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Virtual pedagogical strategies and HESI student outcomes in response to COVID-19

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Abstract

Background

To maintain curricular integrity in response to COVID-19, nursing educators are increasingly required to transition from traditional (face-to-face) to virtual pedagogy.

Objectives

The purpose of this analysis was to compare the HESI scores based on a traditional pedagogy with the HESI scores following implementation of virtual pedagogy during Spring 2020.

Methods

Student (n = 115; 81% female; mean age = 25.71 years) HESI scores were compared after each eight-week session using the Mann Whitney U test, permutation test and Wilcoxon rank test. Logistic regression was used to identify students achieving at least 850. Chi-square test was used to determine the relationship between pedagogy and students meeting 850 HESI scores. Fall 2019 Exit HESI scores were also compared with Spring 2020 Exit HESI scores.

Results

Students from diverse backgrounds (53.9% White; 27.8% Hispanic; 10.4% Asian; 5.2% Black; 1% Unknown) increased ($p = 0.022$) M_{HESI} scores following virtual pedagogy in Fundamentals, although no difference was found in Maternity ($p = 0.311$), Psychiatric ($p = 0.129$) or Medical Surgical Nursing ($p = 0.692$). Wilcoxon rank test revealed significant differences in M_{HESI} scores in same cohort of students between traditional (Psychiatric) and virtual strategies (Medical-Surgical) ($p < 0.01$); and traditional (Medical-Surgical) and virtual (Psychiatric) strategies ($p = 0.023$). White students' M_{HESI} scores were higher than Asian students', as revealed by logistic regression with no differences based on gender. Spring 2020 and Fall 2019 Exit HESI scores were comparable ($p=0.499$). Chi-square analysis revealed no relationship between pedagogy and achieving at least 850 on HESI ($\chi^2=0.027$, $p = 0.871$).

Conclusions

Based on the exit HESI scores, virtual pedagogy was as effective as traditional pedagogy for maintaining student competency in a community college associate degree nursing program. Future analyses of the effectiveness of virtual pedagogy in meeting curricular outcomes is warranted, regardless of exit degree option.

Keywords: *HESI, pedagogy, virtual, traditional, COVID-19, associate degree, concept-based, curriculum*

INTRODUCTION

The worldwide outbreak of the COVID-19 pandemic from SARS-CoV-2 (Zheng, 2020) has currently infected approximately 7,641,502 individuals and caused more than 213,037 deaths in the United States (Centers for Disease Control [CDC], 2020). This unprecedented global crisis has permeated political, societal, economic, and commercial sectors (Karabag et al., 2020), to include acute and long-term facilities and various community settings that require nursing care. While nurses are at the forefront providing care (American Association of Colleges of Nursing [AACN], 2020), simultaneously, nursing educators continue to prepare students to become competent practitioners through classroom, laboratory, simulation, and clinical instruction, in spite of the recent crisis which mandated a nearly overnight change in the curricula in most institutions. Further aggravating the demands of nursing education as well as the profession is concern for student risk regarding the lack of available personal protective equipment (PPE; Mason, 2020) and danger of acquiring or spreading the virus, all of which further threaten student engagement and nursing practice.

BACKGROUND

Nursing education continues to be a dynamic process of preparing students to work with patients (Benner et al., 2009; Moxley & Waller, 2019; Njie-Carr et al., 2017; Ward et al., 2018), so the use of technology in nursing education is not new (De Gagne et al. 2013; Oermann, 2015). Several recent studies in healthcare education have demonstrated positive outcomes from the use of technology (Shellenbarger & Robb, 2015; Tao et al., 2010; Weicha et al., 2010). Novel pedagogical strategies that focus on student-centered teaching have increased in recent decades (Johnsen et al., 2018; Morse et al., 2019). For example, the flipped classroom method (Betihavas et al., 2016; Hew et al., 2018, Tan et al., 2017) and narrative pedagogy (Brady & Asselin 2016; Brown et al 2008; Ironside et al., 2003; Nehls et al.; Santo 2011) have recently gained recognition (Brady & Asselin). Perhaps most notably, the momentum gained by virtual pedagogy has advanced nursing education to new levels. Manikins are used extensively to conduct clinical simulations (Padilha et al., 2018) and virtual platforms such as Second Life[®] (Linden labs, 2020), a new resource for nursing education, have recently been demonstrated as an effective pedagogy (Aebersold et al., 2020; Gallego et al., 2016).

