill videos (Kim & Suh, 2018). The skills included in the study were vital signs, intravenous injection, gastric lavage, and

endotracheal suction. A pretest questionnaire was developed using a nursing textbook and official protocols. A group of experts assessed the content validity index (CV = .93). The knowledge instrument comprised 23 true or false items; the KR-20 of the tool was calculated at .43. The self-efficacy instrument consisted of 5 items on a 10-point Likert scale; the Cronbach's alpha for the scale was .90. Skills performance was measured using Laerdal Manikins (Laerdal Medical) Objective Skill Competency Evaluation tool.

The findings revealed a significantly higher value for knowledge in the experimental group (t = 3.34, p = .00; Kim & Suh, 2018). However, there was no statistically significant difference in self-efficacy between the two groups (t = 1.18, p = .243). The comparison of skills performance also indicated significant differences at the post-test (t = 7.05, p = <.001). This study's findings can be generalized to all nursing students enrolled in courses with a clinical skills component.

The study adds relevance to the importance of the adoption of interactive learner-centered education within nursing education. Researchers include small sample size, a single setting, and that the assessment was based on short-term outcomes as potential limitations to the study. Future research is recommended to include studies using the interactive mobile application in larger groups of students in different settings. The researchers also suggest future studies to assess long-term outcomes. This research supports the use of learner-centered education. The study also supports the use of a mobile application to enhance students' knowledge, self-efficacy, and nursing skills performance. No bias was identified in the study (Kim & Suh, 2018).

In a mixed-methods study conducted by Staykova et al. (2017), an anonymous online survey was administered to participants following the integration of several

innovative laboratory instructions. The purpose of the study was to examine students' self-perceptions of traditional versus innovative teaching strategies concerning psychomotor skills in the laboratory setting. Adult learning theory provided the theoretical framework for the study (Knowles, 1998). While the location of the study is not disclosed, the authors are listed to be affiliated with colleges and universities in Virginia and Indiana. The sample population comprised 39 junior nursing students. Inclusion criteria were the completion of a basic nursing skills course, enrollment in the advanced nursing skills course, participation in weekly activities, and a minimum of 75% attendance. The innovative strategies implemented for the study included knowledge checks, clickers, games, role-modeling, simulation, and pre-class admission tickets.

For this study, investigators created an original instrument. Demographic, quantitative, and qualitative questions were included. A 5-point Likert scale measured the value of the laboratory instruction. The original instrument was tested for internal consistency, and a Cronbach's alpha, $\alpha = .968$, was established for the quantitative items (Staykova et al., 2017). The overall response rate for the survey was 53.80%.

Researchers used SPSS software to analyze the data using descriptive and differential statistics. For the narrative component, the researchers used content analysis. The findings of the study revealed that six of the innovative strategies achieved a level of significance. However, only two of the traditional strategies achieved the same level of significance. A *p*-value of $< .05$ was considered significant. The overall significance of traditional versus innovative approaches was not studied (Staykova et al., 2017).

Implications of the study on nursing education are consistent with the literature suggesting that active learning is achieved by combining traditional and innovative

approaches. Offering an integrated approach to teaching psychomotor skills should improve student learning outcomes (Staykova et al., 2017). These findings can be generalized to nursing programs that use educational and laboratory strategies to teach nursing skills. The significant limitations of the study included the small sample size and lack of evidence from the literature. The researchers did not make recommendations for future studies. In summary, this research supports the use of innovative teaching strategies for the acquisition of nursing skills.

Using a randomized controlled trial, Tayebi et al. (2017) conducted a study to compare the quality of oral feedback versus written feedback to nursing students. No theoretical framework was identified. A purposive sample of 44 students enrolled in the last semester of a nursing program in Bonjnurd, Iran, participated in the study. The inclusion criterion was senior status. Exclusion criteria were absenteeism and any interruption in the training process. Participants were randomly divided into two groups, oral and written feedback (Tayebi et al., 2017).

Researchers assessed the faculty's delivery of feedback using a standardized checklist. Eighty percent of the items were reported as satisfactory, with a mean Phi consistency coefficient of .84. A questionnaire was developed by the researchers to gather data from students regarding satisfaction in the delivery of oral and written feedback. The satisfaction survey tool consisted of 11 questions on a Likert-type scale. Six field experts established content validity. Reliability was determined using a test-retest method (r = .87; Tayebi et al., 2017).

Data analysis revealed no significant difference between the control group and the intervention group concerning the students' satisfaction with feedback delivery quality (p

< .05). However, the only difference identified was the relationship between students' reactions to feedback. Students in the oral feedback group demonstrated more severe reactions to the feedback, with a confidence level of 90%. Implications of the study suggest that the type of feedback is not a defining factor for quality and satisfaction for clinical nursing education (Tayebi et al., 2017).

Researchers reported generalizability as a limitation in this study due to the selection of final year nursing students. Recommendations for future research included similar studies using larger sample sizes and varying levels of nursing students, different types of feedback, and the relation of the feedback to student outcomes. According to this study, students seem to benefit from different types of feedback delivery. Online video platforms offer faculty the ability to provide video-recorded oral feedback, written, and time-stamped feedback. The researchers identified no bias (Tayebi et al., 2017).

Faculty Workload Issues

In a 2017 article, Bittner and Bechtel outlined the results of a survey exploring factors contributing to the nurse faculty shortage. The survey was designed to identify nursing faculty's workload, explore the impact of retirements, and pinpoint retention issues. No theoretical framework was identified. The study's sample was 182 nursing faculty in Massachusetts, with the majority over 50 years of age. To ensure anonymity, researchers requested that respondents not identify their employer. Due to the nature of this anonymous survey design, the response rate is unknown. The setting was private and public nursing programs (Bittner & Bechtel, 2017).

The research team developed the survey through consultation with an instrument development expert. The survey contained 95 total questions. The main content areas

were roles, responsibilities, workload, satisfaction, mobility, and retirement. Researchers did not provide validity or reliability. The items did not require an answer, so percentages were calculated based on the number of responses per question. Findings revealed an aging and non-diverse faculty with a varied workload. Fifty-one percent of respondents reported an increased workload due to the faculty shortage (Bittner & Bechtel, 2017).

The research suggests that the nursing faculty shortage, combined with increased workloads and lack of flexibility in the workplace, will contribute to increasing difficulty in filling faculty positions. This information is relevant to the retention of current nursing faculty and used to aid in the strategic recruiting of new faculty. The findings can be generalized to public and private nursing programs across the United States. No limitations were identified. Researchers recommend future studies to explore the motivation of nurses who transition to the role of faculty after age 40. This article supports the evidence of the nursing faculty shortage in the United States, which contributes to the need for improved efficiency within nursing education. The researchers identified no bias (Bittner & Bechtel, 2017).

