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Undergraduate Nursing Students' Depth of Reflection and Perceptions of Self-Debriefing Following Virtual Simulation: A Multi-method Descriptive Study

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UNDERGRADUATE NURSING STUDENTS' DEPTH OF REFLECTION AND PERCEPTIONS OF SELF-DEBRIEFING FOLLOWING VIRTUAL SIMULATION: A MULTIMETHOD DESCRIPTIVE STUDY

by

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ABSTRACT

Virtual simulation is a method of simulation-based education in which students participate in a clinical experience within a computer program and away from a clinical environment or classroom. This innovation makes simulation more accessible for learning, but also more challenging when it comes to providing a debriefing activity directly afterward by a facilitator. The purpose of debriefing is to afford learners the opportunity to reflect on the experience with a goal toward improvement. From the best practice standards, two recommendations stipulate that a debriefing session should occur soon after a simulation and should promote reflection. Self-debriefing is uniquely capable of providing a debrief immediately after a virtual simulation since self-debriefing does not rely on a facilitator's presence. However, little evidence exists on self-debriefing's ability to promote reflective thinking. The purpose of this dissertation was to explore evidence from a self-debriefing activity to determine the depth of reflection achieved as well as students' perceptions of the self-debriefing activity. A quantitative descriptive study was conducted to examine the depth of reflection from a self-debriefing activity. Levels of reflection were identified by rating students' written responses using a rubric designed for this purpose. In a qualitative descriptive study, students' perceptions of the self-debriefing activity were also explored through conventional content analysis of the data from individual interviews. The results from this research lend support for self-debriefing and may inform educators on design considerations of this type of debriefing to promote student reflection.

Keywords: virtual simulation, self-debriefing, depth of reflection, undergraduate nursing students

This work is dedicated to my kiddo, Cameron. Thank you for listening to me prattle on about my courses, papers, evolving research plans, my trials, and tribulations. Thank you for talking me off the ledge when I did not think I would finish. You have been my biggest cheerleader. This work is also dedicated to Irene, who has been in the trenches with me since we gave our first bed baths. Thank you for your encouragement, collaboration, inspiring academic example, and for taking a shine to simulation.

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CHAPTER 1:
INTRODUCTION

Within nursing education, simulation has allowed for the expansion of practice opportunities in light of dwindling clinical sites (Smiley, 2019). Simulation-based education is a pedagogy that allows learners to transfer theoretical knowledge to practical clinical situations. Simulation also provides vital learning experiences for nursing students without the risk of patient harm.

For decades, educators have orchestrated clinical events with manikins or actors as patients (Decker, Caballero & McClanahan, 2014). These events are held in clinical spaces or laboratory rooms where learners and educators come together at specified times. As technologies have advanced, other modes of simulations have emerged, including virtual simulation, where students may still experience clinical scenarios, practice critical thinking and decision-making skills, all within the confines of a computer screen (Foronda et al., 2017). The benefits of virtual simulation include cost savings and scheduling freedom over high-fidelity manikin-based simulation (Cobbet & Snelgrove-Clarke, 2016; Foronda et al., 2018).

Regardless of the mode of simulation, a pivotal component to solidify the learning is the debriefing event that follows (Levett-Jones & Lapkin, 2014). During a debrief, students are given feedback on performance and encouraged to reflect on the experience so that they explore decisions, identify misconceptions, and correct their thinking for future situations (Rudolph, Simon, Rivard, Dufresne, & Raemer, 2007). When conducted in person, a debrief is a session led by a facilitator who guides the group of participants through a structured process. When done

according to a framework for debriefing, this process typically has at least three phases within it: a reaction phase, an analysis phase, and a summary phase (Oriot & Alinier, 2018).

Reflection is an essential process within experiential learning events such as simulation-based education. Educators and theorists agree that reflection is a crucial concept for learning to occur (Dewey, 1933; Gibbs, 1988; Kolb, 1984). Dewey (1933) acknowledges reflective thinking's role in problem-solving because it allows the user to see connections and relationships between aspects of the experience. Kolb's (1984) Experiential Learning Theory positions reflective observation as a key step between concrete experience and abstract conceptualization. Gibbs (1988) built upon Kolb's work to generate a cyclical structure to guide the steps in the reflective process that take a user from describing an event, exploring reactions, analyzing, and drawing conclusions before formulating a plan for future actions. Mezirow (1990) describes his theory on transformative learning as a specific type of reflection, on the premise of a situation, also called critical reflection. This type of reflection, which is beyond simple problem-solving, involves a person experiencing a disorienting dilemma that challenges current thinking and leads to a change in perspective through analysis. Considering all these ideas leads to viewing reflection as specific analytical processes that assists with scrutinizing new information in light of prior knowledge to arrive at a new understanding. A change in perspective from this new understanding is the result of critical reflection.

