Title: **Teaching Collaborative Communication Skills Using Rapid E-learning Technology and a Brief Interprofessional Event**

1. Summary of Project Aims

Medical and nursing professions work closely together in interprofessional healthcare teams. The provision of safe, quality patient care depends on the ability of the healthcare team to communicate and collaborate effectively; and interprofessional education events allow medical and nursing students to learn with, from, about each other to improve future collaborative practice. Effective interprofessional communication and collaboration is becoming more important in healthcare, physician and nurse perceptions of their collaboration have historically differed, and e-learning technology and simulation may contribute to collaborative competency improvement in pre-licensure health professions students. Although technology-enhanced educational modalities have shown some promise in medical and nursing education, more exploration on its effect in the interprofessional education setting on communication and collaborative attitudes and behaviors has been called for.

The purpose of this study was to:
1. Determine the effect of participation in a rapid e-learning module focused on interprofessional roles/responsibilities and communication [Experimental Group] on medical and nursing student participant attitudes toward physician-nurse communication prior to a brief interprofessional education event versus no participation in a rapid e-learning module [Control Group].
2. After participation in the rapid e-learning module [Experimental Group] or no participation in a rapid e-learning module [Control Group], determine the effect of a brief simulation-enhanced interprofessional education event on interprofessional communication behaviors of Experimental and Control Groups.

2. Theoretical/conceptual framework

Because interprofessional communication and teamwork may be improved through technology and simulation enhancement strategies, Kolb's Experiential Learning Theory guided this study. During interprofessional simulation activities, participants move through a learning cycle that includes: a simulated patient and team experience, reflection and debriefing of clinical decisions, teamwork and communication experienced during the activity, identification of new learning or concept, and application of the new learning to future situations (McLeod, 2013).

3. Methods, Procedures, and Sampling

Participants

The sample included undergraduate, upper-division nursing students and 1st-year medical students from separate institutions in a Midwest state. The nursing students were recruited from a Nursing Leadership course over a period of two semesters (fall and spring). Medical students were also recruited for the study over the two-semester (fall and spring) period, on a voluntary first-come/first-serve basis.

Interventions

Participants from both nursing and medicine were randomly assigned to two separate groups, each comprised of a combination of nursing and medical students. The participants in Group #1 (Experimental group) participated in two events; a rapid e-learning technology intervention (*Computer Module)* and an interprofessional simulation event (*IPE Simulation Event)*.

The *Computer Module* was designed to introduce students to the Interprofessional Educational Collaborative Core Competencies (Interprofessional Education Collaborative Panel, 2011; Interprofessional Education Collaborative, 2016).

The IPE Simulation Event required students to work in teams of medical students and nursing students, to complete a 30-minute scenario that required interprofessional communication and collaboration in order to determine a course of action for a patient (manikin).

The participants in Group #2 (Control Group) participated in the *IPE Simulation Event* only. The necessary IRB approval was obtained along with informed consent from all participants.

Instrumentation

The Jefferson Scale of Attitudes toward Physician-Nurse Collaboration (JSAPNC), was used to assess attitudes toward interprofessional collaboration among the participants (Dougherty & Larson, 2005; Hojat et al., 2003; Ward et al., 2008).The survey contained 15, 4-point Likert-type items and composite scores were calculated for all participants.

The Indiana University Simulation Integration Rubric (IUSIR) was used to measure interprofessional communication behaviors among the participants. The rubric, completed by trained observers, included 12 verbal and non-verbal collaborative behaviors rated on a 3-point scoring rubric. For the purposes of this study, only team communication scores were calculated - with higher scores denoting more collaborative behaviors exhibited (Reising, Carr, Tieman, Feather, & Ozdogan, 2015).

Procedures

Phase I: IPE Simulation Event Preparation and Computer Module Completion

One week prior to the IPE Simulation Event, the Experimental Group was sent a web link to the computer module. The link also contained a copy of the JSAPNC, which served as a pretest. Upon completion of the computer module, all Experimental Group medical and nursing

student participants then completed the post-JSAPNC tool embedded at the end of the computer module. The Control Group received no computer module.

One month prior to the fall and spring IPE Simulation Events, four pairs of observers were trained in the use of the IUSIR tool by a Health Science professor with a two decades of interprofessional education and practice experience. In particular, observers were introduced to the many behaviors to observe that constitute each of the items being scored. Over the course of that month, four, 30-minute long, interprofessional video scenarios, (similar to what occurs in the IPE Simulation Event) and a live, practice interprofessional scenario staged in the simulation lab were viewed and rated by the trainees. Once consistency of agreement was reached (within 1 point), the observers were assigned to observe one of the four simulation rooms that would hold fall and spring IPE Simulation Events.