Synthesis of Literature

This review of the literature consistently reported the successful integration of video-assisted skills validation in the undergraduate nursing student population (Marquez-Hernandez et al., 2019; Purpora & Prion, 2017). Research also suggests that student-produced video is useful in attaining psychomotor skills (Purpora & Prion, 2017). Self-recording, self-evaluation, peer-review, and faculty-led debriefing are several factors identified in facilitating the achievement of these skills (Ostovar et al., 2018; Watts et al., 2009; Yoo et al., 2010). Additionally, the implementation of tools to promote practice-

based learning in small groups improves the knowledge and skills of nursing students (Darban et al., 2019). These innovative learning strategies are imperative for students' optimal performance and will enhance the quality of patient care that they will provide as students and, eventually, as nurses. Further research is needed to identify additional opportunities, potential advances with the pedagogy, and other debriefing methods to enhance the effectiveness of learning. Additional research using various disciplines and larger sample sizes over a more extended period is also suggested (Darban et al., 2019; Purpora & Prion, 2017; Yoo et al., 2010).

CHAPTER III

METHODOLOGY

Chapter III aims to provide a framework for the methodology used to examine the effect of GoReact© on a group of third-term nursing students' PIVC skills evaluations. The study compared faculty work hours spent validating IV catheter insertion, the number of student errors identified by the faculty during the skill performance, and the number of students achieving a passing score using GoReact© technology in Group B and face-to-face validations in Group A. The researcher will discuss participants, participant protections, and data collection. The instruments used for the study will be described along with methods for statistical analysis.

Purpose of the Study

New technologies present the potential to transform nursing education. Online video recording tools such as GoReact© provide a platform for educators and students to record, upload, and evaluate video recordings (GoReact, 2018). The purpose of this study is to compare faculty work hours, the number of student errors identified by the faculty, and the number of students achieving a passing score when using an online video recording tool versus the traditional face-to-face approach in the evaluation of peripheral intravenous catheter insertion in third-term, associate degree nursing students.

Hypotheses

The null hypotheses developed for this study are:

$H_{01:}$ There will be no statistically significant difference between the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number

of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation.

H_{02}: There will be no statistically significant difference between the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation.

H_{03}: There will be no significant difference in the number of third-term nursing students who pass the peripheral intravenous catheter skill performance validation on the first attempt using an online video recording tool compared to the number of third-term nursing students who pass the peripheral intravenous catheter skill performance on the first attempt using a face-to-face validation.

Research Design

The study used a retrospective comparative quantitative design. This research design was chosen because it allowed the researcher to analyze existing quantitative data to identify any differences, based exclusively on the use of GoReact© to evaluate the psychomotor skill of peripheral intravenous catheter (PIVC) initiation. In a retrospective study, the researcher examines an observed outcome to a possible cause that occurred in the past (Polit & Beck, 2018). The independent variable was the use of GoReact©, an online video recording tool, for the PIVC insertion skill validation. The retrospective design was appropriate, as existing data were used to explore possible differences in the dependent variables between Group A and Group B.

The study retrospectively compared faculty work hours spent evaluating PIVC insertion, the number of student errors identified by the faculty during the skill performance, and the number of students achieving a passing score using GoReact© technology in Group B and face-to-face validations in Group A. An advantage of using a retrospective design in the study was that the researcher used existing data to determine whether a statistical difference existed between Group B that used GoReact© for PIVC skills evaluation and those in Group A that were evaluated face-to-face in a laboratory. An additional advantage of the design is that no participant selection bias occurred as the data occurred in the past (Polit & Beck, 2017). A weakness of the design is the inability of random sampling in retrospective data (Polit & Beck, 2017).

Setting

The study's setting was an accredited ADN program at a public four-year institution in a rural area of the southern United States. The study was conducted in the fall of 2020.

Participants and Sampling

The target population for this study was third-term pre-licensure ADN students. The inclusion criterion was pre-licensure nursing students who were enrolled in the fall 2020 Adult Health Nursing course. Exclusion criterion was previous PIVC skill demonstration. There were 38 students enrolled in the course. One student passed the PIVC skill demonstration in the spring of 2020 and was excluded from the study. Data from 37 students' skill demonstrations was extracted for the study.

Peripheral intravenous catheter insertion is a critical component of the Adult Health Nursing course. All students are required to participate in the instructional and

evaluative components for peripheral intravenous catheter insertion. At the beginning of the fall term, the lead instructor for the course informed the students that the class would be randomly divided into two groups. Students were placed in Group A (face-to-face) or Group B (GoReact©) and informed of group placement via individual email.

Due to the COVID-19 crisis in the spring of 2020, skills demonstrations for IV catheter insertion were postponed for this cohort of students from the spring of 2020 until the fall of 2020. Three students in the cohort of students enrolled in the Adult Health course were validated for PIVC insertion before the cancellation of all on-campus courses. Only one of these students was enrolled in the Adult Health course and was excluded from the study.

To reduce internal validity threats, all students attended a mandatory skill laboratory demonstration with instructor-guided practice. All students had access to the ATI® Skills Module for IV therapy initiation, including an interactive video tool, accepted practice standards, step-by-step viewing, evidence-based research, practice challenges, and a pretest/posttest (Assessment Technology Institute, 2015). Students were also allowed access to the laboratories for one week. During this time, the students practiced with peers, and a skills laboratory instructor was available for additional instruction as needed or as requested by the students. The course instructor provided all students with the IV therapy skills validation tool to utilize during practice sessions. All students received an orientation to GoReact© in the spring of 2020 as part of the Foundations of Nursing course. The students in Group A received specific instructions and a schedule for face-to-face skill evaluations. Students in Group B received submission instructions and a due date for the GoReact© video submission. A skills

laboratory coordinator scheduled laboratory access for both video recording and face-to-face skill performance.

Instructors from the Adult Health Nursing course evaluated both groups of students. Faculty were oriented to the PIVC skills validation checklist, including identifying errors and assisting students with practicing the skill. Instructors also received training from GoReact© in regard to the implementation and utilization of the software. The researcher was not an instructor for this course and did not participate in the evaluation process.

Group A (Face-to-Face)

1. The skills laboratory coordinator created a schedule using 20-minute time increments for face-to-face evaluations.
2. The course coordinator for Adult Health Nursing assigned faculty to evaluate skills during the periods provided on the schedule.
3. Students selected a time for the demonstration. The student did not know the identity of the assigned faculty grader until the time of the validation.
4. Faculty and students arrived at the skills laboratory at their designated time.
5. Students were instructed to familiarize themselves with the room and equipment, ensuring all required supplies and equipment were present.
6. Once the student verified all required supplies and equipment were present, the student was allowed one attempt to perform the IV insertion skill. The faculty grader was present during the entire session. However,

no intervention or instruction related to the skills performance was offered.

7. The faculty grader utilized the IV Insertion Checklist to evaluate student performance.
8. Students were given feedback only after the completion of the skills performance.
9. The faculty grader was allowed to remain in the laboratory if scheduled to grade multiple students consecutively.
10. The faculty grader recorded time spent in the laboratory on the provided faculty timesheet.