Maintaining rigor in a nursing curriculum to improve student outcomes is urgent considering the radical transformation in the last few months from traditional face-to-face didactic instruction in laboratory, simulation and clinical in either acute or community environments, to predominantly virtual pedagogy. The recent global pandemic has accentuated the need for creative methodologies in teaching such as virtual pedagogy and the robust integration of technology within a very brief time frame (Konrad et al., 2020). This need cannot be overstated; the magnitude of maintaining a quality standard in nursing education, consistent with the demands of the profession is immense. Nursing educators must continue to identify effective innovative strategies to improve learning. The aim of this investigation is to provide insight into virtual pedagogical strategies that effectively maintained HESI (Health Education Systems, Inc., Elsevier Publishing) outcomes during Spring 2020 in a community college associate degree nursing program that utilizes a concept-based curriculum. HESI scores were analyzed in four courses in which traditional eight-week face-to-face sessions occurred but were followed by an abrupt transition to eight weeks of virtual pedagogy. These outcomes and the strategies utilized for effective virtual learning may provide insight into nursing educators can maintain and/or achieve curricular requirements in the future, regardless of exit degree option.

METHODS

Design

An ex post facto design was performed in which HESI outcomes for the first eight-week session in which traditional pedagogy was utilized in comparison to the second session in which virtual pedagogy was utilized. All students completed all HESI exams during Spring 2020. The Fall 2019 Exit HESI scores were compared with the Exit HESI scores from Spring 2020. Participant data were de-identified upon entry into the study therefore, were exempt from review by the IRB.

Setting and Participants

All students were enrolled in a pre-licensure associate degree program (ADN) in a community college setting with the capacity to admit 160 students each academic year. The program utilizes a fully concept based curriculum implemented in 2013 with a total of 53 concepts based on the “Concepts of Nursing Practice” (Giddens, 2020). The ADN program typically utilizes a traditional face-to-face teaching pedagogy for all modes of instruction, including classroom, laboratory, clinical and simulation. The clinical portion of two of the community-based courses (Family Health Concepts I and II) in which HESI exams were administered are presented in Table 1. Due to COVID-19, shortly after the first eight-week session, virtual pedagogy was abruptly incorporated into all types of instruction during week two of the second eight-week session. HESI exams are routinely integrated to measure student outcomes in courses and are administered in the Testing Center. During the second eight-week session, HESI exams were administered online. Based on faculty decision, a proctoring software (PROCTOR-U, 2020) was used to maintain exam integrity. Proctor U verified participant identity via video monitoring during the virtual HESI exams.

Table 1. Placement of HESI Examinations (as of Spring, 2020)

Course	HESI Examination
Health and Illness, Concepts I	Fundamentals
Family Health Concepts I	Maternity
Health and Illness Concepts II	Medical-Surgical*
Family Health Concepts II	Psychiatric
Clinical Decision Making, Practicum	Exit HESI

*moved to 4th semester, Fall 2020

Virtual Strategies

Traditional pedagogy was replaced with virtual pedagogy by implementing several instructional methods into the curriculum, such as case studies, virtual simulation programs, simulations, and use of reflection. In a traditional setting, students were assigned to small groups to complete case studies whereas, in the virtual setting, breakout rooms were used to present each of these exemplar activities, including case studies. In the smaller group setting, student engagement and discussion of content was enhanced, then students presented content to the entire class. The faculty also developed a page that was posted in Blackboard, the learning management system, with resources to help the faculty plan their courses. Despite the barrier from that lack of traditional classroom engagement, the faculty were committed to teaching concepts within the parameters of a virtual environment. The emphasis was on transferring the learning activities to a virtual model while maintaining the program integrity which involved continuing to adhere to the longitudinal testing plan in certain courses. While faculty were challenged to engage in technology, the curriculum remained sound in providing readiness for course exams.

