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Canadianizing and Evaluating a Virtual Simulation Program for Community Health

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The *Guidelines for Quality Community Health Nursing Clinical Placements for Baccalaureate Nursing Students* in Canada recommend vigorous clinical education for students to attain the defined beginner's competencies (Canadian Association of Schools of Nursing [CASN], 2010b). This is supported by the *National Nursing Education Framework* (CASN, 2022), which includes learning outcomes for nursing practice related to community health. Even though the onset of the COVID-19 pandemic disrupted clinical learning opportunities for community health (Ahmed et al., 2020), challenges in meeting the established guidelines for clinical practice existed before the pandemic (Chircop & Cobbett, 2020; Pijl-Zieber et al., 2015). However, the pandemic magnified the need for new and efficacious strategies to tackle the problems of curriculum design, student expectations, gaps in theory-practice education, partnerships between community groups and nursing schools, and partnering students with registered nurses working in community settings (Wik et al., 2022; Williams et al., 2016). The COVID-19 pandemic also highlighted the need for teaching and learning methods that can deliver learning opportunities in situations and periods when the traditional or status quo method of teaching is not possible (Zaragoza-García et al., 2021).

Therefore, nurse educators need to integrate innovative pedagogies to enable students to acquire the required competencies (Chircop & Cobbett, 2020; Pijl-Zieber et al., 2015). The COVID-19 pandemic contributed to the rapid adoption of distance learning programs to replace traditional teaching methods in several schools of nursing (Luo et al., 2021). The use of simulation as a teaching technique in nursing education is popular and recognized (Haugland & Reime, 2018). Verkuyl et al. (2017) describe virtual simulation as a computerized imitation that consists of (a) a reasonable case study of clients, (b) the application of knowledge in an activity, and (c) learner engagement in the care-provider role.

Nursing students who used virtual simulation for community health clinical learning had learning outcomes equal to or better than those for students who used traditional methods (Chircop & Cobbett, 2020; Verkuyl et al., 2017). A multisite evaluation study of *Sentinel City*, a virtual simulation for community health clinical, across nine schools of nursing in Canada revealed positive learning outcomes (Chircop et al., 2022). Although the positive contribution of *Sentinel City* to knowledge and skills acquisition has been documented, changes to the program, reflecting the Canadian health care system and context, were repeatedly suggested by students (Chircop & Cobbett, 2020; Chircop et al., 2022; Wik et al., 2022). Consequently, *Sentinel City Canada* (*SCC*) was developed to improve Canadian students' learning experiences with this simulation program. In this paper, we describe the collaborative development of the Canadian version of the previously existing U.S.-based *Sentinel City* and present its subsequent evaluation. This study is a replication of the study in our previously published work (Chircop et al., 2022), using the same survey and learning outcomes but this time after students used the Canadian version, *SCC*.

Adapting *Sentinel City* to the Canadian Context

Sentinel City has been used in our nursing programs for the past few years, with positive evaluative outcomes; however, we constantly needed to adapt information to fit the Canadian context. For the most part, the virtual city, characters, and general layout worked well, but the simulation required alterations to make the city more visually Canadian and the assignments more applicable and "real" within the Canadian context and mapped to Canadian standards and competencies. By attending to realism and fidelity, which are key components of simulation design in nursing (Silva et al., 2022), we believed that usability in Canadian nursing education programs would be enhanced and enable students to better connect the concepts to real life in Canada. In conversation, we felt that we could harness the expertise of community health nurses in our country

to contribute to an adaptation of *Sentinel City* that would reflect the Canadian nursing educational landscape (*Entry-to-Practice Public Health Nursing Competencies*, *Curricular Guideline for Integrating Community Health in Baccalaureate Programs of Nursing*), Canadian demographics (including Indigenous and French characters), billboard signage, and so on. This work involved five aspects that are in accordance with simulation design best practices (International Nursing Association for Clinical Simulation and Learning [INACSL] Standards Committee, 2021a):

1. Development of a theoretical framework for the adaptation of *Sentinel City* to the Canadian context
2. Revision of the *Sentinel City* assignment catalogue to fit the Canadian context
3. Subtle visual changes to make the city look Canadian
4. Character stories edited to represent Canadian culture, demographics, and health care practices, public policy, and so on
5. Demographics information specific/important to reflect Canada

Upon receiving funding, the adaptation was implemented. The original developers of *Sentinel City*, Healthcare Learning Innovations, provided information technology support to complete our requested changes to the city. To avoid conflict of interest, the co-developers requested no monetary compensation. A contributor's list was included in the Canadian version to acknowledge the contributions of each person involved in the adaptation.

Background and Literature Review

The use of virtual simulation in health care education has steadily increased (Jeong & Lee, 2019). Several schools of nursing introduced virtual simulations to complement or substitute for clinical practice during the COVID-19 pandemic (Fogg et al., 2020; Kim et al., 2021; Verkuyl et al., 2021; Wik et al., 2022). Virtual simulation in nursing education is an effective pedagogical approach for meeting student learning outcomes (Chircop & Cobbett, 2020; Chircop et al., 2022). Benefits include pedagogical safety, improvement of psychomotor skills, and knowledge and skill acquisition (Chircop & Cobbett, 2020; Chircop et al., 2022; Haraldseid et al., 2015; Meiers & Russell, 2019). Recent systematic reviews confirm virtual simulation is effective in improving students' clinical performance and knowledge acquisition (Sim et al., 2022), critical thinking, and self-confidence (Foronda et al., 2018), as well as in decreasing students' anxiety levels (Gebreheat et al., 2022).