Given the importance of reflection on learning, it is incumbent upon simulation facilitators to promote students' reflective thinking during debriefing following any simulation event. In the case of virtual simulation, there is a concern regarding how a facilitator may manage the debrief when learners complete this type of simulation autonomously and away from

the classroom (Gordon, 2017; Verkuyl, Lapum, St-Amant, Betts & Hughes, 2017). There is an impracticality to requiring students to complete virtual simulations only during class sessions due to scheduling concerns and access to adequate numbers of trained facilitators. Evidence suggests that alternative forms of debriefing that do not require facilitator presence may be effective (Dufrene & Young, 2014). The literature also encourages exploring alternative forms of debriefing due to various benefits such as cost savings and expanding simulation availability (Fanning & Gaba, 2007; (Ryoo & Ha, 2015).

The purpose of this dissertation was to explore evidence from a self-debriefing activity to determine the depth of reflection achieved as well as students' perceptions of the self-debriefing activity. A literature review was conducted to explore current evidence on self-debriefing used in healthcare simulation using the Self-Debriefing Activity Appraisal Tool (SDAAT). Findings from this review, such as evidence for self-debriefing, design recommendations, and directions for future research, informed the design and analysis of the research within this dissertation. These findings are shared in the first manuscript (Chapter 2).

In order to determine the depth of reflection, a quantitative descriptive study was conducted with undergraduate nursing students by using a theory-based self-debriefing activity. This study shows varying depths of reflection achieved by the students, with the most substantial reflective responses focused on description and analysis. Rubric creation and interrater reliability testing are also presented in the second manuscript (Chapter 3).

A desire to know students' perceptions of the self-debriefing activity spurred an additional study. A qualitative descriptive study was conducted to understand how the students

perceived the self-debriefing activity as an aid for reflection. Findings, including themes and subthemes, are shared in the third manuscript (Chapter 4).

Together, these three manuscripts present the first research to measure reflective thinking from self-debriefing as a part of healthcare simulation. The results of this research will add to the evidence in support of using self-debriefing during appropriate situations. The findings from this research will also inform educators about recommended design considerations for self-debriefing to ensure alignment with the INACSL Standards of Best Practice: Simulation Debriefing (INACSL Standards Committee, 2016). The evidence presented in this dissertation may be used to expand virtual simulation usage while maintaining debriefing standards and without impacting limited resources. The findings may also contribute to improving learning outcomes and encourage future research on self-debriefing.

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CHAPTER 2:
SELF-DEBRIEFING – AN INTEGRATIVE LITERATURE REVIEW MANUSCRIPT

Abstract

Background: Debriefing is an essential component of simulation-based education. In-person, facilitator-led debriefing may not always be practical or fit newer forms of simulation. This integrative review explored existing literature for evidence on self-debriefing in healthcare simulation.

Methods: A comprehensive database search was conducted using PRISMA guidelines. The INACSL Standard of Best Practice: Simulation Debriefing was used as a framework for analysis.

Results: Ten articles were retained for this review. Equivalence to instructor-led debriefs for performance gains was seen with graduate-level learners or designs that more highly align to the standard. Not all criteria from the debriefing standards appear in the self-debriefing designs. None of the studies measured reflection capacity despite it being a recommendation.

Conclusion: Findings indicate that well-designed self-debriefing provides equivalent outcomes to instructor-led debriefing. The Standards of Best Practice emphasize reflection promotion, yet no evidence confirms its presence in previous studies. Therefore, research on the presence of reflection from self-debriefing is indicated.

Keywords: self-debriefing, self-debrief, virtual debrief, simulation, nursing education

Introduction

Simulation-based education (SBE) has evolved within nursing education (Doolen et al., 2016; Smiley, 2019). From the early days of injecting fruit to immersive environments within virtual worlds, educators provide opportunities for students to learn and practice their newly acquired skills in situations that avoid patient harm. Debriefing is an essential component of these practice opportunities where learners explore their performances, review decision-making, and change their perspectives. Educators agree that debriefing is an essential component in SBE (Dreifuerst, 2009; Fanning & Gaba, 2007; Levett-Jones & Lapkin, 2014).

