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Perspectives of simulation facilitators, course professors and students on factors and outcomes of simulation effectiveness

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ABSTRACT

Background:
Simulation-based activities (SBAs) research has explored the perceived and actual impact of SBAs on nursing education. The current study compares the perceived efficacy and transferability of nursing simulation to clinical practice from the point of view of simulation facilitators (SFs), course professors (CPs) and students.

Methods:
A one-time online survey was administered to SFs, CPs and students regarding SBA effectiveness. Quantitative data were analysed using descriptive analysis.

Results:
Student participants (especially those in years 2 and 3) perceived simulation to be a poorer (relative to course professors and SFs) reflection of their capabilities and means of developing clinical skills. Participants (including students, CPs and SFs) who reported that simulation group sizes as ideal were better prepared for SBAs, able to engage in clinical roles and to more effectively incorporate feedback. Qualitatively, CPs identified low-quality SBA facilitation as a barrier to learning effectiveness, and SFs described multiple approaches to simulation that influence transferability to clinical practice.

Conclusion:
We conclude that a misalignment between the strengths and weaknesses of SBAs by CPs, SFs and students may challenge improvement efforts. Group size, less positive student attitudes and a lack of confidence in SFs should be specifically addressed.

What this study adds

- Evidence that students perceive that increased group size decreases simulation effectiveness
- Course professors lack confidence in the consistent quality of simulation facilitation
- Students perceived less simulation effectiveness than simulation facilitators and course faculty
- When student group sizes were perceived to be ideal (median of 4), students were perceived to be better prepared, better able to identify simulation-based activity roles and be provided with the feedback needed for improvement.

Nursing simulation-based activities (SBAs) often use clinical scenarios to facilitate clinical decision-making and behaviours based on *a priori* identified educational objectives and outcomes [1]. Nursing educators have developed SBAs to enhance students' clinical skills based on scenarios that approximate reality to different degrees (i.e. ranging from low-, medium-, to high-fidelity [2–4]), with differing levels of responsibility (e.g. observational vs. participatory [5]), and assuming a multitude of clinical tasks (e.g. medication preparation or patient assessment [4,6–8]). In the literature, 'instructors' are rarely separated into categories. However, implementation of SBAs requires different roles and responsibilities from course professors (CPs) and simulation facilitators (SFs). CPs refer to faculty members that primarily teach in a classroom setting and do not regularly facilitate simulation. SFs refer to faculty and staff that primarily provide simulation facilitation and instruction but do not regularly teach in a classroom setting. SBAs are often provided as a subcomponent of courses that are administered under the direction of CPs who influence (and may have decision-making powers over) SBA frequency, design and assessment weight within courses.

There is extended research investigating nursing students', CPs' and SFs' perspectives on the effectiveness of nursing SBAs across domains such as the authenticity of participation in scenarios [9,10], impact on critical thinking [9,11–13], learning satisfaction [14], self-efficacy [6,11,15,16], psychomotor competency [17], preparedness for work [18], effectiveness of teaching tools [19–22], adequacy of SBA training [23], outcome-based design [17] and learning transfer [21,23]. However, much less research compares and contrasts SBA perspectives of CPs, SFs and students [24]. This is an important gap since disunity between the perceived benefits of SBAs and/or the efficacy of implementation by CPs and SFs may result in conflict that can negatively impact student learning. Successful SBA implementation requires that the goals, motivations and perceived benefits of both CPs and SFs are aligned with those of students [25].

In this study, we consider the perspectives of CPs, SFs and students regarding the effectiveness of nursing simulation, including the provision of clinical roles within the SBA, the number of participating students, transferability of skills to clinical environments and the value of preparation. We also investigate perspectives on the ideal and actual number of nursing students engaged in simulation at one time.

Methods

We used a cross-sectional survey with both a Likert-based numeric scale and free-response questions. We used quantitative and qualitative analyses for these questions, respectively [26]. Participants ranked the perceived effectiveness of current approaches to simulation using 5-point Likert scales. In addition, participants had the opportunity to explain and contextualize their ratings via free text response.