Purpose

The purpose of this research was to evaluate student learning outcomes after implementation of *SCC* across three different sites in two provinces in Canada. This replication study investigated whether there were any differences in use and learning since the city has been Canadianized. Our study was guided by the following research questions:

1. What is the relationship between the use of the *SCC* virtual simulation program for student community/public/population health nursing clinical learning and students' ability to meet their learning outcomes among different Canadian schools of nursing?
2. How do students' experiences differ and/or align across the different jurisdictional sites?

Methodology

This study was guided by constructivist and experiential learning concepts (Huang & Liaw, 2018; Poikela & Teräs, 2015). Students worked in teams and were supervised by a clinical instructor to facilitate reflective practice of their learning experiences. This cross-sectional study used a mixed methods approach, inviting participants to complete an online survey related to learning outcomes and the experience of learning community health nursing (CHN) practice through the use of *SCC.*

The study population was registered nursing students (n = 396) in postsecondary nursing programs at two universities and one college site of a university collaborative program who had completed their community/public/population health nursing clinical with the use of *SCC* during the 2021–2022 academic year.

Survey Design

A descriptive survey was used to evaluate the use of *SCC* and student learning outcomes. Data collection occurred using the 21-question Student Survey of Virtual Community/Public/Population Health Clinical Experience using *SCC* (Chircop et al., 2022). The Likert-scale survey questions were informed by the CASN (2018) *Curricular Guidelines for Integrating Community Health in Baccalaureate Programs of Nursing*. The questions were structured according to the following content domains: (a) Knowledge/critical thinking (CHN process, five principles of primary health care, determinants of health, population health perspective, recognition of health inequities); (b) practice (application of nursing process specifically assessment [data collection and analysis], evidence-informed practice, planning, implementation and evaluation of population health interventions); (c) communication and collaboration (building/establishing relationships, identifying priority/target populations, identifying and interviewing key informants, communicating with other sectors); (d) legal, ethical, and professional accountability (teamwork, accountability for own contribution, scope of practice, lifelong learning, ethical practice, locating and using jurisdictional health policy); and (e) leadership (advocacy for health equity, advocacy with decision makers).

Ethical approval was obtained from all participating schools in this study. Immediately after completing their community clinical with *SCC*, nursing students received information about the study from the schools' administrative support persons in an email invitation to participate via their schools' Listserv. Consenting participants completed the online survey using Opinio software.

Analysis

The quantitative questions were analysed using descriptive statistics. Inferential statistics (analysis of variance [ANOVA]) examined the relationship between the use of *SCC* and the ability to meet course learning outcomes. Qualitative data were analyzed using thematic analysis following a six-step process as outlined by Braun and Clarke (2022): (a) become familiar with the data, (b) generate initial codes, (c) search for themes, (d) review themes, (e) define themes, and (f) write up the findings.

Results

Demographics

A total of 90 students engaged in the survey, with 72 completed responses and a response rate of 18.2%. The numbers and percentages differ because some students chose not to answer some questions. The majority, 47.56% (n = 39) of students were between the ages of 21 and 25 years, and most of the students identified as female. Most of the respondents, 48.78% (n = 40), were from Nova Scotia, followed closely by Ontario with 41.46% (n = 34) students. The third school is in Southern Ontario and had 9.76% (n = 8) students. Most of the students, 52.44% (n = 43), were in year 2 of their nursing program and 40.24% (n = 33) in year 4. More than half, 68.75% (n = 55), were enrolled in the direct-entry program. Across all the sites most of the students, 67.07% (n = 55). had no university credit course before enrolling in the nursing program.

Virtual Simulation Experience and Computer Proficiency

Most of the students, 52.44% (n = 43), had experience with previous computer simulation learning including Shadow Health (https://evolve.elsevier.com/education/simulations/shadow-health/), health history simulation, mental health, labour, delivery, and pediatrics. More than half, 53.66% (n = 44), had never participated in a virtual simulation learning experience before using *SCC*. The majority, 47.5% (n = 38), of students across the sites rated their use of computers as "proficient," and 40% (n = 32) felt "very proficient." About 42.5% (n = 34) felt "confident" with the use of computers, and only 1.25% (n = 1) felt "not confident."

Learning Outcomes

Knowledge/Critical Thinking

Across the three sites, most students declared that they were "confident" or "very confident" in their knowledge/critical thinking in all indicators, as shown for each item in Table 1. The highest knowledge-related confidence was expressed for their ability to apply a population health perspective (upstream thinking) (M = 4.04, SD = 1.0), and 86.31% (n = 63) were "confident" or "very confident" in their ability to recognize health inequities (M = 4.25, SD = 0.97).