Tools, technology and strategies were selected that facilitated learning and were consistent with the goals of the course rather than because they were new and exciting (Oermann, 2015). A priority among the faculty in developing the virtual learning strategies was to promote critical thinking (Caputi, 2020). Strategies were developed that aimed at active learning (Moore-Cox, 2017; Scheckel, 2020), and a reflection component was utilized to reinforce concepts and increase awareness of learned content to foster critical thinking (Moore-Cox). To stimulate clinical decision making, students were assigned to watch an interactive video then discuss their findings in groups. Strategies were utilized in simulation debriefings to allow for a greater depth of discussion of rationale, prioritization for interventions, and review of medications. The concept of safety was a priority in the clinical nursing courses and was consistently emphasized following the transition to the virtual format. To demonstrate medication safety, students watched a video and participated in an interactive case study involving role playing medication dispensation. Students also reviewed the six rights of medication administration and documented in an electronic health record to reinforce clinical decision making. Nursing

students must be proficient in the psychomotor skills of nursing practice (Johnson et al., 2020) and adept at communication (The Joint Commission, 2017) to provide safe care. 4

Two courses involved community based clinicals; faculty members developed modules to reflect the community activities. One assignment involved a Writing Workshop via Zoom that involved writing about a topic focused on health promotion in the context of its application to a community setting (Moxley & Waller, 2019). This assignment was an optional learning activity in the traditional setting, however, became mandatory in the health promotion course after transitioning to the virtual environment. This assignment required students write the article for publication on a local website to educate the community. It not only encouraged autonomous decision-making (Brown Tyo & McCurry, 2019) and critical thinking, but provided them with an opportunity to be creative and express their knowledge in writing.

Short term free trials of three programs that emphasized clinical reasoning were secured, two of which featured virtual simulations to provide opportunities to apply clinical scenarios to nursing practice, followed by discussion for improved knowledge of the content (Verkuyl et al., 2020). Another program included unfolding case studies to emphasize clinical reasoning. Simulation techniques utilizing case-based learning in groups with instructor facilitated debriefing and self-reflection facilitated reinforcement of the nursing process (Freitag et al., 2017). Similarly, an additional program was utilized that allowed the students to practice clinical decision making in an adaptive mode.

Outcome Measures

Scores from the HESI exams: fundamentals, medical surgical, maternity, and psychiatric nursing were analyzed following the traditional and virtual sessions and are included in this analysis. HESI exams provide a theoretical basis for testing platforms (Nibert et al., 2006) to help students succeed (Nibert & Morrison, 2013) and routinely utilized to measure learning outcomes in this institution. HESI exam validity and reliability had been established (Morrison et al., 2008, Morrison et al., 2002). The number of students who scored at least 850 on the HESI exam was then analyzed. Next, students' HESI scores of students in the same cohort after completing the traditional session were compared with HESI scores from the course completed following the virtual session. Fall 2019 HESI Exit scores were compared with Spring 2020 Exit HESI scores, the time frame in which virtual pedagogical strategies were abruptly implemented.

Data Analysis

The median, average, inter quartile range and standard deviations were calculated for the numerical variables. Percentages and frequency distribution tables were created for the categorical variables. The normality assumption was not satisfied for the HESI scores due to the sample size (not large enough). As a result, Mann Whitney U test, permutation test and Wilcoxon rank test were employed to investigate the effectiveness of the traditional and virtual pedagogical strategies. To evaluate the performance of the students who achieved HESI exam scores of 850 or higher, logistic regression was used. The HESI score was categorized from a continuous variable into two groups above and below the passing HESI score as a response variable, and students' age, race and gender were potential predictor variables for the logistic regression. A chi-square test was used to evaluate any link between teaching pedagogy and the proportion of students who passed HESI exam (850 or above). All testing was two-sided, with p values < .05 as statistically significant. Statistical analyses were carried out using R and Statistical Analysis System [SAS] (Version 9.4 SAS Institute Inc).

