Nursing Informatics Advanced Competency Comparison for Graduate Students Completing Virtual and On-site Practicum Experiences

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The publication of this research is in the memoria of Dr. Kathy Hunter (one of the last projects that she worked on). Kathy, you led, and inspired all of us, your legacy for excellence in teaching, research, and nursing is our guide.

Abstract

The Nursing Informatics Research Team completed a study at a one-university level to compare graduate virtual and on-site practicum nursing student self-assessment of nursing informatics competencies using the Nursing Informatics Competency Assessment Tool (NICA-L3/L4). The sample was obtained from the graduate nursing informatics specialty track program at Chamberlain College of Nursing to determine whether there were differences between the self-assessments of the two groups upon the completion of their respective practicum experiences. The original intent was for students to complete the self-assessment as an anonymous survey that fell outside of assigned coursework. A low number of students enrolled in the virtual practicum, and a low response rate led investigators to revise their data collection methods to pull data retrospectively from a classroom assignment submitted to their last practicum course. Data were collected during the period starting with November 2017 running through the July 2018 session from a total of 56 student self-assessment tools, of which five were excluded because of incomplete data. Of the remaining 51 instruments, 11 represented students completing the virtual practicum, and 40 completed on-site practicum experiences. Both groups indicated a perceived net gain in competency levels. There was no significant overall difference between the post practicum ranking of the two groups, which seems to suggest that both virtual and on-site practicum could be equally effective in helping students to meet learning outcomes.

Practicum experience in nursing is a foundational experience through all degree programs.

Knowledge, experience, and outcomes vary from Bachelor of Nursing through the Doctoral level. As healthcare has changed, the areas for practicum for students through all levels have decreased. Nursing education in looking for ways to continue and improve the foundational practicum experience has embraced alternative learning modalities through virtual experiences. Virtual experiences include simulation, teleconnection to the on-site venue, virtual case studies and immersion in virtual learning environments Future opportunities are growing with nurse educators thinking outside the box. Nursing is built upon science and upon research, which supports studies of new venues of education. The research project in this paper informs on virtual learning for practicum. The practicum experience research focus was on a Master of Nursing Students in an immersive virtual learning environment (VLE), working toward completion of a specialty degree in Nursing Informatics. Our research group sought to compare the virtual experience of these Master's Degree candidate nurses with on-site practicum experience of other Master's Degree candidates in the same courses. Our question: is there a perceived difference in informatics competencies between students in a virtual practicum versus and on the ground practicum? The question looks at a comparison of different practicum options in student efficacy utilizing a self-assessment component, the NICA L3/L4. We assume that there is no difference; this research is to verify there is no difference or to identify any areas of difference from a student, self-assessment focus.

Literature Review

A review of the literature finds some research on blended environments and simulation but a minimal amount concerning a virtual practicum. Keys words utilized were: nursing, virtual practicum, research. Using EBSCO Host and CINAHL, 33 articles were found; with Pub Med, 18 items were found. Six research

articles were drawn from this search. An independent Internet search was done on background, locating another eight articles, which were included in this literature review.

With the onset of online learning in higher education, educators have been tasked with course development that fits with the asynchronous format of most online learning management systems. Research in nursing has expanded to include both traditional and blended education formats for evaluation of student learning (Lancaster, Wong, & Roberts, 2012). Some course components still need a synchronous educational design to solidify competencies in higher-level learning. The Institute of Medicine (IOM) called for advanced education, supporting the advancement of nursing science (2011).