Debriefing in healthcare education emerged from methods found in other industries. The US Army's after-action review and aviation's crew resource management are predecessors to healthcare debriefing (Gardner, 2013; Sawyer & Deering, 2013). In military and aviation applications, trainees analyze their performances following real or simulated activities to reach a better understanding of what happened and how to make improvements. Early adopters of these training techniques developed a version of debriefing for medical simulation training, where it has since spread across other healthcare training disciplines (Gardner, 2013).

Based on decades of research and practice, The International Nursing Association for Clinical Simulation and Learning (INACSL) Standards Committee has created guidelines for best practices in all aspects of SBE, including debriefing (INACSL Standards Committee, 2016). The standard specific to debriefing asserts that "all simulation-based experiences include a planned debriefing session aimed at improving future performance" (INACSL Standards Committee, 2016, p. S21). The committee also presents five criteria necessary to meet this standard. Those criteria are: 1) a facilitator who is competent in debriefing, 2) an environment

that supports learning, confidentiality, self-analysis, feedback and reflection, 3) a facilitator who is attentive of the simulation to debrief effectively, 4) a structured debrief based on a theoretical framework, 5) congruence between the debrief and SBE objectives and outcomes. Debriefing efforts that attend to all five criteria may enhance learning and increase self-awareness and self-efficacy (INACSL Standards Committee, 2016).

Since successful debriefing results in closing performance gaps, a structure is required to navigate the process. There are several frameworks for structured debriefing available. Examples include Plus/Delta, GAS (gather, analyze, summarize), Debriefing with Good Judgment, PEARLS, Debriefing for Meaningful Learning (DML), and 3D Model of Debriefing (INACSL Standards Committee, 2016). While the Plus/Delta framework allows participants in a simulation to identify what went well (the "Plus") and what could have gone differently (the "Delta"), the other identified debriefing frameworks are more substantive. Beyond differing in the total number of steps, these other frameworks share three essential phases: a period for learners to react to the experience, a phase for analysis, and summarization of learned concepts (Oriot & Alinier, 2018). There is inadequate evidence to recommend one framework over another; however, a structured debrief with at least these three stages (reaction, analysis, summary) enhances student learning (Hall & Tori, 2017; Neill & Wotton, 2011).

Changes in simulation design and facilitation practices continue as new evidence is found (Sittner et al., 2015). Debriefing has also evolved to accommodate the needs of a changing landscape of simulation. As simulation design and delivery continue to change, innovations in debriefing are necessary to provide optimal learning experiences and outcomes. Virtual simulation is one such innovation in simulation. Features of virtual simulation include unlimited

access, remote use, and individual participation. Despite the perceived benefits, these features make facilitating a debrief soon after the simulation a challenge. Therefore, simulation educators may want to consider other methods of debriefing besides face-to-face facilitator-led debriefs.

Self-debriefing is a potential innovation for circumstances when facilitator-led debriefs are unfeasible. However, its ability to align with current self-debriefing practices in the standards of best practice is unclear. The purpose of this integrative review is to explore the current evidence on the use of self-debriefing in healthcare simulation using the framework of the INACSL Standards of Best Practice: Simulation^{sm} Debriefing (INACSL Standards Committee, 2016). This review represents a response to the call for exploring alternative forms of debriefing (Fanning & Gaba, 2007; Lapum et al., 2019). Findings from this review will highlight the extent of alignment and areas for further exploration and research.

Methods

The integrative literature review methodology described by Whittemore and Knafl (2005) served as the framework for this review. Whittemore and Knafl's methodology has five stages: problem recognition, literature search, data evaluation, data analysis, and presentation. The integrative review approach allows for the examination of both quantitative and qualitative studies, which is an advantage when exploring understudied topics. To address the first stage, problem recognition, the following questions guided this review: 1) What are the characteristics of self-debriefs used in healthcare simulation? 2) To what extent do self-debriefs found in the literature align with the INACSL Standards of Best Practice for debriefing?