Phase II: IPE Simulation Events

On one occasion (either fall and spring), both the Experimental and Control Groups met at a clinical simulation center at a medical school. Prior to the IPE Simulation Events, all participants participated in a 15-minute pre-briefing on their IPE Simulation Event scenario with medical and nursing faculty members, orienting to the simulation room, manikin, and equipment. All Control Group participants completed a pretest JSAPNC given by research assistants and placed in a sealed envelope, immediately before they entered the simulation center.

Participants in the Experimental Group were divided into teams consisting of a medical student and a nursing student. Control group participants were also divided into teams consisting of a medical student and a nursing student. Each team was placed into one of four simulation rooms. A 30-minute long, interprofessional simulation scenario was performed. The nursing student performed a nursing assessment on the simulated patient/manikin, communicated assessment and recommendation to the medical student, and both collaborated to determine an appropriate plan of care. A 30-minute long debriefing session with medical and nursing faculty immediately followed as a standard part of the event. All teams rotated through the process to complete their simulation scenario.

The simulation center housed eight simulation rooms observable through two-way windows for sight and for microphones to collect sound. As soon as the medical and nursing student teams entered their simulation rooms, observers recorded team communication behaviors (energy, closed-loop communication, input/patient care, clinical impression, patient education, and reassessment). As soon as the simulation was stopped under direction of the observation room personnel, observers stopped recording.

Immediately following the simulation, all Experimental and Control Group participants completed the written posttest JSAPNC tool given by the research assistants and placed in a sealed envelope.

Analysis

Data for the JSAPNC was entered into IBM SPSS Statistics 24 (IBM, 2016). The significance level was set at $p<.05$. Descriptive statistics were computed for survey items and composite scores.

A Repeated Measures ANOVA was used to compare mean JSAPNC scores prior to the Computer Module, prior to the IPE Simulation Event, and again after the IPE Simulation Event for the Experimental Group.

A paired samples t-tests was used to assess changes in JSAPNC scores among the Control group prior to the IPE Simulation Event and after the event.

All data for the IUSIR was entered into IBM SPSS Statistics 24 (IBM, 2016). Team total scores were calculated. Paired samples t-tests were used to assess pre-post changes in scores in both the Experimental and Control Groups. An independent t-test was used to compare Experimental and Control Groups on team mean scores.

4. Summary of Findings

Experimental Group - JSAPNC

A total of 42 individuals participated in both the Computer Module and IPE Simulation Events, however, 6 were removed due to missing data (n=36). The participants consisted of 26 females and 9 males. One participant did not identify their gender. Fourteen of the participants were medical students and the remainder (n=22) were nursing students.

The results of the repeated measures ANOVA revealed a statistically significant difference between the JSAPNC scores (f(1.330, 46.548)=108.790, p=.031).

A series of paired-samples t-tests were used to determine differences between the individual assessments. A statistically significant difference was found between the pre-Computer Module JSAPNC test (M=54.58, SD=6.79) and the pre-IPE Simulation Event test (M=56.69, SD=3.21) (t(35)=-2.058, p=0.047).

In addition, a statistically significant difference was found between the pre-Computer Module test (M=54.58, SD=6.79) and the post-IPE Simulation Event Test (M=57.28, SD=2.54) (t(35)=-2.283), p=0.029).

No statistically significant difference was found between the pre-IPE Simulation Event test and the post-IPE Simulation Event test.

Control Group - JSAPNC

A total of 41 individuals participated in the IPE Simulation Event, however, two cases were removed due to missing data (n=39). The participants consisted of 27 females and 12 males. Fourteen of the participants were medical students and the remainder (n=25) were nursing students.

A paired-samples t-test was used to compare pre-post IPE Simulation Event JSAPNC scores. The results of the paired-samples t test revealed a statistically significant difference between the pretest JSAPNC scores (M=55.33, SD=2.58) and the posttest JSAPNC scores (M=56.41, SD=2.50) (t(38)=-3.571, p=.001).

Comparison Between Experimental and Control Group JSAPNC

An independent samples t-test was used to assess differences between Experimental and Control groups for pre-IPE Simulation Event JSAPNC. There were two questions which produced significant differences between groups. When asked "a nurse should be viewed as a

collaborator and colleague with a physician rather than his/her assistant," Experimental group participants (M = 3.97, *SD* = .158) responded with more agreeance than Control group participants (M = 3.80, *SD* = .459; *t*(38) = -2.08, *p* = .044). When asked "there are many overlapping areas of responsibilities between physicians and nurses," Experimental group participants (M = 3.87, *SD* = .361) responded with more agreeance than Control group participants (M = 3.54, *SD* = .596; *t*(67.77) = -2.06, *p* = .043).