Group B (GoReact©)

1. The skills laboratory coordinator created a schedule using 20-minute time increments for students to record their skills performance.
2. Students were responsible for securing a videographer. No restrictions were placed on the choice of a videographer.
3. Students selected a time to record.
4. Upon arrival to the skills laboratory, the skills laboratory coordinator allowed the student and videographer to enter the designated laboratory room.
5. Students were instructed to familiarize themselves with the room and equipment, ensuring all required supplies and equipment were present.
6. Once the student verified all required supplies and equipment were present, the student was allowed one attempt to record the IV insertion

skill. The skills laboratory coordinator was present during the session. However, no intervention or instruction related to the skills performance was offered.

7. Following the completion of the video recorded skills demonstration, the students uploaded the video to GoReact©. No video editing was allowed.
8. Faculty graders utilized the IV Insertion Checklist to evaluate student performance. Grading was completed at the instructors' convenience, but no more than one week following the due date for video submission.
9. Faculty graders utilized the Faculty Timesheet to record time spent validating the IV insertion skill performance in GoReact©.

Permission

An Institutional Review Board (IRB) application was submitted to William Carey University before beginning the study. Upon approval from the William Carey University IRB, the researcher obtained permission from the institution's IRB to retrieve data (Appendix D).

Participant Protections

The researcher completed the required Collaborative Institutional Training Initiative (CITI) Training (Appendix A). For Group A, records of skills evaluations were retained within a password protected online database accessible to faculty. Students' names on the records were removed, and sequential numbers were assigned to prevent confidentiality breaches. The researcher was responsible for data retrieval from GoReact©. Student names were removed via the same process applied to Group A. All videos on GoReact© are private and viewable only by the student presenter and

instructors. The GoReact© website states that the software complies with the U.S. Family Educational Rights and Privacy Act (FERPA), the U.S. Health Insurance Portability and Accountability Act (HIPAA), and various other privacy-related guidelines. The retrieved data was stored on a password-protected personal computer located inside a locked office.

Data Protection

The electronic data were stored on a password-protected personal computer located inside a locked office. Data will be stored for 5 years. At the end of the 5 years, paper documents will be shredded, and digital files destroyed. For Group B, the evaluation tool is digitalized and housed within GoReact©. GoReact© is a secure web-based video software company that requires the course instructor to input a login and password to access student data (GoReact, 2018).

Instruments

This study's only instrument was an excel spreadsheet used for recording data regarding student achievement, error identification, and faculty work hours. Data collection was from two sources. Student achievement and error identification were based on the Peripheral Intravenous Catheter (PIVC) Insertion Skills Checklist (Schuster et al., 2016). Faculty timesheets reflected the time spent in the laboratory setting for face-to-face evaluations and time spent in the GoReact© product while validating video performances.

The PIVC insertion checklist is a 28-item tool created to reflect best practices and recognized standards (Schuster et al., 2016). Items include each step of the PIVC insertion process, from verification of the prescriber's order to the documentation of the

procedure. Three infusion therapy experts determined content validity through a unanimous agreement that each item was required. Reliability testing was established using Cronbach's alpha and was found to be .84. According to Polit and Beck (2018), values of 0.8 or higher demonstrate good reliability.

The tool is designed as a checklist to determine whether the student completed each item in the order provided to perform the skill of PIVC insertion safely. While there are no point values associated with the checklist, the researchers suggest a patient safety approach to identifying essential items that would determine a pass or fail score. For this study, all items will be considered crucial components of the skill (Appendix B).

To collect data on faculty time to evaluate skills, faculty timesheets were utilized. This timesheet included the date, start time, and end time for each evaluation session. Face-to-face evaluation timesheets began with the instructor's arrival to the laboratory and ended following the last evaluation. If the instructor left the laboratory, or there was a break between assessments, the timesheet reflected the gap. Timesheets for video evaluations began and ended with each grading session. Any breaks from grading were also recorded during video evaluations (Appendix C).

Data Collection

Following IRB approval from William Carey University and the participant institution, digital records were retrieved from the institution’s online record system and extracted from the Fall 2020 Adult Health Nursing GoReact© course database. The faculty timesheets were obtained from the skills laboratory coordinator. The researcher evaluated the student records and faculty timesheets for data collection. All student identifiers were removed and replaced with a numerical code. An excel spreadsheet was

used to organize data collected on the following: (a) faculty work hours, (b) the number of student errors identified by faculty, and (c) the number of students achieving a passing score. The excel spreadsheet is stored on a password-protected computer inside a locked office.

Data Analysis

Quantitative data analysis was completed to test the hypotheses using methods recommended by Polit and Beck (2018). The procedures included: (a) preparing the data for analysis (extracting data from GoReact© and compiling data from paper evaluations and faculty timesheets), (b) entering the data into an Excel spreadsheet created by the researcher for the study, and (c) analyzing the data. Data from the spreadsheet were uploaded into SPSS for analysis. Descriptive statistics (mode, median, mean), variability (range and standard deviation), and statistical significance (*t*-test and Chi-square test) were used to test hypotheses (Polit & Beck, 2018). Table 1 summarizes the elements of data analysis for the study.

Table 1

Data Analysis

Null Hypotheses	***Statistical Test***	***Rationale***
H_{01}	Independent groups *t*-test	Tests the difference between the means of two independent groups (Polit & Beck, 2018)
H_{02}	Independent groups *t*-test	Tests the difference between the means of two independent groups (Polit & Beck, 2018)
H_{03}	Chi-Square Test	Tests the difference in frequencies of two or more groups based on a specific criterion (Polit & Beck, 2018)