RESULTS

Demographics

Nursing students' (n = 115; M_{AGE} = 25.71 years) backgrounds were fairly heterogenous (Hispanic 28%, Asian 10%, Black 5%, Other 3%) with the majority White (53.9%) females (81%) (Table 2).

Table 2: Demographic Summary

Characteristic	N	%			
Gender					
Male	22	19			
Female	93	81			
Race					
Asian	12	10.4			
Black	6	5.2			
Hispanic	32	27.8			
Two or more race	2	1.7			
Unknown	1	1.0			
White	62	53.9			
Age					
Min	Median	Max	Mean	SD	IQR
18	23	49	25.71	7.55	9.50

Comparison of Virtual and Traditional Pedagogy by Course, Different Student Cohorts

A significant difference was observed between HESI scores following the virtual and traditional pedagogy (Table 3) in *only* Fundamentals ($p = 0.022$) based on a Mann-Whitney U test, further confirmed by a Permutation test ($p = 0.032$) (Table 3, Figures 1 and 2). No significant differences were observed between the average HESI scores following the virtual pedagogy and the HESI scores following the traditional pedagogy in any other course (Maternity, $p = 0.311$, and the permutation test confirmed, $p = 0.429$; Medical-Surgical Nursing, $p = 0.692$, permutation confirmation, $p = 0.615$, Psychiatric Nursing, $p = 0.129$, with permutation test confirmation, $p = 0.203$) as presented in Table 3.

The Mann-Whitney U test was utilized to compare the virtual and traditional pedagogical strategies for all courses, with a Permutation test further confirming each of these conclusions. Following implementation of the virtual pedagogy in Fundamentals, HESI scores increased by an average of 88.67 compared with HESI scores following traditional pedagogy. The overall quantitative results demonstrated that the HESI scores following the virtual pedagogy averaged 8.3 higher than HESI scores following the traditional pedagogy (Table 3, Figures 1 and 2). In addition, the Fall 2019 Exit HESI scores (traditional) were compared with Spring 2020 Exit HESI scores in which virtual pedagogy was implemented, with no difference observed between cohorts (Table 3).

Table 3. Comparison of Traditional (nonvirtual) and Virtual Courses in Different Student Cohorts

Course	Traditional: Mean, SD (1 st session)	Virtual: Mean, SD (2 nd session)	Difference	Significance Mann-Whitney U
Fundamentals	848.58, 148.80	937.25, 176.86	88.67	$p = 0.022$
Maternity	888.17, 130.23	862.94, 131.26	-25.23	$p = 0.311$
Psychiatric	933.27, 139.06	889.63, 110.99	-43.64	$p = 0.129$
Medical-Surgical	785.81, 165.94	810.15, 166.89	24.34	$p = 0.692$
Exit HESI	In class FA2019	Virtual SP 2020	Difference	Significance
	882.80, 125.58	867.45, 114.56	-15.35	$W = 1442, p = 0.604$