Participants

The sampling frame for our study was comprised of students, CPs and SFs across three medium- and large-sized Canadian Universities. Participants selected their primary affiliation in the first survey item (see Appendix). In addition, we sent an invitation to faculty, and SFs through the Canadian Alliance of Nurse Educators using Simulation (CAN-Sim) and California Simulation Alliance mailing lists. Ethics was obtained from research ethics boards from all participating schools (REB 2019-354, SMED 18-153, SMED 223-18). Informed consent was received from all participants. Students, CPs and SFs participated in the survey between July 2018 and January 2019, and to increase response rate and statistical power, invitations were sent out again between October 2019 and June 2020.

Data collection

Our survey was developed using many rounds of correction, consolidation, and ultimately finalized in unanimous agreement via synchronous dialogic methods [27]. Initial survey drafts were collaboratively developed and based on previous survey work in the area [28–30]. Our investigators have in-depth knowledge and experience working with (and as) students, CPs and SFs. Our team was also integral in the development of assessment and evaluation approaches for both CAN-Sim and the Ontario Simulation Alliance.

Participants engaged anonymously and provided demographic information regarding their geographical location (province/state), role in nursing education, year of study (students only), levels of nursing students taught (staff and faculty only) and gender (see Appendix). Analyses were conducted between CPs, SFs and students to determine if statistically detectable differences would be found in perceptions of SBA effectiveness. The survey had 41 items and used branching technology to customize question-wording for participant categories (see Appendix). Effectiveness questions were scored on a 5-point Likert agreement scale including *1 = Strongly agree, 2 = Somewhat agree, 3 = Neither agree nor disagree, 4 = Somewhat disagree, 5 = Strongly disagree.*

Data management and analysis

Our Likert-scale responses are considered ordinal data. We used descriptive count data and averages to outline participant demographics. Due to a lack of normal distribution and ordinal data inferential statistics were conducted using non-parametric approaches [31,32]. Kruskal–Wallis Chi-square analyses were conducted to assess differences between CPs', SFs' and students' perceptions of simulation effectiveness. A second set of Kruskal–Wallis analyses were conducted to consider perceived simulation effectiveness between students across years of study. Wilcoxon Signed Rank tests (with Bonferroni corrections) were used for post hoc analysis. To establish the effect of desired vs. actual SBA student group sizes a secondary analysis was conducted of participants who (on average) reported that student groups in their setting had more students than ideal (MSI), equal students to ideal (ESI) or less students than ideal (LSI). Quantitative analysis was conducted using IBM SPSS for Windows ©, Version 27.

Qualitative analyses were conducted within a constructivist ontological and epistemological lens [33]. Our

goal was to report the constructed reality of participants. Narratives were short, so preliminary reading and high-level coding were used within the first phase, and more structured codes were then developed and reported as they related to the constructs of interest within this study. An initial round of coding was conducted by the lead researcher (RE). Next, nursing and simulation experts within the team (CL and JB) evaluated the validity of the codes, adjustments were made and disagreements were resolved through discussion. Qualitative analysis was conducted using NVIVO ©, Version 12.

Results

Quantitative results

Our survey demonstrated good to high internal consistency amongst all rating items (Cronbach's alpha = 0.87). Most participants were from Ontario, Canada. A small number of participants were from various Canadian Universities outside of Ontario and California, USA. Most participants were female, and the majority were engaged in Year 2–4 of their program. SFs tended to teach students roughly equally between Year 1–4, whereas most CPs taught students in Year 2–4 (see Table 1).

Effectiveness by participant group

Statistically significant differences were found between Kruskal–Wallis Chi-square tests mean rank and a variety of measures of perceived simulation effectiveness (see Table 2).

Effectiveness by student year of study

Students clinical experience, acumen and perspectives on simulation may evolve across the years. Given the lack of participants in Year 1, 5, and graduate work we have considered differences between Year 2–4 on perspectives on simulation effectiveness (see Table 3).