Procedure

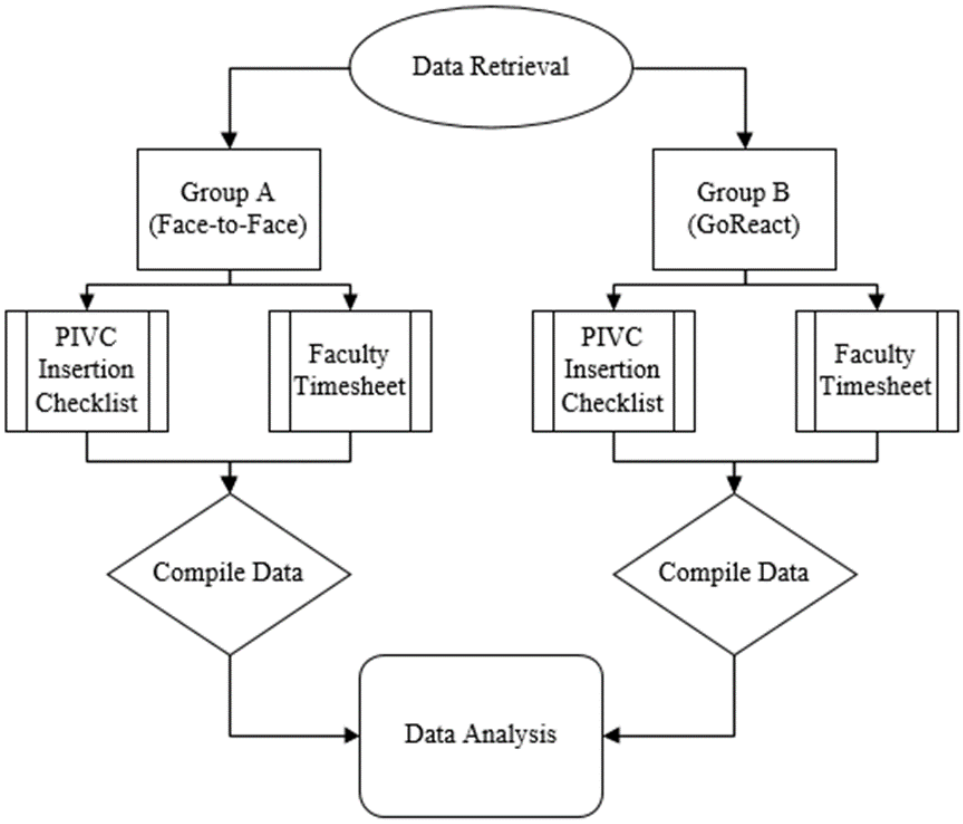
The study was conducted in the spring term of 2020. The researcher retrieved the electronic data stored within the institution's online database and from the GoReact© course. The researcher began data retrieval following IRB approval from both William Carey University and the participant university (see Figure 2).

1. Submitted IRB application to William Carey University.
2. Upon receiving approval from William Carey University's IRB, submitted IRB application to the participant institution.
3. Following approval from the participant institution, the researcher began data retrieval.
4. Group A: The researcher collected the students' PIVC skill checklists from the institution's online record storage database. The faculty timesheets were requested from and provided by the nursing department's skills laboratory coordinator.

5. Group B: The researcher collected the data from the students' PIVC skill checklist from the GoReact© course for NS 202. Skills checklists, including the PIVC skill checklist, are built into GoReact© as a rubric to allow seamless evaluation and grading. Faculty timesheets were requested from the nursing department's skills laboratory coordinator.
6. Following retrieval of all data, the researcher replaced student names with a number.
7. The researcher input all data into an Excel spreadsheet.
8. From the Excel spreadsheet, the researcher used IBM SPSS v 22 to analyze data.
9. The findings of this study are reported in Chapter IV.

Figure 2

Procedure



Chapter IV

RESULTS

Purpose of the Study

Chapter IV presents the data collection and the data analysis results as they relate to the null hypotheses. This chapter describes the hypotheses, participants, and hypotheses findings. The purpose of this study is to compare faculty work hours, the number of student errors identified by the faculty, and the number of students achieving a passing score when using an online video recording tool versus the traditional face-to-face approach in the evaluation of peripheral intravenous catheter insertion in third-term, associate degree nursing students. SPSS software version 22 provided an analysis of retrieved data. Data were analyzed using independent samples *t*-tests and the Chi-square test.

Hypotheses

$H_{01:}$ There will be no statistically significant difference between the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation

H_{02}: There will be no statistically significant difference between the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation.

H_{03}: There will be no significant difference in the number of third-term nursing students who pass the peripheral intravenous catheter skill performance validation on the first attempt using an online video recording tool compared to the number of third-term nursing students who pass the peripheral intravenous catheter skill performance on the first attempt using a face-to-face validation.

Description of Participants

This study compared records of two methods of evaluating the psychomotor skill of peripheral intravenous catheter (PIVC) insertion of 37 nursing students. The students were enrolled in the Adult Health Nursing course during the third semester of an ADN program in the fall of 2020. The program's faculty had evaluated half of the cohort of students face-to-face in the skills laboratory and half of the cohort using GoReact© software. For data analysis, the students were categorized into Group A (n = 18) if they were evaluated using the traditional face-to-face method or Group B (n = 19) if they were evaluated using GoReact© software. Demographic data were not retrieved during data collection.

Results

Null Hypothesis (H_{01})

The first null hypothesis stated that there would be no statistically significant difference between the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation. An independent samples *t*-test was used to assess for a

possible difference in the means the number of faculty work hours when using an online video recording tool and when using the traditional method of face-to-face validation. To assess for a difference in means, faculty time spent evaluating individual students was converted from hours and minutes to total minutes spent on each student evaluation then entered into SPSS. Statistical analysis revealed that faculty spent less time evaluating the PIVC skill for Group B students (M = 8.05, SD = 3.41) than for the students in Group A (M = 14.11, SD = 5.54). The difference between the two means was statistically significant at the .05 level ($t = 4.22$, $df = 37$). The independent samples *t*-test for the faculty time spent validating the PIVC insertion skill indicated a statistically significant difference, and the null hypothesis was rejected. The total minutes faculty spent evaluating each group was also calculated. Faculty spent a total of 254 minutes evaluating Group A and 176 minutes evaluating Group B. These results suggest that faculty time spent validating the PIVC insertion skill is decreased when using an online video recording tool. See Table 2 for the results of the independent samples *t*-test (equal variances assumed).

Table 2

Results of independent groups t-test for H_{01}

Variable	Group A		Group B		*t*	*p*
	M	SD	M	SD		
Faculty Time	14.11	5.54	8.05	3.41	4.22	< .001

Null Hypothesis (H_{02})

The second null hypothesis stated that there would be no statistically significant difference between the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students when using the face-to-face method of evaluation. An independent samples *t*-test was used to assess for a possible difference in the means of the number of student errors identified by the faculty evaluators using an online video recording tool and the traditional method of face-to-face validation. To assess for a difference in means, the number of errors identified for each student within each respective group was calculated and entered into SPSS. Statistical analysis revealed that faculty identification of student errors was similar between Group B (M = 1.95, SD = 2.68) and Group A (M = 1.0, SD = 1.14). The difference between the two means was not statistically significant at the .05 level (t = -1.41, df = 24.58). These results suggest that the number of student errors identified by the faculty while validating the PIVC insertion skill is similar when using an online video recording tool and when using a face-to-face method. See Table 3 for the results of the independent samples *t*-test (equal variances not assumed). The independent samples *t*-test

from the faculty time spent validating the PIVC insertion skill did not indicate a statistically significant difference. Therefore, this researcher failed to reject the null hypothesis.