Figure 1: Comparison Amongst Courses: Traditional (Non- Virtual) Pedagogy

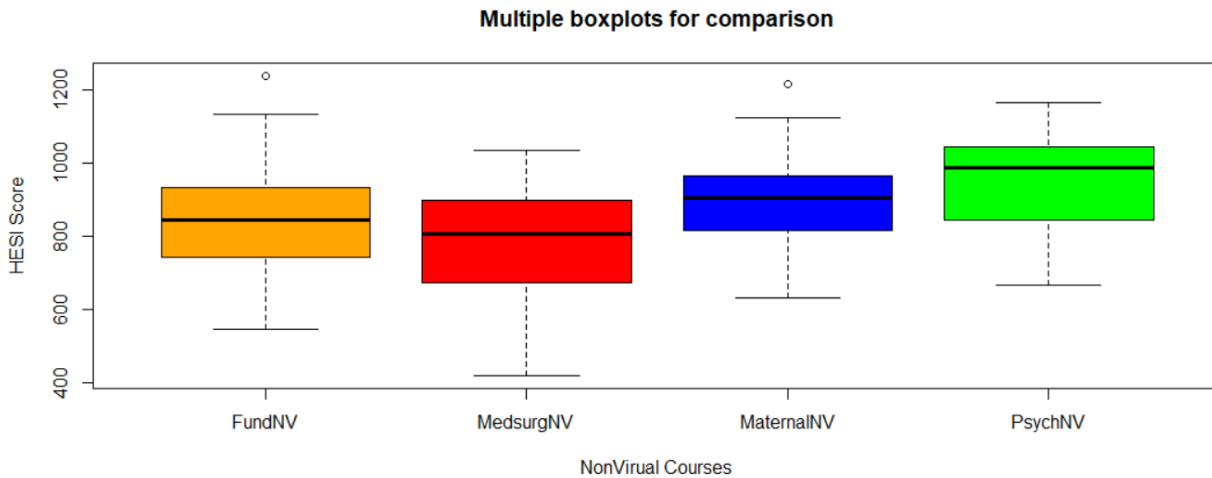
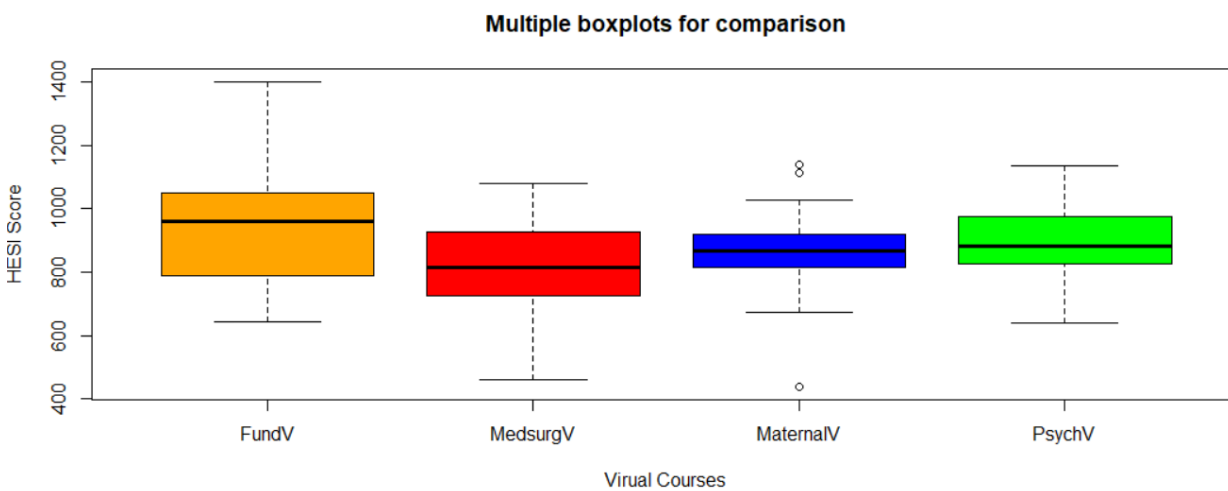


Figure 2: Comparison Amongst Courses: Virtual Pedagogy



Comparison of Virtual and Traditional by Student Cohort: Different Courses

Two subsequent cohorts were compared in which the HESI scores of the same students after they completed the virtual session were compared with their HESI score after they completed the traditional session. The HESI scores for the same student were not significantly different after completing Fundamentals in the traditional session with the virtual session for Maternity ($M_{\text{HESI}} = \text{traditional and Maternity, virtual}$ ($p = 0.60$) (Table 4). Nor were significant differences observed in the HESI scores of those students who completed Maternity via traditional pedagogy and Fundamentals, virtually ($p = 0.09$). Significant differences were observed in HESI scores; however, for students in the same cohort who completed Psychiatric ($M_{\text{HESI}} = 933.27$, $SD = 139.06$; traditional) and Medical-Surgical ($M_{\text{HESI}} = 810.15$, $SD = 166.89$; virtual), $p < 0.01$ and Medical-Surgical ($M_{\text{HESI}} = 785.81$, $SD = 165.94$; traditional) and Psychiatric ($M_{\text{HESI}} = 889.63$, $SD = 110.99$; virtual), $p = 0.023$. (Table 4).