Group size and effectiveness

There was a statistically significant difference in the reported average number of students who participate at one time

Table 1: Participant demographics

Demographic category	Simulation facilitator count (%)	Course faculty count (%)	Student count (%)
	***N* = 40**	***N* = 23**	***N* = 87**
Country			
USA	12 (30)	0 (0)	0 (0)
Canada	28 (70)	23 (100)	87 (100)
Province/state			
Ontario	22 (56.4)	15 (68.2)	87 (100)
California	12 (30.8)	0 (0)	0 (0)
Other	5 (12.8)	7 (31.8)	0 (0)
Gender identification			
Male	4 (10.3)	0 (0)	8 (9.2%)
Female	35 (89.7)	23 (100)	77 (88.5)
Non-binary		2[Φ] (1.1)	
Not disclosed			1 (1.1)
Instruction level*/learning level			
Year 1	28 (23.1)	8 (16.3)	6 (7)
Year 2	32 (26.4)	16 (32.7)	27 (31.4)
Year 3	25 (20.7)	13 (26.5)	29 (33.7)
Year 4	27 (22.3)	10 (20.4)	21 (24.4)
Year 5	3 (2.5)	1 (2)	0 (0)
Masters	6 (5)	1 (2)	3 (3.5)
Current nursing program			
Four-year			78 (89.7)
Compressed 2-year			4 (4.6)
Graduate			5 (5.7)
Previous highest degree			
High school			68 (78.2)
Undergraduate			17 (19.5)
Masters			2 (2.3)

*Multi-selection response item.
[Φ]Not stratified to protect confidentiality.

Table 2: Perspectives on simulation effectiveness by role

Variable	Position	*N*	Median (mean)	Mean rank	Kruskal–Wallis χ^2	Sig.
Students' performance in simulation-based experience is a fair representation of their clinical ability.	CP	22	2 (2.1)	55.4	12.8	.002
	SF	38	2 (2.4)	64.5		
	S	82	2.5 (2.7)	84.2		
Students' performance in simulation-based experiences is an accurate indication of their ability in clinical practice.	CP	22	2 (2.3)	59.0	8.0	.018
	SF	38	2 (2.4)	63.7		
	S	82	3 (3.0)	81.0		
Simulation is an effective way for students to learn.	CP	22	1 (1.2)	62.5	21.5	.001
	SF	38	1 (1.1)	56.4		
	S	82	2 (1.8)	86.7		
Students are usually given a meaningful role in nursing simulations.	CP	22	2 (1.7)	56.7	20.9	.001
	SF	38	2 (1.7)	57.3		
	S	82	2 (2.4)	87.8		
Students' professional roles in nursing simulation-based activities are made clear.	CP	22	2 (1.8)	64.1	11.7	.003
	SF	38	2 (1.7)	60.3		
	S	82	2 (2.4)	845		
Preparation improves students' performance in simulation-based experiences.	CP	22	1 (1.3)	64.0	19.9	.001
	SF	38	1 (1.1)	56.7		
	S	82	2 (1.7)	86.1		
Preparation improves students' learning in simulation-based experiences.	CP	22	1 (1.3)	62.3	16.2	.001
	SF	38	1 (1.2)	58.8		
	S	82	1 (1.7)	83.8		
Students are able to directly transfer the skills they learn during simulation-based experience to their FUTURE clinical practice.	CP	22	2 (1.9)	76.4	7.3	.026
	SF	38	2 (2.0)	88.3		
	S	82	2 (1.8)	67.7		

CP = course professor; SF = simulation facilitator; S = student.

Table 3: Perspectives on simulation effectiveness by student program year

Variable	Position	*N*	Median (mean)	Mean rank	Kruskal–Wallis χ^2	Sig.
Students have sufficient information to effectively prepare for simulation-based experiences.	Y2	35	2 (2.1)	37.02	6.86	.032
	Y3	18	2 (2.6)	46.24		
	Y4	79	2 (1.9)	31.55		
Replacing clinical hours with simulation is likely to have either no impact OR have a positive impact on students' preparedness for practice.	Y2	35	4 (3.3)	46.24	6.43	.040
	Y3	18	2 (2.8)	38.96		
	Y4	79	2 (2.2)	30.17		

Y2 = Year 2; Y3 = Year 3; Y4 = Year 4.

in an SBA between SFs (median = 5), CPs (median = 8) and students (median = 6, Chi-square = 6.29, $p = .043$, df = 2). Post hoc analysis initially showed statistically significant differences between students and CPs and SFs, with the latter remaining significant after Bonferroni correction ($U = -2.42$, $p = .047$). A secondary comparison was conducted between participants categorized as MSI, ESI and LSI. Statistically significant scores were found for these groups regarding the perceived number of students who participate at one time in SBAs (MSI = 8, ESI = 4, LSI = 3; $\chi^2(2) = 40.28$, $p = .001$, df = 2). Post hoc scores showed differences between LSI and MSI ($U = 5.08$, $p = .001$) and ESI and MSI ($U = -4.86$, $p = .001$).