Table 3

Results of independent groups t-test for H_{02}

Variable	Group A		Group B		*t*	*p*
	M	SD	M	SD		
Identified Errors	1.00	1.14	1.95	2.68	-1.41	.17

Null Hypothesis (H_{03})

The third null hypothesis stated that there would be no statistically significant difference in the number of third-term nursing students who passed the peripheral intravenous catheter skill performance validation on the first attempt using an online video recording tool compared to the number of third-term nursing students who passed the peripheral intravenous catheter skill performance on the first attempt using a face-to-face validation. The Chi-square test assessed for a statistically significant difference between Group A and Group B based on passing the PIVC skill evaluation on the first attempt. In Group A, 12 out of 18 students passed the skill validation for an average of 66.7%. In Group B, 13 of 19 students passed the skill validation for an average of 68.4%. The results of the Chi-square analysis, χ^2 (n = 37, df = 1) = .01, p = .91 did not reveal a statistically significant difference, therefore this researcher failed to reject the null hypothesis. These results suggest that the number of students who passed the skills performance on the first attempt is similar when using an online video recording tool and when using a face-to-face method. See Table 4 for the cross tabulations for H_{03}.

Table 4

Cross Tabulations for H_{03}

	Pass or Fail on the First Attempt		
	Pass	Fail	Total
Group			
A (face-to-face)	12 (66.7%)	6 (33.3%)	18 (100%)
B (GoReact©)	13 (68.4%)	6 (31.6%)	19 (100%)
Total	25 (67.6%)	12 (32.4%)	37 (100%)

Table 5 *Statistical Analysis of Hypotheses* depicts the results and conclusions of the statistical analysis of all three null hypotheses.

Table 5

Statistical Analysis of Hypotheses

Null Hypotheses	***Statistical Test***	***Conclusion***
H_{01}	Independent groups *t*-test $p < .001$	Rejected H_{01}
H_{02}	Independent groups *t*-test $p = .17$	Failed to reject H_{02}
H_{03}	Chi-square test $p = .91$	Failed to reject H_{03}

Summary of Results

Three dependent variables were assessed for differences when two groups of third-term nursing students were evaluated on the psychomotor skill of PIVC insertion. The dependent variables were the number of faculty work hours, number of student errors, and the number of third-term nursing students who passed the skill validation on their first attempt. Data analysis indicated a statistically significant difference between faculty work hours when using an online video recording tool and a traditional face-to-face method. The data analysis did not reveal a statistically significant difference between using an online video recording tool and using the face-to-face method of validation in respect to the number of student errors identified or the number of students who passed the PIVC skill validation on the first attempt.

CHAPTER V

DISCUSSION

Chapter V includes a discussion of the retrospective comparative quantitative study. The findings of the research are discussed and correlated to the theoretical framework and published literature. Additionally, the researcher discusses problems encountered during research; implications of the study's findings on nursing education, practice, and policy; an examination of the research limitations; and recommendations for future research.

Summary of the Study

Kurt Lewin's (1951) change theory highlights the necessity of understanding the need for change, working with others to implement change, and assessing the effect of change. According to recent data, not only is there a need for additional nurses, there is a shortage of nursing faculty (American Association of Colleges of Nursing, 2019; Bureau of Labor Statistics, 2020). As many nursing programs are working with limited faculty, innovative methods to optimize time and resources become increasingly vital. Nurse educators spend significant amounts of time preparing lessons, simulations, and clinical experiences. Additionally, the evaluation of student learning is a crucial component of the faculty job description (Chuang et al., 2018; DeYoung, 2015). The sophisticated tasks that fall to nurse educators are made even more problematic when faced with a limited faculty population.

As Lewin's (1951) change theory describes a phenomenon of identifying a problem or need for change, nursing faculty at the research institution recognized a need to improve the efficiency of validating students' psychomotor skills. A review of the

literature unearthed a wealth of information supporting the use of video for skill evaluation. However, research regarding online video recording tools was virtually absent. The purpose of this study is to compare faculty work hours, the number of student errors identified by the faculty, and the number of students who achieved a passing score when using an online video recording tool versus the traditional face-to-face approach in the evaluation of peripheral intravenous catheter insertion in third-term, associate degree nursing students.

This study sought to find differences between two groups of students who had been evaluated on PIVC insertion. Group A was assessed using the traditional face-to-face method in which faculty grade students by observing psychomotor skill performance in a laboratory. Group B recorded the psychomotor skill performance using an online video recording application (GoReact©) on their cellular device, uploaded it to the GoReact© course platform, and was graded by the faculty at a later time.

A retrospective comparative quantitative design was used to evaluate data from the PIVC evaluations of 37 pre-licensure nursing students enrolled in the third term of an ADN program. The study's data attainment occurred through a retrospective review of those pre-licensure nursing students' PIVC checklists and faculty timesheets. An analysis of the dependent variables of faculty time spent evaluating, the number of errors identified by the faculty, and the number of students who passed the skill on the first attempt was completed to determine the possibility of a statistically significant difference between the two groups of ADN students. An independent groups *t*-test indicated a statistically significant difference in results for the dependent variable of faculty work hours documented to validate PIVC insertion. The independent groups *t*-test results did

not show a statistically significant difference in the results for the dependent variables of student errors identified by faculty or the number of students who passed the PIVC insertion skill validation on the first attempt. This study's key findings suggest that integrating an online recording tool for PIVC insertion in third-term nursing students saves faculty time without jeopardizing the evaluation's quality.

Discussion of Results

H_{01}

The first null hypothesis stated that there would be no statistically significant difference between the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using an online video recording tool compared to the number of faculty work hours documented to validate peripheral intravenous catheter insertion in third-term nursing students using a face-to-face method of validation. A faculty time sheet utilized to record the minutes spent during each student validation was used to gather data on this variable. An independent groups *t*-test was used to assess for a possible difference in the means of the independent variable of GoReact© and the dependent variable of faculty work hours. The results of the independent groups *t*-test indicated a statistically significant difference ($p < 0.001$). The findings are similar to a study that found that time spent evaluating psychomotor skills was significantly reduced when using a web-based skill evaluation (Marquez-Hernandez et al., 2019).

One possibility for this reduction in time spent evaluating PIVC insertion is that the faculty eliminated non-productive time. Faculty were instructed to record the time spent in the laboratory evaluating each student. If the student was late for the scheduled

evaluation, the wait time was included in the faculty time spent for evaluation. The researcher thought it was essential to capture all time spent in the lab to understand the total time spent devoted to skills validations. An additional possibility is the faculty used a feature in GoReact© that enables video to play at 1.3x, 1.5x, 1.7x, and 2x the recorded speed. Theoretically, this could allow faculty to view a five-minute video in two and a half minutes if watched at 2x the recorded speed.

According to Lewin's Change Theory (1951), the "refreezing" stage occurs following implementation and data collection. During this last stage, and based on the study's preliminary findings, the nursing faculty at the research institution has determined to integrate GoReact© for psychomotor skill validations for future use in the program. The faculty have chosen to add additional skills, including physical assessment, medication administration, and indwelling urinary catheter insertion.

H_{02}

The second null hypothesis stated that there would be no statistically significant difference between the number of student errors identified by faculty when validating peripheral intravenous catheter insertion in third-term nursing students when using the face-to-face method of evaluation. An independent samples *t*-test was used to assess for a possible difference in the means of the independent variable of GoReact© and the dependent variable of student errors identified by faculty.