Table 4. Comparison of Virtual and Traditional Courses in Same Cohort

Courses	Traditional: Mean, SD	Virtual: Mean, SD	Difference	Significance
Fundamentals T Maternity V	848.58, 148.80	862.94, 131.26	14.36	$p = 0.60$
Maternity T Fundamentals V	888.17, 130.23	937.25, 176.86	49.08	$p = 0.09$
Psych T Medical-Surgical V	933.27, 139.06	810.15, 166.89	-123.1154	$p < 0.01$

Medical-Surgical T Psych V	785.81, 165.94	889.63, 110.99	103.8221	$p = 0.02$	7
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Logistic regression outcomes demonstrated White students' performances fared better than Asian students with no significant difference found between student performance based on gender (Table 5).

Table 5. Logistic Regression

	Coefficients	Significance
Intercept	-0.275	0.499
Female (Ref. C)	Ref. C	Ref. C
Male	0.342	0.319
Asian (Ref. C)	Ref. C	Ref. C
Black	0.695	0.266
Hispanic	0.524	0.234
Two or More Races	0.351	0.697
White	1.01	0.014 *
Virtual (Ref. C)	Ref. C	Ref. C
Non-Virtual	- 0.151	0.553

HESI Scores of at Least 850

Students who achieve 850 on HESI have a 90% likelihood of passing NCLEX® (Phelan, 2019). Most of the students scored at least 850 on the HESI in the four courses. Following the traditional pedagogy, 61% of students scored a mean of at least 850 of the HESI whereas, after the virtual pedagogy 59% achieved a score of 850. Thus, there is no significant link between teaching pedagogy and the proportion of students who met the 850 benchmarks on HESI ($\chi^2=0.027$, $p = 0.871$) (Table 6).

Table 6. HESI Scores Achieving 850

HESI	Virtual (n, %)	Traditional (n, %)	Total
≥ 850	66 (59%)	70 (61%)	136
< 850	46 (41%)	45 (39%)	91
Total	112	115	

DISCUSSION

On a global scale, COVID-19 has resulted in the radical transformation in the curricula of many nursing programs, from that of a predominantly traditional, face to face pedagogy to primarily a virtual pedagogy, causing concern for curricular integrity (Konrad et al., 2020). The transformation of the nursing curricula in this program from a predominantly traditional pedagogy to a virtual pedagogy demonstrated successful curricular outcomes according to HESI scores. To our knowledge, this is the first study to compare the HESI outcomes between a traditional face-to-face curriculum with HESI scores following virtual strategies in the same semester during Spring 2020.

Students who represented diverse backgrounds successfully completed the four HESI exams after implementing virtual strategies. The courses aligning with HESI exams were Health and Illness Concepts I (Fundamentals HESI), Family Health Concepts I (Maternity HESI), Family Health Concepts II (Psychiatric HESI), and Health and Illness Concepts II (Medical-Surgical HESI). The average HESI score increased in the Foundations and Medical-Surgical courses but decreased in the Psychiatric and Maternity courses following the implementation of the virtual strategies. Virtual learning environments are typically used less for nursing education in mental health and illness courses (Wilson, & Hungerford, 2015), although it is interesting to note the Psychiatric HESI score was the highest following traditional pedagogy, and the second highest HESI score

following the virtual pedagogy session. The same faculty member taught both sessions of the Health and Illness Concepts II (Medical-Surgical HESI) course only (Table 1). Whereas, different faculty taught in the other courses (Health and Illness Concepts I (Fundamentals HESI), Family Health Concepts I (Maternity HESI), and Family Health Concepts II (Psychiatric HESI) and may have contributed to the differences between HESI outcomes.