Literature Search

The second stage of this integrative literature review involves a search process to identify articles and studies focused on self-debriefing as part of simulation-based education. A comprehensive search occurred within the CINAHL, MEDLINE, PsycINFO, ERIC, Education Full Text (H.W. Wilson), Education Source, and Academic Search Premier databases. Search terms included "simulation," "debrief*" or "self-debrief*," and "research" to capture all empirical articles related to self-debriefing within the context of healthcare simulation. A separate search was conducted within the same databases as well as Web of Science using the singular term "self-debrief*" to ensure that other terms did not limit the results. Ancestral searches of the reference lists from records that met inclusion criteria also occurred.

Selection criteria. Original research articles with a focus on self-debriefing, published on any date and written in English, served as initial inclusion criteria. Exclusions consisted of articles that describe instructor-led debriefing exclusively or self-debriefing conditions comprising of pairs or groups of students. To keep the focus on healthcare simulation, articles that described self-debriefing used in other domains were also excluded. The search strategy is illustrated in Figure 1, based on the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009).

The database searches resulted in a total of 1,375 records (Figure 1). After the removal of duplicates, 822 records remained for screening. Titles and abstracts of the 822 records were scanned for relevance based on inclusion criteria; of these, 796 records were excluded for not being original research articles, not focusing on healthcare simulation, and for not focusing on self-debriefing. The remaining 26 full-text articles were downloaded for further evaluation.

Sixteen of these articles were removed based on exclusion criteria, such as the application of self-debriefing using pairs and groups instead of individual students, which resulted in ten articles being retained for this review.

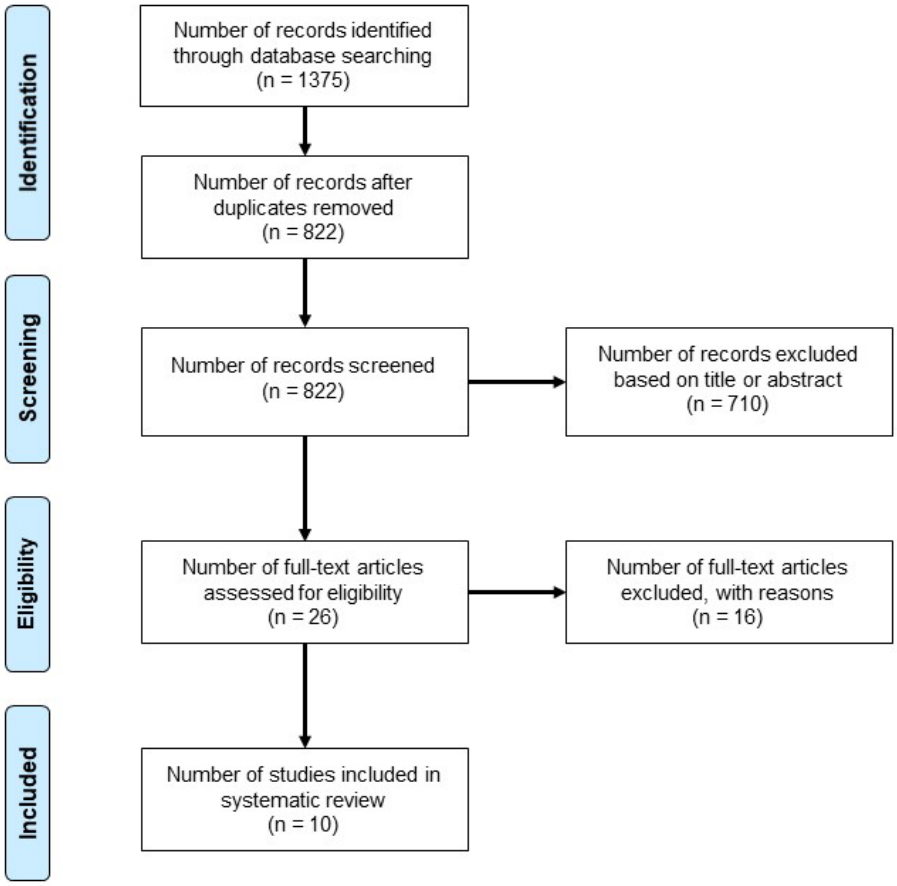

Figure 1 PRISMA flow diagram. (From Moher, et al., 2009)