An independent samples *t*-test was again used to assess differences between Experimental and Control groups for the post-IPE Simulation Event JSAPNC. Two questions had statistically significant differences between groups. When asked "nurses are qualified to assess and respond to psychological aspects of patients' needs," Experimental group participants (M = 4.00, *SD* = .000) responded with more agreeance than Control group participants (M = 3.90, *SD* = .307; *t*(44.98) = -2.29, *p* = .026). When asked "there are many overlapping areas of responsibilities between physicians and nurses," Experimental group participants (M = 3.85, *SD* = .408) responded with more agreeance than Control group participants (M = 3.64, *SD* = .537; *t*(55.68) = -3.06, *p* = .003).

Table 1
Mean scores for each Jefferson question (Experimental group)

	Pre-Module	**Pre-IPE**	**Post-IPE**
Q1	3.84 (.520)	3.98 (.149)	3.98 (.149)
Q2	3.76 (.57)	3.96 (.208)	4.00 (.000)
Q3	3.69 (.596)	3.87 (.344)	3.98 (.149)
Q4	3.89 (.487)	3.93 (.252)	3.96 (.208)
Q5	3.87 (.505)	3.96 (.208)	3.98 (.149)
Q6	3.61 (.655)	3.86 (.347)	3.86 (.409)
Q7	3.53 (.588)	3.73 (.447)	3.78 (.471)
Q8	2.25 (.918)	2.16 (1.07)	2.09 (.984)
Q9	3.71 (.589)	3.87 (.344)	3.84 (.424)
Q10	2.00 (.769)	2.04 (.999)	1.91 (.973)
Q11	3.73 (.580)	3.93 (.252)	3.89 (.318)
Q12	3.66 (.645)	3.84 (.370)	3.91 (.291)
Q13	3.89 (.487)	3.96 (.208)	4.00 (.000)
Q14	3.82 (.576)	3.93 (.252)	3.96 (.208)
Q15	3.66 (.568)	3.89 (.321)	3.98 (.151)

IUSIR Results

A total of 27 teams were assessed using the team communication items IUSIR. Of these 27 teams, 13 were in the Control Group, and 14 comprised the Experimental Group. There were no statistically different scores in the team scores on the IUSIR between the Control Group (M = 21.23, SD = 8.31) and the Experimental Group (M = 23.57, SD = 5.72), t(25) = -0.86 , *p* = 0.40.

5. Recommendations

The results of the study revealed some evidence to support the positive impact of the interventions on interprofessional care. Evidence from the Control Group supports that the IPE Simulation Event was effective in increasing interprofessional collaborative attitudes among the participants, based on the small, yet statistically significant increase in JSAPNC scores.

Evidence from the Experimental Group supports effectiveness of the Computer Module but not necessarily the IPE Simulation Event in increasing interprofessional collaborative attitudes. Scores for the JSAPNC did increase overall between the pre-Computer Module test and the post-IPE Simulation Event test. However, no statistically significant change in JSAPNC scores was noted between the pre-IPE Simulation Event test and the post-IPE Simulation Event test.

The combined evidence suggests that both the Computer Module and IPE Simulation Event alone may be effective in increasing interprofessional collaborative attitudes and that the combination of the two interventions may not be necessary. It should be noted that the relatively high JSAPNC scores, combined with a small sample size, may have made detecting statistical significance difficult.

The results of IUSIR failed to provide evidence that the combination of Computer Module and IPE Simulation Event was a more effective option than the IPE Simulation Event alone in improving communication scores. Additional studies would need to be conducted to determine if the limitations of this study impacted the results. Further, future researchers should implement a pre-post-test design to better assess the impact of the interventions on communication. Upon confirmation of these results in future studies, educational institutions can benefit from using either intervention to train students in interprofessional care. As both interventions present unique challenges in regards to technology requirements, facilities, and financial commitments, having multiple effective intervention options will be of great benefit.

Due to small sample sizes because of limited students in the programs and selection of medical and nursing students from two universities in the same town for convenience, generalizability of results was limited and possibly resulted in convenience sample bias. In efforts to address sample size, the simulation was conducted twice over the course of one year to increase participant numbers. The nursing students were from a class that included the simulation event as part of their coursework, however the medical students were volunteers. Because this was part of their normal coursework, there may be bias among the nursing students altering how they approached the simulation. Also, because the Control Group was in the same schools and town as the Experimental Group, participants may have potentially shared or discussed information outside of the events, minimizing differences.

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