The lowest HESI score was found in Medical-Surgical for both sessions. This is typical based on when this exam is offered in the curriculum. In this analysis, the Medical-Surgical HESI was offered in third semester when students have not yet been taught all content on this HESI exam. In Spring 2020, the Medical-Surgical HESI was moved to a fourth semester course. Thus, the observed variance between the Psychiatric and Medical-Surgical HESI scores was expected.

Program integrity was successfully maintained due to the collaborative faculty effort in realigning lecture, lab, clinical, and simulation to virtual pedagogical strategies within one week. Faculty decided to prioritize critical thinking (Caputi, 2020) to meet the learning outcomes for promoting clinical reasoning development (Brown Tyo & McCurry, 2019) when transitioning to virtual strategies. The current testing policy requires HESI exam scores be counted in the course grade (faculty agreed to review exam scores prior to submitting the final grade and consider adjusting based on previous cohorts). Students earn 2% of the total course grade if they score 850 or above based on the testing policy. HESI exams were required to be administered remotely, however, rather than in the testing center. A proctoring service, Proctor U, was adopted for this purpose, however, faculty needed to adopt new technology. Zoom was selected for virtual teaching; lectures, simulations, labs and clinical sessions although most faculty had never used Zoom.

Student frustration was heightened by inconsistent access to online exams. Many students lacked access to technology, a problem that went unnoticed before the pandemic because of cell phone use for the internet, and students were orientated to Proctor U on the day of exam. According to Morin (2020), virtual learning is more difficult for students with limited resources, or work and family responsibilities at home. In evaluating the learning experiences of students during the first month of confinement, Ramos-Morcillo and colleagues (2020) found older students and students in environments with limited electronic resources experienced greater limitations in virtual learning. The college at this institution allowed students who lacked a computer or internet access to borrow laptops, and in spite of technological issues, all students in the four courses completed the HESI exams.

The HESI exit exam (Langford & Young, 2013; Nibert et al., 2002; Phelan) links student scores with NCLEX-RN[®] success and is the most used standardized predictor NCLEX. A HESI score of 850 throughout the program is a recommended standard for course competency, therefore, 850 is the cut-score (Phelan, 2019). Most students achieved at least 850 or greater in the four courses following the implementation of virtual pedagogy. A minimal difference was found between those who achieved 850 following traditional pedagogy those who achieved 850 following virtual pedagogy which indicated the effectiveness of the virtual strategies in maintaining learning outcomes. Previous HESI scores in this program demonstrate a simultaneous upward trend between HESI scores and NCLEX-RN[®] pass rates. In 2016, intense rigor was implemented in the program due to NCLEX-RN[®] pass rates of 62% in 2015. By 2018, NCLEX pass rates were 95%, and 96% in 2019. The history of the NCLEX-RN[®] pass rates and programmatic challenges impacted the faculty decision to maintaining rigor in the curriculum during the transition to virtual instruction. Most faculty have taught in the program since 2016 and were committed to maintaining the HESI policy, offer HESI exams as scheduled, and to developing a HESI tool for curricular evaluation.

HESI scores were analyzed for the same students who were in different courses during the eight-week sessions. A significant difference was observed *only* between the HESI scores in the Psychiatric and Medical-Surgical courses; the rationale for these outcomes have been discussed. No difference was observed in the HESI scores of the same students following completion of the Maternity course and the Fundamentals course which suggests the HESI scores may be due to course content rather than pedagogy.