Data Evaluation

In keeping with the process of the integrative review, the retained articles were appraised for quality. Conducting a quality comparison using a single instrument was deemed inappropriate due to the varied methodological approaches identified in the studies (Whittemore & Knafl, 2005). An instrument was identified that evaluates quality according to multiple

specific research designs. The Mixed Methods Assessment Tool (MMAT) provides criteria to evaluate qualitative, randomized control trials (RCTs), non-RCTs, quantitative descriptive, and mixed methods studies with distinct criteria tailored to each methodology (Hong et al., 2018). For instance, an appropriate approach, data collection methods, whether findings are from the data, and if the data substantiate interpretation all inform the appraisal of qualitative studies. Other criteria suited to appraising RCTs, such as appropriate randomization, baseline comparisons, blinding of assessors, and complete outcome data, are also provided in this tool. The MMAT was used to assess the ten studies identified in the literature search. None of the studies were rejected from applying the MMAT assessment, but this provided additional information in terms of relative weight or contribution to the findings (Table 1).

Table 1

MMAT Data Evaluation

Qualitative	**Right Approach?**	**Adequate Data Collection?**	**Findings from Data?**	**Interpretation substantiated?**	**Coherence in elements?**
Verkuyl,Lapum, et al (2018)	2	2	2	2	2
Quantitative RCTs	**Randomized?**	**Comparable baseline?**	**Complete Data?**	**Blinding of assessors?**	**Adhere to intervention?**
Boet et al. (2011)	1	2	2	2	2
Fan et al. (2017)	2	1	2	1	2
Kun et al. (2018)	1	2	2	1	2
Sukalich et al. (2014)	1	1	2	1	2
Verkuyl, Atack, et al. (2018)	1	2	2	1	2
Welke et al. (2009)	2	2	2	2	2
Quantitative Non-randomized	**Population represented?**	**Appropriate measures?**	**Complete Data?**	**Confounders accounted?**	**Intervention as intended?**
Gantt et al. (2018)	2	1	0	1	1
Quantitative Descriptive Studies	**Relevant sampling?**	**Population represented?**	**Appropriate Measures?**	**Low non-response bias?**	**Appropriate analysis?**
Miller et al. (2018)	2	2	2	0	2
Mixed Methods Studies	**Rationale for MM?**	**Integration of components?**	**Outputs interpreted?**	**Divergences addressed?**	**Adherence to methods?**
Verkuyl, et al., (2019) *	2	0	0	0	0
* as an RCT	1	2	2	1	2

0 = no, 1 = can't tell, 2 = yes

Data Analysis

A thorough analysis of each article was conducted. Along with gathering details about the study designs, study aims, findings, and mode of simulation, special attention was paid to self-debriefing characteristics and evidence of the INACSL Standards of Best Practice: Simulation[SM] Debriefing (SOBP) criteria. A matrix was explicitly created and labeled with the following phrases for the five SOBP debriefing criteria: (1) Debriefing Competence, (2) Learning Environment, (3) Attentive Facilitation (4) Debriefing Framework, and (5) Outcomes Congruence, to identify information from each study that indicates alignment with the SOBP. A review of the criteria caused some initial concern in attempting to evaluate self-debriefing activities with the debriefing SOBP. For example, Criterion 3 states that the facilitator is someone "who can devote enough concentrated attention during the simulation to effectively debrief the simulation-based experience" (INACSL Standards Committee, 2016, p. S22). It may seem a moot point to assess for alignment of this criterion since a facilitator is not present during self-debriefing. One point to consider is that the SOBP were originally written before situations, such as virtual simulation, might benefit from self-debriefing (Sittner et al., 2015). An evaluation may still be possible with a caveat. The requirement of a facilitator's presence may be replaced by the presence of design features that serve the facilitator's functions. By interpreting the criteria overall, and especially the third criterion in this manner, self-debriefing activities may still be assessed for alignment to the SOBP.

There are several required elements under each criterion in the debriefing SOBP. Four of the five criteria (1-Debriefing Competence, 2-Learning Environment, 4-Debriefing Framework, and 5-Outcomes Congruence) contain elements with a narrower focus. Acknowledging the

presence or absence of a single attribute addresses each of these criteria. Conversely, Criterion 3-Attentive Facilitation includes 16 elements for a wide variety of topics that a single attribute is unable to represent. After reviewing the elements, it became apparent that a few of the elements are specific to live group debriefs only, and a few other elements were similar enough to be combined. Therefore, for this assessment of self-debriefing activities, the 16 elements of Criterion 3 were reduced to 10 unique and pertinent items for evaluation. These 10 items were then sorted into three categories: feedback, reflection, and user experience. This review of the debriefing SOBP led to the creation of a new tool to assist with comparing the self-debriefing activities from each study: The Self-Debriefing Activity Appraisal Tool (SDAAT).