Table 1

Confidence in Knowledge/Critical Thinking

Items	N[a]	NC n (%)	SC n (%)	NT n (%)	C n (%)	VC n (%)	M	SD
Knowledge about CHN process	73	4 (5.48)	7 (9.59)	9 (12.33)	30 (41.1)	23 (31.51)	3.84	1.14
Understanding of a population health assessment	73	5 (6.85)	3 (4.11)	7 (9.59)	33 (45.21)	25 (34.25)	3.96	1.11
Ability to plan a population health intervention	73	3 (4.11)	10 (13.7)	12 (16.44)	29 (39.73)	19 (26.03)	3.7	1.13

Ability to integrate the 5 principles of primary health care into my practice	73	6 (8.22)	3 (4.11)	20 (27.4)	23 (31.51)	21 (28.77)	3.68	1.18
Ability to apply a population health perspective (upstream thinking)	73	3 (4.11)	2 (2.74)	10 (13.7)	31 (42.47)	27 (36.99)	4.05	1.0
Ability to recognize health inequities	73	3 (4.11)	1 (1.37)	6 (8.22)	28 (38.36)	35 (47.95)	4.25	0.97

Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question; NC = not confident at all; SC = slightly confident; NT = neutral; C = confident; VC = very confident.
[a] Represents 17 missing responses.

Practice

Table 2 shows students' confidence in their practice of the nursing process across all items, including population health assessment (data collection and analysis), planning, implementation and evaluation. Specifically, over 75% of the students were "confident" or "very confident" in their ability to collect secondary data, critically analyze data, and participate in a population health assessment. The highest level of confidence was indicated in their ability to critically analyze data (*M* = 3.97, *SD* = 0.93).

Table 2
Level of Confidence in Practice

Items	*N*[a]	NC *n* (%)	SC *n* (%)	N *n* (%)	C *n* (%)	VC *n* (%)	*M*	*SD*
Ability to collect secondary data	73	6 (8.22)	4 (5.48)	6 (8.22)	32 (43.84)	25 (34.25)	3.9	1.18
Ability to collect primary data	73	8 (10.96)	6 (8.22)	7 (9.59)	30 (41.1)	22 (30.14	3.71	1.29
Ability to critically analyze data	73	3 (4.11)	2 (2.74)	8 (10.96)	41 (56.16)	19 (26.03	3.97	0.93
Ability to integrate evidence in planning for an implementation	73	5 (6.85)	2 (2.74)	12 (16.44)	36 (49.32)	18 (24.66	3.82	1.06
Ability to participate in a population health assessment	73	6 (8.22)	5 (6.85)	6 (8.22)	36 (49.32)	20 (27.4)	3.81	1.16
Ability to participate in planning for population/ community health interventions	73	6 (8.22)	8 (10.96)	10 (13.7)	32 (43.84)	17 (23.29)	3.63	1.2

Ability to participate in implementing population/ community health interventions	73	5 (6.85)	9 (12.33)	9 (12.33)	34 (46.58)	16 (21.92)	3.64	1.16
Ability to participate in evaluating community health interventions	73	5 (6.85)	5 (6.85)	11 (15.07)	33 (45.21)	19 (26.03)	3.77	1.12

Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question; NC = not confident at all; SC = slightly confident; NT = neutral; C = confident; VC = very confident.
[a] Represents 17 missing responses.

Communication and Collaboration

The majority of students indicated their confidence in establishing relationships with community members, interacting and interviewing key informants, and communicating with other sectors and professionals working in the community. The highest level of confidence (*M* = 4.22, *SD* = 0.84) was indicated for their ability to identify a target/priority population (see Table 3).

Table 3
Confidence in Community and Collaboration

Items	*N*[a]	NC *n* (%)	SC *n* (%)	N *n* (%)	C *n* (%)	VC *n* (%)	*M*	*SD*
Ability to establish relationships with community members	72	4 (5.56)	10 (13.89	9 (12.5)	23 (31.94)	24 (36.11)	3.79	1.23
Ability to identify a target/priority population	72	2 (2.78)	-- (--)	7 (9.72)	34 (47.22)	29 (40.28)	4.22	0.84
Ability to interact and interview key informants	72	6 (8.33)	12 (16.67)	11 (15.28)	24 (33.33)	19 (26.39)	3.53	1.28
Ability to communicate with other sectors and professionals working in the community	72	5 (6.94)	9 (12.5)	12 (16.67)	28 (38.89)	18 (25.0)	3.62	1.19

Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question; NC = not confident at all; SC = slightly confident; NT = neutral; C = confident; VC = very confident.
[a] Represents 18 missing responses.

Legal, Ethical, and Professional Accountability

When students were asked about their confidence in their ability to be an effective team player and be accountable for their practice, the majority indicated "confident" or "very confident." Almost all (90%) of the students were "confident" or "very confident" in their desire for lifelong learning and in their ability to adhere to ethical practice (Table 4). Most students were "confident" or "very confident" in their ability to locate local, provincial, and national public health policies.

Table 4
Confidence in Legal, Ethical, and Professional Accountability

Items	*N*[a]	NC *n* (%)	SC *n* (%)	N *n* (%)	C *n* (%)	VC *n* (%)	*M*	*SD*
Ability to be an effective team player/ collaborator	72	1 (1.39)	2 (2.78)	6 (8.33)	27 (37.5)	36 (50)	4.32	0.85
Ability to be accountable for my practice	72	1 (1.39)	2 (2.78)	5 (6.94)	27 (37.5)	37 (51.39)	4.35	0.84
Desire for lifelong learning	72	1 (1.39)	1 (1.39)	3 (4.17)	24 (33.33)	43 (59.72)	4.49	0.77
Ability to adhere to ethical practice	72	1 (1.39)	-- (--)	3 (4.17)	26 (36.11)	42 (58.33)	4.5	0.71
Ability to locate local, provincial, and national public health policies	72	3 (4.17)	7 (9.72)	8 (11.11)	29 (40.28)	25 (34.72)	3.92	1.11

Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question; NC = not confident at all; SC = slightly confident; NT = neutral; C = confident; VC = very confident.
[a] Represents 18 missing responses.