With the increased number of nurses following the mandate of the IOM, the nursing education community has found that there is a shortage of on-site environments for practicum and graduate-level experience achievement (Gregory, 2014; Foronda, Lippincott & Gattamorta, 2014; Gore & Thompson, 2016; Hansen & Bratt, 2017). Expansion of education into the virtual world has been one answer to the lack of on-site practicums for higher degrees. Utilization of simulation and immersive learning within virtual learning environments has opened doors for education to meet the needs of the 21st-century student. Virtual learning environments are new entities and, as such, a rich ground for research. Several studies have shown that simulation utilized in nursing education has been effective in student learning (Foronda, Lippincott & Gattamorta, 2014; NCBSN, 2014; Gore & Thompson, 2016; Hansen & Bratt, 2017). One study found with applicability utilizing simulation and real-life experience had students after an encounter with a real patient, an avatar patient, and a scripted actor, which showed improvement in all encounters of communication skills (Quail, Brundage, Spitalnick, Allen, & Beilby, 2016). This study mixed educational venues for comparison of student outcomes. Virtual immersive educational components other than high-resolution simulation have not been studied, as evidenced by the lack of publications available at the time of this literature review. A virtual immersive practicum component is an excellent answer for the lack of an on-site practicum. Virtual practicum, as a newer component of virtual learning, needs to be evaluated for effectiveness. This research project will be a beginning to develop evidence of this type of immersive learning experience.

Materials

This study utilizes the "*Novice to Expert Theory*" by Benner (1982). The pathway to student learning usually is a curved road, not a straight path. In all degree levels in nursing, skill, and competency level is essential to ensure safe and effective practice. Higher standards, of course, such as nursing-informatics competencies identified by Quality and Safety Education in Nursing (QSEN) and the American Nurses Association (ANA), are applicable during practicum curriculum development (QSEN, 2012; ANA, 2015). These standards help to ensure that content is in alignment with virtual, as well as on-site learning. A practicum experience is a component to take education and begin to apply that learning. It is a chance to step out of the novice area and work toward mastery of essential competencies to support role transition post-graduation.

Nursing informatics competencies have been an area of review and definition since the advent of the electronic health record. A master's degree in nursing informatics is considered the baseline degree for nurse informaticists in practice today. This study uses the validated tool NICA L3/L4 (Hunter, McGonigle, Hill, Hebda, & Sipes, 2014; Hill, McGonigle, Hunter, Sipes & Hebda, 2014; Sipes, McGonigle, Hunter, Hebda, Hill & Lamblin, 2016). NICA L3/L4 assesses beginning to expert nursing informatics competencies divided into twenty-five applicable sections (Sipes et al., 2016). The NICA tool Self-assessment of advanced nursing informatics skills through the NICA L3/L4 is a guideline to evaluate competency achievement, which supports practicum effectiveness.

Study Protocol

Design: Quantitative, quasi-experimental pre and post-test design utilizing the NICA L3/L4

Study Aim: The aim of this research is the evaluation of student learning and achievement of practicum outcomes for nursing informatics students whose practicums take place in the College of Nursing virtual learning environment (VLE).

Research Question: In a population of master's level nursing-informatics students, is there a difference in

perceived informatics competencies between students taking a VLE-based practicum and students taking an in-person (on-the-ground) practicum?

H0 - There is no difference in perceived informatics competencies between students in VLE-based nursing-informatics practicums and students in in-person nursing-informatics practicums.

H1 – There is a difference in perceived informatics competencies between students in VLE-based nursing-informatics practicums and students having in-person nursing-informatics practicums.

Methods

The NICA L3/L4 self-assessment tool has been utilized in the Master Degree Nursing Informatics program at Chamberlain College of Nursing as a pre and post-assessment tool for students. The original intent of this study was for students to complete the self-assessment as an anonymous survey not included as a course assignment. The virtual learning environment

Table 1. Comparison of On-Site vs. Virtual Post-Pre Change in Mean Scores for Each Subject Area