The SDAAT has 14 items, 10 for Criterion 3, and 1 for each of the other four criteria. Each item is rated on a dichotomous scale. A rating of "0" is for an item that is absent or not described, and a rating of "1" if present. After rating each self-debriefing activity according to the 14 items, the resulting numbers are totaled to provide an overall score. These scores may be used to identify relative adherence or alignment to the debriefing SOBP. Scores between 0 to 4 show low alignment. Self-debriefing activities with a score from 5 to 9 have moderate alignment, and those with a score from 10 to 14 have high alignment to the debriefing SOBP.

Results

Study Characteristics

Table 2 describes the general characteristics of the studies within this review. Included are six randomized control trials, one quasi-experimental study, a quantitative descriptive study, one qualitative focus group, and a study that identifies as mixed methods; however, it does not

integrate the two designs nor include any qualitative findings within the report (Verkuyl et al., 2019). Origins of the research include Canada (n = 5), the United States (n = 3), China (n = 1) and Taiwan (n = 1). The studies' participants represented a variety of healthcare disciplines: undergraduate nursing students (n = 4), medical school residents (n = 2), anesthesia residents (n = 2), emergency medical technicians (n = 1), and multi-disciplinary staff in a neonatal intensive care unit (n = 1). The mode of simulation for six of the studies was live and in-person, using either manikins, robotic trainers, or standardized patients. The remaining studies used virtual simulation.

Table 2

Study Characteristics

Authors	Aim	Sample	Research Design	Sim Mode	Findings
Boet et al. 2011 Canada	To examine self-debrief compared to instructor-led debrief for change in nontechnical skills	n = 50 anesthesia residents	RCT IV: type of debrief - instructor debriefing (CG), video-assisted self-debriefing (EG) DV: Performance in second simulation	Live Manikin	Significant, comparable improvements for both groups.
Fan et al. 2017 Taiwan	To examine different types of self-debriefing for CPR training	n = 88 EMTs	RCT IV: self-debriefing with results (CG), self-debriefing w/ results and bio-mechanical performance feedback (EG) DV: Post-test CPR performance	Live Manikin	Significant, comparable improvements for both groups.
Gantt et al. 2018 USA	To compare student outcomes from different debriefing methods	n = 95 2nd semester BSN students	Quasi-experimental plus survey question IV: 3 types of debriefs (facilitated, feedback only, self-debrief, and rotation of all types as "control") DV: Simulation performance score Survey question on the fit of the debriefing method	Live Manikin	ID group scores significantly higher than other groups. Method not a good fit for at least 52% SD and 55% Feedback-only groups.
Kun et al. 2018 China	To compare self-debriefing with video review with standard skills training	n = 50 2nd/3rd year medical residents	RCT IV: self-training group w/ no self-debrief (CG), self-training group w/ self-debrief via video performance (EG) DV: robotic surgery training task performances	Live Robotic Trainer	SD group made continuous significant gains; non-SD group had skill decay between sessions.

Authors	Aim	Sample	Research Design	Sim Mode	Findings
Miller et al. 2018 USA	To evaluate online debriefing post content and focus group on debriefing experience	n = 34 multi-disciplinary NICU dept.	Descriptive Participation rates of debriefing Analysis of learners' postings Focus group questions	Virtual	Responses dropped from 1st to the 4th session. User comments focused on virtual simulation and not on learning.
Sukalich et al. 2014 USA	To determine if a self-guided tutorial improves self-efficacy compared to faculty-led debriefing after SP scenario	n = 55 PGY 1 residents	RCT IV: self-debrief or faculty debrief DV: self-efficacy pretest and posttest scores	Live Standardized Patients	Significant, comparable improvements for both groups.
Verkuyl et al. 2018a Canada	To compare types of debriefing after a virtual simulation for self-efficacy, knowledge gains, and debriefing experience	n = 200 first-year BSN nursing students	RCT IV: type of debrief (in-person, synchronous online, or self). DV: Self-efficacy (SE) scores, Knowledge test scores, Debriefing experience responses	Virtual	Significant, comparable improvements for all groups in SE and knowledge gains, ID significantly higher in debriefing experience.
Verkuyl et al. 2018b Canada	To explore students' experiences on style of debrief from larger study (Verkuyl et al., 2018a)	n = 24 first-year BSN students	Qualitative Focus group	Virtual	Themes: defusing emotions. more confidence, time for exploring errors, reflection on decision-making, writing solidifies knowledge, summarize the big picture, answer honestly, desire to know others' experiences