Next, perceptions of simulation effectiveness were assessed across the three groups (see Table 4).

Qualitative results

Three key themes emerged from the qualitative data, including SBA inconsistency and ineffectiveness, transfer of skills/knowledge to clinical practices and perspectives on group size.

Table 4: Perspectives on simulation effectiveness by perceived effectiveness of group size

Variable	Position	*N*	Median (mean)	Mean rank	Kruskal–Wallis χ^2	Sig.
Students have sufficient information to effectively prepare for simulation-based experiences.	MSI	87	2 (2.1)	75.63	9.28	.010
	ESI	37	2 (1.7)	56.05		
	LSI	18	2 (2.5)	83.28		
Students are provided with the feedback they need to improve their learning in simulation-based activities.	MSI	87	2 (1.8)	78.26	7.86	.020
	ESI	37	1 (1.4)	58.45		
	LSI	18	1 (1.7)	65.67		
Students' professional roles in nursing simulation-based activities are made clear.	MSI	87	2 (2.3)	76.42	9.42	.009
	ESI	37	2 (1.7)	55.07		
	LSI	18	2 (2.6)	81.50		

MSI = more students than ideal; ESI = equal students as ideal; LSI = less students than ideal

SBA inconsistency and ineffectiveness

Many CPs felt that 'the impact [on learning] of simulation really depends on the skill of the facilitator' and the 'abilities of the facilitator largely impact the students' ability to meet the learning outcomes'. A lack of consistency in SBA preparation, development and debriefing were identified as key challenges to SBA efficacy. This finding was epitomized by a CP participant who identified a need for greater SF expertise, improved SF training and increased administrative support. This participant stated that '[i]f there isn't experienced, trained facilitators, faculty who buy-in and admin support for time and money, sim[ulation] isn't as effective'. In contrast, only one comment was made by an SF indicating that SBA challenges 'lie[s] in the fact that faculty in nursing programs do not have sufficient knowledge about simulation ... [and that it] ... is more than simply turning on a mannequin'. SF's concerns were not focused on CPs competency. Rather, perceived challenges related to a lack of video-based debriefing and reflection opportunities and the lack of learner-centred practice based on guidelines, which they felt hampered SBA effectiveness. Although limited, student feedback focused on a lack of consistency in simulation facilitation.

Transfer of skill/knowledge to clinical practices

Comments regarding the (lack of) transfer between simulation and clinical practice were made by all participants, but the majority emerged from SFs. The exception was one CP who indicated that the main concern was that 'evidence of clinical preparation, performance and competency remains to be studied in more detail'.

Positive comments about simulation to clinical transfer

SFs offered the large majority of opinions on how/why simulation is an effective means of preparation for clinical practice. SFs indicated that simulation had clear implications for clinical practice, and that 'students do have the ability to directly transfer the knowledge from sim[ulation] to clinical practice'. The value of incremental learning, and coordination between simulation and theory courses were also highlighted as important to enhance clinical transfer. Both SFs and students indicated that simulation is effective for the instruction of high-acuity situations as demonstrated by a student's suggestion that simulation should be used in 'emergency situations, like the nursing role in cardiac arrest, rather than [redacted for confidentiality] and [redacted for confidentiality] which is an actual scenario that we simulated'. Although some SFs felt that simulation could replace some placements (e.g. long-term care), participants generally advocated for simulation as an important strategic augmentation to clinical practice. SFs uniquely identified the importance of psychosocial and communication objectives with a representative statement suggesting that simulation could improve 'communication with patient, family and healthcare team members'. In addition, SFs pointed out that often the 'clinical environment does not always allow the students to do the actions [while] critically think[ing] or communicat[ing] with team members as they do in simulation'.