Skill Area	On-site	Virtual	Difference	p-value
Computer Skills	-0.7200	-0.6909	-0.0291	0.7895
Computer Skills – Quality Improvement	-0.9583	-0.6970	-0.2613	0.4005
Computer Skills - Systems	-0.7875	-0.6363	-0.1512	0.5340
Informatics Knowledge - Data	-0.9625	-0.6818	-0.2807	0.2899
Informatics Knowledge – Education	-0.7792	-0.4697	-0.3095	0.1482
Informatics Knowledge – Impact	-0.9227	-0.6529	-0.2698	0.2718
Informatics Knowledge – Privacy/Security	-0.8833	-0.6061	-0.2772	0.2389
Informatics Knowledge – Regulations	-0.9000	-0.9091	0.0091	0.9607
Informatics Knowledge – Systems	-0.8600	-0.6061	-0.2539	0.1858
Informatics Knowledge – Usability	-0.9125	-0.8182	-0.0943	0.6850
Informatics Skills - Analysis	-0.8175	-0.6636	-0.1539	0.3567
Informatics Skills – Data/Data Structures	-0.7533	-0.6970	-0.0563	0.7628
Informatics Skills – Design, Development	-0.7727	-1.0496	0.2769	0.2640
Informatics Skills – Evaluation	-0.7350	-0.6364	-0.0986	0.5327
Informatics Skills – Fiscal Management	-0.8375	-0.9545	0.1170	0.5723
Informatics Skills – Implementation	-1.0464	-0.8831	-0.1633	0.2760
Informatics Skills – Management (part 17)	-1.0000	-0.6777	-0.3223	0.1212
Informatics Skills – Management (part 18)	-0.8125	-0.6818	-0.1307	0.4145
Informatics Skills – Programming	-0.6000	-0.6364	0.0364	0.8175
Informatics Skills – Requirements	-1.0031	-0.6932	0.3099	0.1533
Informatics Skills – Role	-0.9207	-0.6324	-0.2883	0.1928
Informatics Skills – Systems Maintenance	-0.6250	-0.7045	0.0795	0.6782
Informatics Skills – System Selection	-0.8667	-0.6061	-0.2606	0.2531
Informatics Skills – Testing	-0.9500	-0.8636	-0.0864	0.7237
Informatics Skills – Training	-0.8875	-0.6136	-0.2639	0.2600
Overall (All Subject Areas)	-0.8696	-0.6986	-0.1710	0.1827

(negative difference in column 4 indicates mean change Virtual less than mean change On-Site)

has been utilized as a secondary assigned practicum for any students that developed issues with their on the ground practicum allowing another avenue to complete their degree. With the low number of students enrolled in the virtual practicum and a low response rate, investigators choose to revise their data collection methods to pull data retrospectively from a classroom assignment submitted to their last practicum course. Data collection was done over several cohorts from November 2017 through July 2018. The total sample size was 56 student self-assessment tools, of which five were excluded because of incomplete data. Of the remaining 51 instruments, 11 represented students completing the virtual practicum, and 40 completed on-site practicum experiences. Statistical evaluation included a mean difference post – pre-test for each of the 25 skill areas and also an overall mean difference post – pre-test for all skill areas for all 51 students.

Table 2. Comparison of On-Site vs. Virtual Post-Treatment Mean Scores for Each Subject Area

Skill Area	On-site	Virtual	Difference	p-value
Computer Skills	1.8250	1.6182	-0.2068	0.2516
Computer Skills – Quality Improvement	1.4333	1.3030	-0.1303	0.4801
Computer Skills - Systems	1.7500	1.6364	-0.1136	0.6351
Informatics Knowledge - Data	1.4250	1.3182	-0.1068	0.5396
Informatics Knowledge – Education	1.6125	1.4848	-0.1277	0.5585
Informatics Knowledge – Impact	1.4568	1.3967	-0.0601	0.5129
Informatics Knowledge – Privacy/Security	1.3083	1.2424	-0.0659	0.9499
Informatics Knowledge – Regulations	1.5500	1.1818	-0.3682	0.1118
Informatics Knowledge – Systems	1.5400	1.4667	-0.0733	0.6572
Informatics Knowledge – Usability	1.4250	1.2727	-0.1523	0.8820
Informatics Skills - Analysis	1.7250	1.6091	-0.1159	0.7403
Informatics Skills – Data/Data Structures	1.9717	1.8030	-0.1687	0.4999
Informatics Skills – Design, Development	1.8942	1.6643	0.2299	0.2965
Informatics Skills – Evaluation	1.8000	1.6727	-0.1273	0.4629
Informatics Skills – Fiscal Management	1.9562	1.5000	-0.4562	0.0213
Informatics Skills – Implementation	1.4607	1.3506	-0.1101	0.6138
Informatics Skills – Management (part 17)	1.5841	1.5207	-0.0634	0.7229
Informatics Skills – Management (part 18)	1.8375	1.5000	-0.3375	0.1712
Informatics Skills – Programming	2.2750	1.8636	-0.4114	0.0863
Informatics Skills – Requirements	1.5594	1.6250	0.0656	0.3152
Informatics Skills – Role	1.5337	1.4822	-0.0515	0.9181
Informatics Skills – Systems Maintenance	1.8625	1.5682	-0.2943	0.1967
Informatics Skills – System Selection	1.8417	1.5758	-0.2659	0.2222
Informatics Skills – Testing	1.8125	1.4091	-0.4034	0.0657
Informatics Skills – Training	1.5375	1.5455	0.0080	0.8700
Overall (All Subject Areas)	1.6481	1.5230	-0.1251	0.5316