Leadership

The majority of students indicated they were "confident" or "very confident" in their ability to advocate for health equity. This is, in other words, their ability to influence nursing and health care through a social and political analysis of current health care issues and application of leadership skills. Slightly more than half, 58.3% (*n* = 42), felt "confident" or "very confident" in their ability to influence decision makers (Table 5). The students had higher confidence in their ability to advocate for health equity (*M* = 4.19, *SD* = 0.88) compared with their ability to influence decision makers (*M* = 3.42, *SD* = 1.37).

Table 5
Level of Confidence in Leadership

Items	*N*[a]	NC *n* (%)	SC *n* (%)	NT *n* (%)	C *n* (%)	VC *n* (%)	*M*	*SD*
Ability to advocate for health equity	72	1 (1.39)	3 (4.17)	7 (9.72)	31 (43.06)	30 (41.67)	4.19	0.88
Ability to influence decision makers	72	10 (13.89)	10 (13.89)	10 (13.89)	24 (33.33)	18 (25.0)	3.42	1.37

Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question; NC = not confident at all; SC = slightly confident; NT = neutral; C = confident; VC = very confident.
[a] Represents 18 missing responses.

Meeting Course Objectives, Overall Satisfaction With *SCC*, and Recommendation

Almost half, 48.57% (n = 34), of the total respondents agreed that *SCC* helped them to achieve course objectives (M = 3.34, SD = 1.59).

Table 6

SCC Virtual Simulation Experience Helped Me Achieve the Course Objectives

	N[a]	Disagree (%)	Slightly disagree (%)	Neutral (%)	Slightly agree (%)	Agree (%)	M	SD
SCC virtual simulation experience helped me achieve the course objectives	70	13 (18.57)	12 (17.14)	11 (15.71)	6 (8.57)	28 (40)	3.34	1.59

Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question.
[a] Represents 20 missing responses.

Regarding satisfaction with *SCC* use, the students had differing views. Only 38.89% (n = 28) students indicated that they were satisfied with *SCC* use, and 22.22% (n = 16) remained neutral.

Table 7

Satisfaction With SCC Use

	N[a]	Disagree (%)	Slightly disagree (%)	Neutral (%)	Slightly agree (%)	Agree (%)	M	SD
I am satisfied with my use of *SCC*	72	18 (25)	10 (13.89)	16 (22.22)	11 (15.28)	17 (23.61)	2.99	1.51

Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question.
[a] Represents 18 missing responses.

Slightly more than half, 50.7% (n = 36), of the students indicated that they would not recommend *SCC* for future use.

Table 8

Recommendation of Future Use of SCC

Choices	N[a] (%)	Yes (%)	No (%)	Prefer not to answer (%)	M	SD
Would you recommend future use of *SCC*?	71 (100%)	33 (46.48)	36 (50.7)	2 (2.82)	1.56	0.55

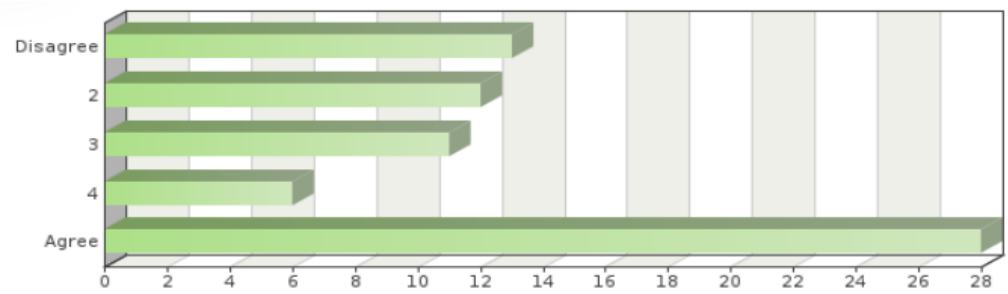
Note. Adjusted relative frequencies for entries.
N = total number of participants who responded to the question.
[a] Represents 19 missing responses.

Relationship Between the Use of *SCC* and Learning Outcomes

What is the relationship between the use of *SCC* for student community/public/population health nursing clinical learning and students' ability to meet their learning outcomes among different Canadian schools of nursing? As illustrated in Figure 1, the majority of students who answered this question (40%) indicated that they met learning outcomes.

Figure 1

Learning Outcomes



How Did Students' Experiences Differ and/or Align Across the Jurisdictions?

Data were analyzed using ANOVA to identify any significant differences among students from each jurisdiction (school) in relation to their perception of the use of *SSC* in meeting their course learning objectives. As Levene's test for equality of variances based upon the mean was not significant (0.106, p =.90), ANOVA was used with the Tukey HSD as the post hoc test. ANOVA indicated that there were statistically significant differences among the jurisdictions (F stat = 6.503, p = .003), concluding that mean scores were not equal across all three jurisdictions. Post-hoc analysis was completed using Tukey HSD to provide further information related to which jurisdiction (school) was assessed to be different and the direction of the difference. There were statistically significant mean differences among two of the three jurisdictions (Table 9). Students from Nova Scotia (M = 3.97) reported meeting course learning outcomes significantly more often than students from Ontario (M = 2.66, p = .002). There were no statistically significant differences between Nova Scotia and Southern Ontario (M = 3.00, p = .301). There were no statistically significant differences in the students' report of meeting course learning outcomes between Ontario and Southern Ontario (p = .861).