Critical comments about simulation to clinical transfer

SFs dominated critical commentary regarding the transfer of learning. CP and student comments focused on the importance of patient fidelity and as such having the opportunity to work with standardized patients. A perception was voiced that mannequins may depersonalize the experience and 'simulations usually work best when actors play the patient role'. Students also provided general comments that indicated concern with the transferability of simulation, such as 'simulations could never compare to the reality of being in a clinical situation dealing with real people'. SFs expressed similar concerns about the transferability of psychosocial skills. For example, one SF commented, 'simulation cannot, however, replace the learning of effective, client/family centred verbal and non-verbal communication necessary to the nurse/client therapeutic relationship, the vehicle through which all nursing care is delivered'. SFs also indicated that logistical aspects of clinical practice are not transferred well including professional socialization skills and that 'management, balancing priorities, multi-tasking are all lost in sim[ulation]'. Finally, SFs indicated that a variety of resources including time, equipment and scenario were needed 'to better prepare students for future practice'.

Perspectives on group size

There was general agreement between CPs', SFs' and students' comments that large group sizes (8 in the MSL group vs. 4 and 3 in ESI and MSI, respectively) decrease the effectiveness of SBAs. This was exemplified by a student who described the importance of simulation but lamented the large size of simulation groups and stated that students '...should be able to participate once as the nurse in a simulation'. Going further, another student stated that simulation was '... pointless, unless you were the one directly participating and not observing'. Similarly, a CP participant identified that 'the number of participants increases, often which can be challenging as more individuals are observers [and not] active participants'. An SF noted that large group size made it a challenge to '...evaluate the student on a formal rubric'. Finally, time and resources were identified as barriers to running individualized SBAs by both CPs and SFs.

Discussion

This research is one of the first studies to directly compare the perspectives of CPs, SFs and students with regards to if and why SBAs are (in)effective. Findings demonstrate there is a lack of consistency amongst the perspectives of parties involved in SBAs.

An important difference in perspective was found between students (especially those in Years 2 and 3) and instructors (SFs and CPs) ratings of SBA educational effectiveness. Students generally felt SBAs were more (relative to SFs and CPs) transferable to practice. Although it is unclear how this specifically effects SBAs, the difference in opinion may result in misalignment between motivations and expectations of these parties [34–36].

Although statistically significant differences were not found between SBA effectiveness ratings of SFs and CPs, qualitative comments demonstrated a lack of cohesion between the perceived cause of SBA challenges. CPs were sceptical of the SFs preparation and effectiveness. Specifically, CPs indicated concern regarding a perceived lack of SF skills, training and consistency in SBA facilitation methods which were compounded by a lack of administrative support. This may result in a lack of collegiality and potentially conflict, especially when SFs are facilitating SBAs that are embedded within CP courses. SFs generally did not indicate concerns about CP capabilities, but rather provided a more nuanced description of simulation areas that may be more (and less) effective for clinical skill transfer.

A particularly important challenge to SBA effectiveness regarding implementation, assessment and design involved group size. The suggested median number of participants in SBAs differed between SFs, CPs and students. The cause of this perceptual difference is unclear, but may be indicative of a further gap between groups. Interestingly, the difference between SFs and students (who are typically most directly involved in SBA implementation) is less than CPs.

This study is the first to consider perceived effectiveness based on the extent to which participants believed that the size of SBA groups was ideal. First, we demonstrated that *student roles* and *the effectiveness of preparation and feedback* were rated lower when the ideal number of students was not equal to the average number of students in SBAs. Qualitative data further contextualized this finding, indicating that participating as an observer decreased learning and made effective rubric-based scoring more difficult. This is in contrast to research which reported that the observer roles have been shown to contribute to similar knowledge gains as measured by forced response questions, qualitative data and rating scales [37–41]. Although there is a measured learning benefit associated with observation, our findings demonstrate that group size remains a perceived challenge to effectiveness by all participant groups.

The success of simulation is a function of effective design and implementation, alongside trust, coordination and implementation amongst CPs, SFs, students and administrators [2,35,42]. There has been a large body of research on SBA design and implementation, especially regarding debriefing effectiveness and replacing clinical practice with SBAs. However, the lack of research on the coordination and shared perspectives amongst CPs, SFs, students and administrators may challenge the ability of educators to translate this research into practice. In addition, effort must be made to find the resources to optimize SBA group numbers and thereby improve experiential learning effectiveness.

Limitations

The intent of our research was to explore differences between the diverse conceptions of simulation effectiveness amongst CPs, SFs and students. As such, our questions were broad and ranged across a large number of experiences. Perspectives regarding specific simulation experiences may vary from the average perception described by participants here. The majority of our sample came from Ontario, and as such, findings may skew towards practices that are more common to this province.