The data analysis did not show a significant difference in the number of errors identified by faculty when validating students using an online video recording tool and while validating students face-to-face ($p = .17$). This study's findings should reassure nursing faculty that the quality of evaluating students via an online recording tool is

comparable to the traditional method of face-to-face. Lewin's Change Theory supports that the faculty determine whether GoReact© should be fully integrated into the curriculum. Based on this study's preliminary findings, the research institution's faculty plan to fully implement GoReact© during the first term of the program for multiple skills evaluations and other assignments.

One possibility for the statistical analysis not showing a significant difference in the number of errors identified by the faculty is that all faculty involved had experience grading using both methods and were proficient in both face-to-face and GoReact© validations. According to program records, this was the third year the program had utilized GoReact© for psychomotor skills validation. All faculty involved in the evaluation of the participants were employed at the institution before and during the implementation of GoReact©. It is unknown if faculty who are using an online recording tool for the first time would have the same similarity level.

The statistical analysis results were different from the researcher's initial assumption that more errors would be identified using an online video recording tool. When looking at the raw data, there were more errors identified in Group B (GoReact©), though the majority of the difference was assessed in one student. Group A (face-to-face) had a total of 18 identified errors, and Group B had a total of 37 identified errors. However, one student in Group B had ten errors identified. These findings also differ from a similar study in 2019 that evaluated using a web-based tool for psychomotor evaluation (Marquez-Hernandez et al., 2019). A significantly higher number of errors were recorded in the group of students who were evaluated with the web-based tool in direct contrast to the findings of this research study. However, the differences in the

research designs may have contributed to the difference in the results. The Marquez-Hernandez study tested the implementation of a new web-based tool and developed a new scale to evaluate psychomotor skills.

H_{03}

The third null hypothesis stated that there would be no statistically significant difference in the number of third-term nursing students who pass the peripheral intravenous catheter skill performance validation on the first attempt using an online video recording tool compared to the number of third-term nursing students who passed the peripheral intravenous catheter skill performance on the first attempt using a face-to-face validation. A Chi-square test was used to assess for a difference between the method of evaluation (face-to-face or using GoReact©) and the number of students who passed the skills validation on the first attempt.

The Chi-square test conducted was not statistically significant. This finding is also reassuring that the integration of new technology did not compromise student success. While educators may question the validity of new tools used to evaluate student learning, this study's findings should serve to support the accuracy of online recording tools when used for grading.

Research indicates higher success rates in students who were validated using student-produced videos (Chuang et al., 2018; Yoo et al., 2010). However, a possible explanation for this difference is that the students included in this study had been evaluated using a face-to-face approach for vital sign assessment in the spring of 2020. Also, the students had previously used GoReact© in the spring of 2020 to validate medication administration and physical assessment skills. These results may indicate that

students were comfortable using either method. There is no evidence to provide information related to differences when students are evaluated for the first time using video. This group of students had experience with the GoReact© mobile app and the web-based platform, which may have reduced the recorder's anxiety. The students also had experience with one-on-one faculty grading in the skills laboratory setting.

An alternative possibility is that both groups of students were only allowed one attempt to perform the skill. If students are allowed to record multiple times, the success rates may improve due to an opportunity to correct mistakes. Additionally, the students included in the study were third-term students. By this point in the program, the students had interacted with all faculty graders and may have felt more at ease in the laboratory.

Problems Encountered in Research Process

The original target population for this study was first-term associate degree nursing students. However, the study was ultimately conducted using data from students during the third semester of the program. The research institution typically validates PIVC insertion during the first semester of the program. The COVID-19 pandemic resulted in a nationwide shift to online learning, and students were not allowed on campus in the spring or summer of 2020. By the time the institution converted back to on-campus instruction, the students were beginning their third term of the program. The gap between the initial introduction of the PIVC skill and the skill validation was approximately five months. This was unprecedented and unexpected for the study, however it did not impact the research design, procedure, or results.

Implications

Nursing Education

This study's results can influence the future use of online video recording tools in the nursing curriculum by helping nursing faculty save time while evaluating students' psychomotor skills. This study suggests that online video recording tools are a valuable time-saving tool for faculty when evaluating PIVC insertion while they do not sacrifice the quality of error identification or student success.

Integrated throughout the curriculum, online video recording tools could be used in various formats. GoReact© technology in different areas of the nursing curricula may enhance efficiency and accumulate time savings. According to the GoReact© website, teacher education programs use online video recording tools to evaluate students clinically (GoReact, 2018). While healthcare is very different from education, utilizing the tool in the clinical setting is a potential use that nurse educators may consider in the future. As technology develops and the necessity of functioning during a global pandemic has highlighted, nurse educators must be willing to adjust, adapt, and be ready to consider new technologies' potential.

Additionally, this study was conducted amid the COVID-19 pandemic. During this time, many nursing education programs were forced to transition to an online format. The sudden transition of undergraduate programs to a virtual environment posed a challenge for many nurse educators. One of the problematic areas to shift to online was the clinical components of the courses. While lectures were often held via virtual meeting platforms, the hands-on component of psychomotor and patient care was difficult to

conduct online. A tool such as GoReact© could provide a seamless avenue of virtual clinical or psychomotor skill evaluations when in-person evaluations are not possible.

Nursing Practice

Based on the significant time-saving findings, hospital-based nurse educators may consider integrating an online video recording tool into competency training and evaluations. Based on the results of this study, educators could potentially save time evaluating nurse competencies. While nursing competencies in the hospital setting are different from the skills evaluations conducted in pre-licensure nursing programs, the evaluation's basis would be similar. For more extensive health systems in which educators must travel to multiple units and, the ability to evaluate competencies remotely could tremendously affect their workflow processes. The GoReact© platform's convenience and the ability to evaluate nursing competencies remotely could allow the hospital educators to utilize their time more effectively.

An example of an integration opportunity in the healthcare facility is the orientation period of new graduate nurses or nurses new to a specialty area such as obstetrics, newborn care, or adult critical care environments. The online video recording tool could allow the new nurse to record the performance of skill competencies in a simulation laboratory during the preceptorship period. Skills such as tracheostomy care, sterile dressing changes for central lines, or performance of an arterial puncture could be effectively evaluated using an online video recording tool. This utilization would not only allow a supervisor or nurse educator to review the skill but also would serve to maintain a record of the competency.

Nursing Policy

The results of this study showed that there was no impact on the identification of errors or student success in evaluation when using an online video recording tool to validate psychomotor skills. This result lends credence to the use of distance learning as related to clinical skills and critical skill assessments. As state regulatory bodies explore simulated learning usage, this study's results may help provide aid to programs hoping to implement more virtual hours. COVID-19 has demonstrated the need for technology and innovative educational technology. Many state bodies and accrediting agencies waived minimum simulation hours and allowed nursing programs to operate solely on virtual experiences. Software such as GoReact© and other online video recording tools built for educational purposes offer many more features to faculty than stagnant video uploaded to online video websites or video that is simply emailed to the instructor. These online recording tools allow faculty to create and customize rubrics, embed time-stamped feedback, and integrate grading into the learning management system (GoReact, 2018).