Table 9

Jurisdictional Learning Outcomes

	N	M	SD	Std. error	95% CI for mean		Min	Max
					Lower bound	Upper bound		
Nova Scotia	35	3.97	1.48	.6512	.4292	2.203	1.00	5.00
Southern Ontario	6	3.00	1.67	.6610	-.589	2.52	1.00	5.00
Ontario	29	2.66	1.42	.3701	-1.239	1.929	1.00	5.00

Qualitative Themes

Through open-ended questions, participants were asked how *SCC* had supported their learning in the community clinical experience. The following three main themes were generated from their responses: (a) learning environment, (b) developing professional competencies, and (a) beneficial learning tool during the pandemic.

Learning Environment

The learning environment revealed three subthemes: (a) safety, (b) pedagogy, and (c) debriefing and activities.

Safety. *SCC* provided participants an opportunity to learn without being in the community. This process eased them into real-life settings and allowed a safe opportunity to explore scenarios they may not have experienced in a community agency:

> I think *Sentinel City* was a great first exposure to public health and the fact that it was online was helpful in the fact that I could learn and go through the nursing process at my speed, and it was a good way to ease into real life situations.

Pedagogy. From a pedagogical perspective, participants noted that the methods used in *SCC* delivery positively supported their learning in the community clinical course, using words like "inclusive" and "immersive" while providing "equal opportunity" and a "standardized" learning experience for all students. The participants also indicated that they felt like part of a team and that *SCC* promoted collaboration. A few appreciated the complexity of *SCC* and noted that despite the perceived difficulty of the course content, the simulation platform facilitated understanding. They reflected on the diverse learning opportunity it created through its diverse city as opposed to learning through one agency or neighbourhood:

> *Sentinel City* has supported my learning in ways that I could safely do a survey of multiple communities and populations. It gives a diverse population with specific needs that you can identify your (the) knowledge gained when you start seeing these communities. I feel the content in this class is really hard to put together unless you're using it and this is a good platform to facilitate that.

Several participants' responses indicated that *SCC* was a waste of time and resources, and they suggested modifying the application of *SCC* over a 1-day event: "It was way too long and could have been a 1-day thing… This was a waste of a whole week and was unnecessarily long."

Debriefing. One major feature of simulation that several participants enjoyed was the debriefing and discussions, which helped promote collaboration and teamwork. They acknowledged that the discussions contributed significantly to their learning, and the interactive nature of these sessions was helpful. The *SCC* program includes a simulation facilitator's guide based on INACSL standards for debriefing, including psychological safety, a structure, and prompts for the discussions.

There were a few isolated responses that indicated that the prebriefing and debriefing did not discuss activities. One participant noted: "We also did not discuss the activities in our debrief sessions, so it was very much independent work with no opportunity to learn from the experiences of other students."

Developing Professional Competencies

A major highlight of using *SCC* was its contribution to the students' ability to synthesize knowledge, skills, and attitudes. We identified two subthemes: (a) acquiring and consolidating knowledge, and (b) skills and attitude development.

Acquiring and Consolidating Knowledge. Overall, the simulation contributed significantly to the students' knowledge of CHN, reinforcing content learned in class and encouraging transfer/application of knowledge. Some students expressed that they gained more knowledge by using *SCC* than when learning theory in class. A few expressed how it helped them understand, clarify, and experience the role of the community health nurse. One participant stated that the simulation highlighted the political aspect of CHN:

> I have a better idea of what it's like to be a community health nurse after doing this clinical, running around doing interviews, scrutinizing data and policy, and brainstorming plans. The political nature of nursing was made clear in this clinical.

CHN concepts embedded in the *SCC* simulation, such as community visualization, understanding policies, community feedback, health indicators, and population assessment, were also part of participants' learning. The simulation allowed participants to recognize the impact of different interventions. In contrast, some noted that *SCC* did not contribute to their knowledge or learning applicable to the community nursing practicum.

Skills and Attitude Development. The contribution of *SCC* to skills development was another strong sub theme. Some reflected on skills learned while others emphasized how it affected their attitudes. They acknowledged that it enhanced their competencies in problem solving, collaboration, critical thinking, data collection, processing, and interviewing skills. It also promoted participants' awareness of health inequities, personal bias, and intricacies of which they were unaware, contributing to positive attitude development and deepening their understanding of assessment and decision-making:

> *Sentinel City* was an eye-opening experience that helped me get a real-life picture of what health inequities look [like]. It allowed me to examine my biases and as well as work in teams to strengthen my communication and problem-solving skills.

Irrespective of *SCC* contribution to knowledge, skills, and attitude, some responses expressed that it was not helpful and a complete waste of time. Some believed that the activities and assignments were confusing and did not support their learning or improve their knowledge.

> I did not enjoy using *Sentinel City*. The activities felt confusing and disjointed from the program. *Sentinel City* sucks. It was a complete waste of time; I did not learn anything through this program that could help me in my nursing practice.