Conclusions

This study demonstrates that a lack of alignment between the perspectives of CPs, SFs and students may influence the perceived effectiveness of SBAs. This research study identified optimal group size of SBAs should potentially be closer to 4 to enhance SBA effectiveness. The ESI group indicated higher ratings for SBA effectiveness than the MSI and LSI groups. Topics for future research should investigate the origin of CP's lack of confidence of SF competence and SF suggestions for adjustments to SBA implementation.

Declarations

Authors' contributions

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Competing interests

None declared.

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APPENDIX: SIMULATION EFFECTIVENESS SURVEY ITEMS

Survey item	Measure
1. Please indicate your primary role in your nursing program.	Simulation instructor/facilitator, Course instructor/ professor, Student
2. Please select your country	Canada, USA, Other (full list of countries)
3. Select your province	Full list of Canadian provinces (if Canada chosen)
4. Select your state	Full list of American states (if USA chosen)
5. How do you self-identify in terms of gender?	Man, Woman, I do not identify within gender binary, I prefer not to disclose information concerning my gender
6. Select the level(s) of nursing students you have instructed using simulation-based experience? [Instructors only]	Multi-select [1, 2, 3, 4, 5, Masters, PhD]
7. What is your current level of study within your nursing program? [Students only]	Single select [1, 2, 3, 4, 5, Masters, PhD]
8. Based on your experience, how many nursing students (on average) participate in a single simulation-based activity?	Single select [1–11, or >11]
9. What number of nursing students in a simulation scenario do you believe would have the greatest benefit to student learning?	Single select [1–11, or >11]
10. Average percentage of time (on average) your students/you is/ are *actively* participating in the nursing simulation context.	Sliding scale [0–100%]
11. Average percentage of time (on average) your students/you is/ are participating as an *observer* in the nursing simulation context.	Sliding scale [0–100%]
12. Students have/I have sufficient information to effectively prepare for simulation-based experiences	5-point agreement scale [Strongly Disagree–Strongly Agree]
13. Students'/my performance in simulation-based experiences is a fair representation of their clinical ability	
14. Students'/my performance in simulation-based experiences is an accurate indication of their ability in clinical practice	
15. It is important for students/me to have specific roles in simulation-based experiences	
16. In my simulation-based experiences, students/I have been able to imagine their actions within a real clinical setting	
17. Simulation is an effective way for students/me to learn	
18. Students are provided with the/simulation assessment provides the feedback they need to improve their learning in simulation-based activities	
19. Students are usually given/I usually have a meaningful role in nursing simulations	
20. Students' professional roles/The role I play in nursing simulation-based activities are made clear	
21. Preparation improves students' performance in simulation-based experiences/I believe that preparing for simulation improves my performance	
22. Preparation improves students' learning in simulation-based experiences/I believe that preparing for simulation improves my learning	
23. Students are able to/I will be able to directly transfer the skills they/I learn during simulation-based experiences to their CURRENT clinical practice	
24. Students are able to/I will be able to directly transfer the skills they/I learn during simulation-based experiences to their FUTURE clinical practice	
25. Replacing clinical hours with simulation is likely to have either no impact OR have a positive impact on students' preparedness for practice	

Survey item	Measure
26. Please provide any further explanation or contextualization to your responses.	Narrative
27. Please share any additional insights based on your experiences in nursing simulation.	Narrative
28. In which nursing program are you currently enrolled? [Students only]	Four-Year, Compressed 2-Year Graduate
29. What is your highest level of education prior to beginning your nursing program? [Students only]	High school, College, Undergraduate, Masters, PhD, Post Doctorate
30. Please provide each of your previous degrees.—1st Degree [Students only]	Narrative
31. Please provide each of your previous degrees.—2nd Degree [Students only]	
32. Please provide each of your previous degrees.—3rd Degree [Students only]	
33. Approximately how many times have you participated in simulation-based experiences in a nursing context? [Students only]	Count
34. Approximately how many times have you participated in simulation-based experiences in a non-nursing context? [Students only]	Count
35. Please provide any further explanation or contextualization to your responses.	Narrative
36. Approximately how many times have you facilitated simulation-based experiences in a nursing context? [Instructors only]	Count
37. Approximately how many times have you participated in simulation-based experiences in a non-nursing context? [Instructors only]	Count