Limitations

One limitation of this study was that it was conducted using only one cohort of third-term students from a small associate degree nursing program. The results are not generalizable to other populations of nursing students. The results also may not be generalizable to nursing students at different levels.

An additional limitation of this study was multiple instructors evaluated the pre-licensure nursing students' PIVC insertion skill. Although the instructors received the same training on how to utilize the PIVC skill checklist and were provided the same GoReact© orientation, it remains a subjective evaluation. Faculty differences in opinion

or bias could have influenced scores provided for various components of the PIVC checklist.

The student participants experienced a five-month delay between the PIVC insertion instruction and the PIVC skill validation due to the research institution transitioning to a virtual learning environment during the COVID-19 pandemic. Upon the students return to campus in the fall of 2020, the faculty scheduled the PIVC validations. It is unknown if this delay affected student performance of the skill and is consequently considered a limitation of the study.

Recommendations for Future Research

The use of online video recording tools in nursing education is an advancing technology that requires further research. This study tested the significance of using an online video recording tool to validate PIVC insertion. However, many additional skills could be evaluated using the same format. For example, the research institution currently utilizes GoReact© software to validate medication administration (including oral, intramuscular, and subcutaneous routes), physical assessment, and indwelling urinary catheter insertion. Additionally, a compilation of data using multiple psychomotor skills evaluations would provide a more comprehensive view of the use of online video recording tools for the purpose of skills evaluation in nursing. Future research might also include evaluating other online video recording technology and the potential to improve pre-licensure nursing students' attainment of psychomotor skills and faculty time savings.

Online video recording tools should also be further studied to evaluate how its use in prelicensure programs could encourage psychomotor skills development. GoReact© proclaims that students acquire skills faster when using the product (GoReact, 2018). The

premise of this idea is that students can view themselves performing the skill, perform a self-evaluation using the grading rubric, and then re-record to correct any mistakes. A feature of GoReact© is that students have the capability of self-grading before submitting for faculty review. The impact of self-evaluation could have a positive impact on skills acquisition. The self-evaluation component could have positive benefits on the acquisition of psychomotor skills.

A comparison of faculty and student perceptions of an online video recording tool and face-to-face evaluation would be another valuable topic for research. Faculty and students who have participated in both methods of validation could share their perceptions of the experiences. Research questions centered on the online video recording tool's perceived value for skill validation would provide further evidence for nurse educators as programs consider implementing this new technology.

Future research is also recommended to evaluate the appropriateness and potential benefits of using an online video recording tool to evaluate graduate nursing programs' skills. Graduate nursing programs with substantial clinical requirements such as midwifery and advanced practice nursing may benefit from using an online video recording tool to evaluate skills such as advanced physical assessments and even communication and interview techniques.

Conclusions

This study evaluated using an online video recording tool to validate PIVC insertion skill in associate degree, third-term nursing students. A psychomotor skill evaluation is a fundamental component of many undergraduate nursing education programs (Chuang et al., 2018; DeYoung, 2015). This study indicates that online video

recording tools for psychomotor skills evaluations provide time savings for nursing faculty. Simultaneously, identifying errors and student success remains mostly the same as when evaluating using a face-to-face approach. Students should also be confident that the quality of the evaluation should be similar to face-to-face evaluations.

The theoretical framework used for the study is the Lewin's Change Theory (1951). Lewin's theory is viewed as one of the most useful theories in recognizing the need for change, implementing change, and assessing the effect of change. These stages are referred to as unfreezing, moving, and refreezing. The theory is easily applied to the integration of new technology. Nurse educators implement the change theory by recognizing an area for improvement and exploring possible solutions, implementing a new technology, and then evaluating the effectiveness of the technology. One of the dilemmas in healthcare today is the shortage of nurses and nursing schools' inability to admit enough students to offset the shortage. Although integrating an online recording tool to save time is valuable, this is only one small method for faculty to become more efficient. For nursing education to offset the shortage and make a significant impact on the profession of nursing, educators must continually strive to implement innovative methods to decrease non-productive time and to engage a technology-savvy student (DeBourgh & Prion, 2017; Kim & Suh, 2018). Based on Lewin's Change Theory (1951) and this study's findings, nursing education programs that struggle with the time spent evaluating skills may benefit from the use of GoReact© or a similar online video recording tool.

Online video recording tools have the potential to transform many aspects of nursing education. Online video recording tools could be integrated into virtual clinical

replacements, psychomotor skills performances, and therapeutic communication. A tool such as GoReact© has the potential to provide numerous benefits to nursing students and nurse educators. Based on this study's findings, using an online recording tool for psychomotor skill validations poses no difference to error identification accuracy or student success during the validation. The future of nursing education may rest in educators realizing the need for innovative changes in the curriculum, methods of evaluation, and student engagement.

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APPENDICES

APPENDIX A

CITI TRAINING MODULES

CITI PROGRAM

Completion Date 19-Aug-2019
Expiration Date 18-Aug-2022
Record ID 32768135

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Social & Behavioral Research - Basic/Refresher (Curriculum Group)
Social-Behavioral-Educational Researchers - Basic/Refresher (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

William Carey University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w0f40a3e9-48e6-4e68-9d6a-2ad822e03a9e-32768135

CITI PROGRAM

Completion Date 27-Aug-2019
Expiration Date 26-Aug-2022
Record ID 32744426

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Responsible Conduct of Research (RCR) (Curriculum Group)
Responsible Conduct of Research (RCR) (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

William Carey University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w760b457d-fabf-4616-bc10-460829c85e2d-32744426

CITI PROGRAM

Completion Date 13-Aug-2019
Expiration Date 12-Aug-2022
Record ID 32744431

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Research Study Design (Curriculum Group)
Research Study Design (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

William Carey University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w001abcc9-1e51-4981-b268-5d4ca6fb435e-32744431

CITI PROGRAM

Completion Date 21-Aug-2019
Expiration Date N/A
Record ID 32744429

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Information Privacy Security (IPS) (Curriculum Group)
Information Security (Course Learner Group)
1 - Basic (Stage)

Under requirements set by:

William Carey University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w91f0c14b-2e71-4a79-be9d-95315a3aadad-32744429

CITI PROGRAM

Completion Date 21-Aug-2019
Expiration Date N/A
Record ID 32744427

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Information Privacy Security (IPS) (Curriculum Group)
HIPAA (Course Learner Group)
1 - Basic (Stage)

CITI
Collaborative Institutional Training Initiative

Under requirements set by:

William Carey University

Verify at www.citiprogram.org/verify/?wd0d39603-8693-4316-b30b-75299d949524-32744427