Beneficial Learning Tool During the Pandemic

Participants recognized the benefit of using *SCC* during the COVID-19 pandemic, noting that it is particularly helpful in situations where in-person learning was difficult or impossible: "Due to the unforeseen circumstances, it provided a community to tour, assess, and evaluate. It gave us the opportunity to interact with different community members and neighbourhoods to assess and plan interventions." Although the participants did not dispute its use during the pandemic, some felt it was not ideal as an alternative to real-life experience, citing that the knowledge gained from a computer is not applicable in real life.

Recommendations for Future Use

Overall, participants' responses to the open-ended question about their recommendations for using *SSC* in the future were mixed. Several features of *SCC* provided a positive experience for the participants who offered reasons why they would support its future use. They include its suitability as a complement with real-life clinical placements and its ability to support CHN knowledge development.

Suitable/Ideal as a Complement

The students noted that *SCC* was useful as an alternative in the absence of in-person learning and felt it could be ideal for periods in which community placements would not be available. They emphasized its inadequacy for sole replacement and stated their preference for "real, community-based placements" as "the ideal for learning"" about CHN. "I think it is great for circumstances where you are unable to be within the community."

Improved Knowledge

Some participants said that they learned a lot of useful information and felt it created an avenue to learn core concepts of CHN, solidified previous information, and provided "good knowledge and insight" into the role of CHN and the nursing process. The facilitated discussions during prebriefing and debriefing provided more "standardized" and "equal learning opportunity" for all students: "I thought it was an excellent introduction to the whole process of community health nursing, and it fostered stimulating conversation and made me more familiar with local plights and services."

In addition, it provided an opportunity to expose the students to more diversity than the students would typically experience during a clinical placement with one agency: "I would recommend it. It shows more diversity than could be seen in a smaller community," and "*Sentinel City* was a unique experience. It provided many perspectives of population and public health."

In contrast, there were several challenges related to the use of *SCC* including persistent technical issues, comparing *SCC* with real-life situations, and unclear instructions.

Technical Issues

Participants noted that *SCC* was difficult to navigate, was slow, had poor graphics, had an unfriendly user interface, was not visually appealing, and was not interactive enough.

> Other than the fact that the activities in general were helpful …, the program itself was very pixelated and graphics could be hard to see at points which made it challenging to fully get a good view of the community.

Further, participants were unable to save or track their progress within the platform. Some students would have appreciated the possibility of receiving immediate feedback from assignments.

Comparison With Real-Life Placement

Some participants perceived that using the computer screen "robs students of the opportunity for real world experience" or limited their understanding of CHN:

> I feel like the use of *Sentinel City* limited my understanding of community health and population needs within my own community and real-life communities within Canada.

> Instead of focusing on services we could implement within our own communities, we had a narrower view of what could be implemented within *Sentinel City*, and I feel that the services offered within *Sentinel City* did not give me a full understanding of what stakeholders I would need to reach out to within my own community and in real life.

Unclear Assignments and Instructions

SCC was used to complete assignments, and some participants believed that the assignments were unclear. Some voiced dismay that external research was required to complete some of the assignments rather than gleaning information from within *SCC*. Additionally, some information embedded in the platform did not match the given assignment:

> I found that a lot of the information I needed to fill out a given activity was missing or not there at all … Similarly, the activity regarding family assessment required me to fill out a sheet with information regarding the parents and children of the family, to which I could not find.

Modifications for Future Use

Participants recommended modifications to *SCC* if it is to be considered for future use. They suggested to include *SCC* in the third year rather than the fourth year of the nursing program. One participant further recommended that a previous background knowledge would serve to improve the experience of *SCC*. They also wanted it modified to interview real people. Other suggestions include having clear written instructions, splitting large documents, evenly distributing workload over several days, and creating easier access to previous activities and information.

Discussion of Findings

Our study findings provide evidence that *SCC* can be a valuable learning tool for CHN clinical education that contributes to course learning outcomes. This is consistent with our previous studies. In fact, the overall mean of students indicating that *SCC* helped them achieve course objectives has increased from our previous studies, from a mean of 2.47 in 2020, to a mean of 3.11 in 2022, to a mean of 3.34 with the Canadian version (Chircop & Cobbett, 2020; Chircop et al., 2022). This implies that the adaptation of *Sentinel City* to our Canadian health care context has contributed to better learning outcomes.

The qualitative findings provide insight into student perceptions of the contribution of *SCC* to community clinical. The learning outcomes of students who used *SCC* varied across jurisdictions. This variance may be due to the timing when *SCC* was used (e.g., 1 day per week throughout a semester, or as a block clinical at the end of a semester), as well as different assignments/clinical activities across the schools. Several other factors, such as the year of the nursing program and the stream of the program, as well as educators' previous experience with simulation, may also contribute to these findings. Most of the students were in year 2, followed by year 4. Previous studies have reported that repetitive simulation strengthened students' learning outcomes and clinical competence (Al Gharibi & Arulappan, 2020; Kaddoura et al., 2016).