(negative values indicate Virtual better than On-Site, the p-value is for the two-sided alternate hypothesis. The skill area for Informatics skills; only one of the skill areas showed differences in post-treatment means scores between on-site and virtual students assuming a 5% significance level (Highlighted yellow).

The mean difference post – pre-test of the 40 on-site students was computed and mean difference post – pre-test of the 11 virtual students for each skill area and an overall mean difference post – pre-test (see table 1).

Mann-Whitney test, which is a non-parametric equivalent of the two-sample t-test for independent samples, was used to determine if on-site post-pre means were different from virtual post-pre standards. The second comparison was mean of post-assessment scores of virtual and on-site (see table 2).

Discussion

Study results show that none of the skill areas showed a statistically significant difference in change of means scores between on-site and virtual students assuming a 5% significance level when comparing pre and post. Essentially the on-site and the virtual students showed a similar change, on average, from pre to post. On-site and virtual students both had a change in their confidence resulting in essentially identical gains (perceived). So at least in terms of perception, it would appear that virtual practicum an on-site practicum both yielded essentially the same improvements in perceived competencies. Only one area that showed an increase in competency for virtual at the 5% significance level over on-site and that was in Informatics Skills- Fiscal Management. Virtual over on-site showed one increase (1.4091-1.8125) but did not reach the 5% confidence level in Informatics Skills-Testing. The null hypothesis was confirmed by this study that there were no perceived differences in nursing informatics competencies when comparing a virtual practicum to an on-site practicum.

Limitations

The study is a single study of virtual versus on-site practicum results in one institution and needs to be validated by more research. The study sample came from only an online education course for Master Degree Nursing Informatics students. Variability in on-site practicum experiences could impact an overall skill achievement, which could make the comparison as a single group less effective. In compiling the data, we found many incomplete self-assessment tools that decreased our sample size as only completed tools were utilized. The lower number of virtual students than on-site gave a significant size difference in the groups and if this difference increased the bias more toward on-site.

Future Implications

The research shows no significant difference in nursing Informatics competency levels from on-site to virtual practicum experience for Master Degree Nursing candidates. This information could lay the groundwork as we look at notable alternative educational venues in nursing. COVID has brought some exciting challenges to nursing practicum education this year. The development of virtual learning experiences to allow students to embrace their practicum skills outside of an on-site healthcare venue. Tailored virtual experiences with course outcomes can give students, safe and effective platforms to embrace their nursing skills across all nursing degrees.

Conclusion

Virtual learning in all formats has been embraced by higher education in nursing. In our highly technological world, all education venues need to be leveraged to support nurses' continued education effectively. Tailored virtual experiences with course outcomes can give students safe and effective platforms to embrace their nursing skills across all nursing degrees. A virtual practicum for an MSN degree specializing in nurse informatics appears to support the achievement of end-level graduate competencies, but further research is recommended.

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