CITI PROGRAM

Completion Date 21-Aug-2019
Expiration Date N/A
Record ID 32744428

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Information Privacy Security (IPS) (Curriculum Group)
FERPA (Course Learner Group)
1 - Basic (Stage)

CITI
Collaborative Institutional Training Initiative

Under requirements set by:

William Carey University

Verify at www.citiprogram.org/verify/?w6791ffb7-f5b8-437e-9a37-9186f48afb49-32744428

CITI PROGRAM

Completion Date 22-Sep-2019
Expiration Date 21-Sep-2022
Record ID 32744430

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Essentials of Statistical Analysis (EOSA) (Curriculum Group)
Essentials of Statistical Analysis (EOSA) (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

William Carey University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wd41e5cb9-2c29-4119-9a2a-694c711f4a56-32744430

CITI PROGRAM

Completion Date 21-Aug-2019
Expiration Date 20-Aug-2023
Record ID 32744424

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

CITI Conflicts of Interest (Curriculum Group)
Conflicts of Interest (Course Learner Group)
1 - Stage 1 (Stage)

CITI
Collaborative Institutional Training Initiative

Under requirements set by:

William Carey University

Verify at www.citiprogram.org/verify/?wb406fb62-c24e-481d-8969-bfe98727f586-32744424

CITI PROGRAM

Completion Date 22-Aug-2019
Expiration Date 21-Aug-2022
Record ID 32744425

This is to certify that:

Dara Murray

Has completed the following CITI Program course:

Community Engaged Research (CEnR) (Curriculum Group)
Community Engaged Research (CEnR) (Course Learner Group)
1 - Basic Stage (Stage)

Under requirements set by:

William Carey University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w30b1494a-967e-4170-9d1a-bc2c1ee775ac-32744425

APPENDIX B

PIVC SKILLS INSERTION CHECKLIST

Peripheral IV Catheter (PIVC) Insertion Skills Checklist

		S	U
1.	Verify physician order	☐	---
2.	Wash hands prior to patient contact	☐	---
3.	Identify patient	☐	---
4.	Explain purpose and procedure to the patient	☐	---
5.	Dons gloves prior to procedure	☐	☐
6.	Apply tourniquet for vein assessment	☐	☐
7.	Assess, palpate and select suitable vein for access	☐	☐
8.	Gather & prepare all required equipment	☐	☐
9.	Select IV catheter suitable for vein & therapy (gauge & length)	☐	☐
10.	Cleanse insertion site and allow to air dry (per protocol)	☐	☐
11.	Tourniquet on prior to insertion (at least 4-6 inches above insertion site)	☐	☐
12.	Perform vein traction, skin tension below insertion site with non-dominant hand	☐	☐
13.	Warn patient of stick	☐	☐
14.	Insert catheter with needle bevel up, at an appropriate angle	☐	☐
15.	Observe flash of blood in flashback chamber	☐	☐
16.	Lower the catheter parallel to the skin and advance the needle and catheter together 1/8 inch	☐	☐
17.	Advance the catheter off needle/stylet and thread into the vein	☐	☐

18.	Release tourniquet	☐	☐
19.	Compress (occlude) vein distal to catheter tip & stabilize catheter hub to prevent dislodgement	☐	☐
20.	Remove the needle/stylet from the catheter and ensure safety mechanism is engaged	☐	☐
21.	Attach extension set with needleless connector	☐	☐
22.	Disinfect needleless connector per protocol	☐	☐
23.	Assess for patency, flush and lock (per protocol)	☐	☐
24.	Dispose of sharps in sharps container	☐	☐
25.	Dress and secure IV access site per hospital protocol	☐	☐
26.	Label dressing with date and initials	☐	☐
27.	Assess site and patient tolerance of procedure	☐	☐
28.	Document IV insertion correctly	☐	☐
	Number of boxes checked per column:	_	_

APPENDIX C

FACULTY TIME SHEET

GoReact® Video Evaluation Timesheet

This timesheet is designed for the purpose of monitoring and tracking faculty time spent evaluating students' GoReact® videos for the skill of peripherally inserted intravenous catheter insertion.

Please record start time, end time, and any breaks that occur during the grading session.

Date	Start Time	End Time

Face-to-face Evaluation Timesheet

This timesheet is designed for the purpose of monitoring and tracking faculty time spent evaluating students' face-to-face evaluations for the skill of peripherally inserted intravenous catheter insertion.

Please record start time, end time, and any breaks that occur during the grading session.

Date	Start Time	End Time

APPENDIX D

IRB APPROVAL LETTERS

WILLIAM CAREY UNIVERSITY

INSTITUTIONAL REVIEW BOARD
Jalynn Roberts, Ph.D.
Chair

November 12, 2020

TO: **Dara Murray**

RE: **A Comparison of Evaluation Methods of Intravenous Catheter Insertion Skills in Third-term Associate Degree Nursing Students (IRB #2020-066)**

Dara,

This letter serves as official notification of the approval of your project by the Institutional Review Board (IRB) of William Carey University. It is the IRB's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study, and that the proposal appears to be in compliance with the Code of Federal Regulations on the Protection of Human Subjects (45 CFR Part 46). **It has been classified as exempt from further review research under the IRB guidelines.**

You are authorized to implement this study as of the date of final approval, which is November 12, 2020. This approval is valid until is November 11, 2021. If the project continues beyond this date, the IRB will request continuing review and update of the project.

You are required to notify the IRB immediately if any of the following occur:

1. **any proposed changes that may affect the status of your project;**
2. **any unanticipated or serious adverse events involving risk to the participants.**

When the above-referenced research project is completed OR if it is discontinued, the WCU IRB must be notified in writing. The IRB Final Report Form will be used for this purpose.

On behalf of the Institutional Review Board,

Jalynn G. Roberts, Ph.D.
Chair, WCU Institutional Review Board

January 6, 2021

Dara Murray
College of Education

Re: IRB Protocol #21-88 "A Comparison of Evaluation Methods of Intravenous Catheter Insertion Skills in Third-term Associate Degree Nursing Students"

Thank you for submitting your application for exemption to the Institutional Review Board. The IRB appreciates your work in completing the proposal. Your proposal was evaluated in light of the federal regulations that govern the protection of human subjects and has been approved through expedited review according to 45 CFR part 46, as it has been determined to involve no more than minimal risk. Approval has been given under **expedited** review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The IRB has determined that your proposed project employs surveys and data collection methods that pose no more than minimal risk to the participants. The information will be obtained in such a way that one's responses will not be linked to one's identity or identifying information. Moreover, accidental disclosure of the participants' responses would not have the potential to harm to the person's reputation, employability, financial status, or legal standing. You request to waive parental consent has also been approved for this project.
Your application will expire on January 5, 2022. Please refer to the protocol number denoted above in all communication or correspondence related to your application and this approval. Should you have additional questions or require clarification of the contents of this letter, please contact me.

Sincerely,

Rodney Granec
Chair, Institutional Review Board
Office of Sponsored Programs &Research