A significant finding of this study was the contribution of *SCC* to synthesizing knowledge, skills, and attitudes, and its role in increasing self-confidence and knowledge of CHN while reinforcing content learned in class. Our study findings corroborate previous findings in which the positive contributions of virtual simulation to students' confidence, knowledge, decision-making skills, and communication skills were documented (Aslan, 2021; Matsuda, Valdes, et al., 2022;

Tiffany & Hoglund, 2016). In the same vein, other studies (Chen et al., 2020; Chircop & Cobbett, 2020; Chircop et al., 2022; Fogg et al., 2020; Padilha et al., 2019) noted that virtual simulation made favourable contributions to knowledge, clinical judgement skills, clinical reasoning, and performance. Several participants described it as a great opportunity to learn CHN concepts and principles, a finding confirmed by Wik et al. (2022), who recently evaluated the use of *Sentinel City*.

The positive learning outcomes could also be attributed to the combination of *SCC* with pre-briefing, debriefing, and the choice of assignments/clinical activities. Like any other teaching tool, the way *SCC* is used, the educational guidance and support during its use, and the selection of learning activities that match learning outcomes make it more or less useful. According to Silva et al. (2022, p. 14) these are critical simulation design components categorized as "structural-methodological." Our findings contribute to evidence-informed practice and further development of health care simulation as promoted by the INACSL Standards Committee's (2021a) standard for simulation design. Since the beginning of our engagement with *SSC*, we have adapted our approach to meet all the criteria necessary for INACSL's standard on simulation design (Chircop & Cobbett, 2020; Chircop et al., 2022). Specifically, to Canadianize the simulation, we have engaged content experts to develop characters that would reflect Canadian Black, Indigenous, and 2SLGBTQ+ communities. Visual changes to the program reflect a Canadian city and population health data for clinical activities, which contribute to making the learning experience as real as possible and enhance the program's fidelity.

A further simulation design component, categorized as "theoretical-pedagogical" (Silva et al., 2022, p. 14), is reflected in *SCC.* From a pedagogical perspective, virtual simulation has been shown to increase students' retention of material and be positively received by students as a fun and engaging way to learn. Some studies described it as an efficient and convenient learning method (Foronda et al., 2018), as well as a cost-effective strategy (Foronda et al., 2018; Mathew et al., 2017), and enjoyable, interactive, and immersive (Saab et al., 2022). These attributes make it more memorable than conventional educational methods. This perspective aligns with the qualitative aspect of our study, in which participants described *SCC* as an interactive and immersive learning environment.

To add to this, the platform creates a fair, positive, and diverse learning environment. *SCC* exposes students to diverse and enriching experiences by exploring a variety of neighbourhoods. In traditional placements, students may be limited to one particular experience or community agency, a finding confirmed by Wik et al. (2022). *SCC* created a fair, uniform, and standardized learning environment, generating a comprehensive experience that is not left to chance, can be measured for effectiveness and quality (Chircop et al., 2022), and may improve rigour (McEwing et al., 2021). Consistency in clinical experiences provided through virtual simulation provides equal learning opportunities for the students (Chircop et al., 2022; Leighton et al., 2021; Wik et al., 2022).

The benefit of *SCC* as a learning tool that facilitates abstract learning in concrete application can be understood by students' experience with the challenging content of the course. They noted that the course content was complex and difficult to understand, and the *SCC* platform helped simplify and promote their understanding. This illuminates the need for simulation programs to maintain alignment among theory, practice, and learning outcomes.

Virtual simulation has been recognized for its contribution to the preparation for practice and the improvement of analytical skills (Akselbo et al., 2019; Isaza-Restrepo et al., 2018; Kononowicz et al., 2019; Luo et al., 2021; Tabatabai, 2020). Likewise, our findings show that *SCC* helped students acquire skills necessary for population health assessment, including data collection, analysis, and interviewing.

Moreover, our findings provide evidence that *SCC* provides a platform to learn about the political aspects of nursing. Students felt more convinced about their ability to advocate for health equity. The open-ended qualitative responses highlighted how *SCC* increased their awareness of health inequities and alerted them to personal biases and intricacies.

Anecdotally, many community health nurse educators maintain that only traditional placements at community-based agencies provide students with insights into the political nature of health, a position that lacks supportive evidence (Leighton et al., 2021; Pijl-Zieber et al., 2015). This issue resonates with the findings of Luo et al. (2021) in which students agreed that virtual simulation scenarios allowed them to understand the complexities of the issues in nursing. Similarly, students noted that the simulation increased their accountability for practice and revealed the impact of their decision-making.

Participants in our study clearly articulated that visiting the four diverse neighbourhoods within *SCC* enabled them to appreciate the environmental/sociostructural context within which inequities are produced and located. They gained a better understanding of the role of the nurse in population health (Matsuda, Prather, et al., 2022), which may or may not be the case in traditional placements, where preceptors may not be from the health sector.

Generally, virtual simulation experience has been noted to increase self-confidence (Chen et al., 2020; Kardong-Edgren et al., 2019; Verkuyl et al., 2017; Wright et al., 2018) and also promote self-directed learning (Chen et al., 2020). This aligns with our survey and the open-ended responses in which students noted that the experience with *SCC* makes them feel confident to go into real-life settings. Similarly, they noted that the ability to learn without the fear of making mistakes has boosted their confidence.

The development of clinical skills is important before exposing student nurses to the practice environments, and this requires creating experiences for students in controlled, safe environments. Nursing students make fewer mistakes when nursing programs incorporate simulations (Eyikara & Baykara, 2017). These study findings are congruent with our study findings that *SCC* is a safe way to learn. *SCC* allowed them to ease into real-life situations and learn skills they might not have had an opportunity to learn otherwise. This fact is supported by others (Chang & Weiner, 2016; Wik et al., 2022) who found that virtual simulations present students with virtual scenarios that would have been impossible to find or relate to in real life. Findings from our study agree with those of Foronda et al. (2018), which indicated that virtual simulation acts as a panacea to give students more educational opportunities in clinical capabilities, especially when clinical practice is not possible.