Exit HESI scores represent content learned throughout the program and not merely content learned in the current semester. Students who completed the Exam HESI exam during Spring 2020 were required to adjust to the abrupt change in pedagogy prior to taking that exam. The Exit HESI scores from the Spring 2020 and Fall 2019 cohorts were comparable ($p = 0.499$) indicating students were prepared from previous course due to the robust curriculum at this institution. In addition, the faculty at this institution have ample experience in nursing

education and responded quickly to the transition, and the resources are adequate. Dreher and colleagues (2019) recently substantiated the legitimacy of the Exit HESI, largely refuting Spurlock & Hunt's (2008) challenge of the usefulness of the HESI Exit to predict NCLEX-RN® success. Dreher et al. suggests the Exit HESI exam not only establish an expectation for students to prepare for class and exams, but standardized testing are an evaluation method to provide accountability for nursing schools' curriculum, clinical experiences, and NCLEX-RN pass rates by the State Boards of Nursing and accrediting agencies. Moreover, the Exit HESI aids in strengthening knowledge of content and identifying weak areas for remediation (Dreher et al.).

Curricular and Clinical Implications

These outcomes provide implications for faculty, students and curricular outcomes, and clinical and didactic instruction. Albeit difficult, the faculty benefitted from the transition to virtual pedagogy. The curriculum changes due to COVID-19 may prepare educators for possible future changes of nursing education and the opportunity to reconsider what constitutes critical information and essential competencies for entry-level nurses (Morin, 2020). Formerly critical content may no longer be considered relevant or feasible in the current context (Morin, 2020). Evidence is lacking to support a specific number of required hours for clinical experiences (Bowling et al., 2018). The curriculum in this ADN was the first in the state to discontinue acute obstetrical clinical experiences and nearly all clinical obstetrical content is taught during simulation although the HESI maternity scores consistently increase (Moxley & Waller, 2019). The need to focus on a competency-based education (Barton et al., 2020) exists due to an uncertain future of clinical availability in acute settings. Furthermore, it may be time to reconsider what is required to prepare and undergraduate level generalist nurse (Morin, 2020; Barton et al., 2020). Curricular outcomes in this program maintained due to a robust curriculum and resilience and professionalism of students and faculty alike. The faculty increased individual student meetings for support and to foster student engagement which increased student motivation, further impacting professionalism in practice. Future implications of these outcomes will provide insight into the use of virtual pedagogy in upcoming semesters, especially considering the rapidly changing environment of nursing education.

Limitations and Strengths

This study has limitations, specifically, the retrospective design does not allow for interpretation of causality, as data were collected as part of routing curricular procedures rather than purposes of the study aim. It is also possible that since the outcomes were measured during a crisis situation in which a sudden curricular transition occurred; the findings may not be generalizable to all situations. Virtual pedagogical strategies were selected based on availability rather than if most effective in all situations: time and resource constraints impacted academic freedom. Validated methodology may be more strategic when designing future interventions. Furthermore, virtual strategies were not consistent across the courses and involved a combination of synchronous and asynchronous platforms and different faculty. Conversely, strengths of this study include the unique opportunity to obtain such student outcomes following the implementation of virtual pedagogy during the COVID-19 crisis. Moreover, in a brief time-period, the strong foundation of the faculty and curriculum could be observed. Faculty had the fortitude to be creative and were courageous in spontaneously and authentically designing virtual pedagogy with unfamiliar resources to fit an existing curriculum.

Conclusion

The sudden transition to virtual pedagogy in response to COVID-19 may influence how nurses are educated in the future. Based on HESI scores in four courses, this analysis demonstrates a well-planned virtual pedagogy is possible for maintaining curricular outcomes. Nursing educators in an associate degree program abruptly integrated virtual pedagogical strategies relevant to nearly any nursing curriculum, regardless of exit degree option. No significant link was observed between pedagogy and student achievement of at least an 850 on the HESI exam. The future impact of COVID-19 remains uncertain; however, virtual pedagogy will likely be utilized on a long-term basis given the increasing emphasis on technology in nursing education. Further

exploration of the impact of virtual exposure in clinical, laboratory, and simulation contexts in addition to 10 didactic instruction as compared with traditional pedagogy and continued evaluation of the importance of HESI scores to curricular outcomes is currently warranted.

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