One important nursing competency in CHN is to develop relationships and partnerships (CASN, 2014). Results attained from our study align with this competency. The participants expressed a high level of confidence in their ability to interact with and interview the *SCC* citizens and work with other professionals in the community, although they noted that it would be more beneficial if they had the opportunity to interview real people. These positive changes corroborate those of Peddle et al. (2019) and Perez et al. (2022), who indicated that virtual simulations support

effective communication skills. In contrast, Wik et al. (2022) reported that their students found it difficult to develop interviewing skills while using *Sentinel City*, because of the preset nature of the citizen interviews. *SCC* enhanced this feature by adding an activity that asks students to develop an interview guide for each character and to formulate additional questions to ask during an assessment.

According to the INACSL Standards Committee (2021b), debriefing is an important standard in the simulation process. As illustrated in our qualitative findings, the participants stressed how the debriefing activities in *SCC* helped promote teamwork and collaboration. It was one of the parts of the virtual simulation the students enjoyed most. Debriefing has several benefits, which include an opportunity to detect knowledge gaps, reflect on the simulation experience, and most significantly, transfer learning to practice (Al Sabei & Lasater, 2016). Despite the advantages of debriefing, the instructor's way of leading the debriefing may influence the learning process (Abelsson & Bisholt, 2017; Karlsen et al., 2017). Although the *SCC* created learning opportunities and improves outcomes, a meaningful debriefing session is important and requires intensive facilitation by a skilled and trained clinical instructor (Lucktar-Flude et al., 2021; McEwing et al., 2021).

SCC was helpful in completing several assignments. Both quantitative and qualitative findings revealed that it was particularly helpful for windshield surveys and tornado emergency response planning. It is important to note that most of the assignments were different across the jurisdictions, and some of these assignments could be completed independently without using *SCC*. For some students, assignment instructions were inadequate, confusing, or missing. As a result, the students spent more time trying to understand the instructions than completing the assignment and activities. The need for clear instructions and expectations has been noted by Matsuda, Prather, et al. (2022) and is key to providing positive learning experiences.

Regarding satisfaction with *SCC* use, the students had divided views. Some were satisfied and some were not. This finding is consistent with our previous studies in 2020 ($M = 2.39$) and 2022 ($M = 2.86$); however, satisfaction has increased over time, with the highest mean reported for *SCC* ($M = 2.99$). Whether we can attribute this to the Canadianized version or repeated use of the simulation program over time remains elusive. Based on our quantitative and qualitative findings, many students would not recommend the future use of *SCC*, irrespective of its contribution to learning outcomes. Technical difficulties remained one of the top reasons why students expressed this view. They particularly noted that it was difficult to save or track their progress and described it as a slow and choppy platform. Foronda et al. (2018) and Tjoflåt et al. (2018) also reported several issues with technical navigation in their studies. Pence (2022) suggested that technical glitches should be avoided to make the learning experience rewarding. It is important to ensure simulation platforms are designed with the appropriate technologies to avoid the technical issues that provided a frustrating experience for the students. Some students agreed with recommending *SCC* for use in the future if modifications were made. Two studies, by Zaragoza-Garca et al. (2021) and Kang et al. (2020), suggested that the software should have a document with simulator controls and a visual description of the platform and controls to ease navigation and save time. Our study findings also generated similar suggestions that the workload should be more evenly distributed, instructions should be clear, and resources should be made available to the students.

Comparing their experience with previous experiences, students perceived *SCC* as a source of anxiety and stress. Many attributed this to technical issues and difficulty understanding

the instructions. Similarly, Cobbett and Snelgrove-Clarke (2016) showed that virtual reality simulation, particularly its technological aspects, increased anxiety levels among students. This is contrary to the findings of Ismailoglu and Zaybak (2018), who concluded that virtual simulation is a reliable and effective teaching method that reduces fear and anxiety. Regular updating of simulation technology, particularly if it is a computer or software-based program, is the responsibility of the producer, and clearly supports student satisfaction with the learning tool.

Limitations

Limitations included the use of a convenience sample, students' self-reporting data, and a low response rate. Variations in the timing and approaches to incorporating *SCC*, including placement in the program limits generalizability. This may also explain some of the jurisdictional differences that we found in this study.

Conclusion and Recommendations

Our study findings provide in-depth insights into the valuable contribution of *SCC* to learning about community/population health in a safe learning environment when in-person placements are not possible. Moreover, foundational knowledge and essential skills were advanced through creating an equal yet diverse clinical experience. Despite some perceived inadequacies of the platform, its contribution to education during the pandemic could not be denied. Critical takeaway messages are that those facilitating the prebriefing and debriefing must be familiar with the simulation process and knowledgeable about CHN concepts and approaches. Future research may focus on the role and educational needs of clinical instructors to improve the facilitation of *SCC*. We suggest incorporating the proposed modifications to the software to promote future use, as the benefits will make a difference in the pedagogy of nursing education. Canadianizing *Sentinel City* has increased the fidelity of this community/population health virtual simulation program and contributed to increasing student learning outcomes.

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