Authors	Aim	Sample	Research Design	Sim Mode	Findings
Verkuyl et al. 2019 Canada	To examine impact of three debriefing methods following virtual simulation on knowledge and debriefing experience	N = 254 First-year BSN students	Mixed methods IV: type of debrief - self-debrief (SD), SD + small group, or self + large group. DV: Knowledge test scores, Debriefing experience responses Focus groups	Virtual	Significant, comparable improvements for all groups for knowledge. SD group lowest on debriefing experience.
Welke et al. 2009 Canada	To determine effectiveness of standardized multimedia instruction after simulation compared to video-assisted oral debriefing with instructor	n = 30 PGY1, PGY2 anesthesia residents	RCT IV: standardized multimedia presentation vs. video-assisted oral debriefing DV: Pre-test, Post-test, Retention (ACLS scenarios)	Live Manikin	Significant, comparable improvements for both groups at post-test and retention.

Study Outcomes

A majority of the studies that compared self-debriefing to instructor-led debriefing for gains in later performance or knowledge demonstrated significant improvements for both groups without significant differences found between the groups. A lone study found significant performance score increases for the instructor-led debrief over self-debriefing (Gantt, Overton, Avery, Swanson, & Elhammoumi, 2018). Those studies that compared variations of self-debriefing demonstrated that a lack of feedback led to skill decay and that additional feedback beyond a performance report does not significantly improve performance. Themes from the qualitative focus group describe the perceived benefits of self-debriefing along with a desire to know about others' experiences.

Self-Debriefing Design Characteristics

Guidance for self-debriefs consisted of either verbal questions, written questions, or multimedia tutorials. Each study's self-debrief contained personalized performance feedback except for one study that used standardized examples of optimal and poor performances along with a tutorial (Welke et al., 2009). One study did not describe any guidance for the self-debrief but did give both personalized and standardized performance feedback (Kun, Hubert, Bin, & Huan, 2018). For those studies that reported on the duration of self-debriefing, the activities ranged from 10 to 30 minutes. One exception was found in the self-debrief for robotic training, where learners reviewed video feedback for an hour a day during 3-day intervals between simulation sessions (Kun et al., 2018). Self-debriefing designs included the practice of writing

reflections for four separate studies. The remaining studies did not describe a process for promoting reflection during the self-debrief. (Table 3)

Table 3

Self-Debriefing Characteristics

Study	Self-Debrief Guidance	Feedback/Type	Duration	Written Reflection
Boet et al. (2011)	Verbal Question, w/ ANTS tool	PFB/Video	20 min	Not stated
Fan et al. (2017)	Not specified	PFB/Report	Unknown	Not stated
Gantt et al. (2018)	Written Questions	PFB/Video	20 min	Yes
Kun et al. (2018)	Not specified	PFB, SFB/Video	1 hr./3 days	Not stated
Miller et al. (2018)	Written Questions	PFB/Report	Unknown	Yes
Sukalich et al. (2014)	Verbal Questions	PFB/Video	15 min	Not stated
Verkuyl et al. (2019)	Written Questions	PFB/Report	10 to 30 min	Yes
Verkuyl et al. (2018)	Written Questions	PFB/Report	Unknown	Yes
Welke et al. (2009)	Tutorial w/ example videos	SFB/Video	Unknown	Not stated

SOBP Criteria Appraisal

The assessment of alignment to the five SOBP debriefing criteria is reported within the Self-Debriefing Activity Appraisal Tool (SDAAT) in Table 4. Regarding the facilitator competence (Criterion 1), four of the studies refer to the individuals providing the SBE, such as simulation faculty, faculty with simulation experience and training, or experienced simulation instructor. Beyond these references, detailed information to support debriefing competence did

not appear in the study reports. Options for a conducive learning environment (Criterion 2) include the simulation lab, at home, or within the hospital. The analysis performed to describe the level of adherence to attentive facilitation (Criterion 3), revealed varying efforts to provide feedback, reflection, and user experience. As for a debriefing framework (Criterion 4), five studies used a framework. Those debriefing frameworks include the Plus/Delta model (n= 3) and the 3D Model of debriefing (n = 2). The remaining studies described no framework. The evidence to support meeting outcomes congruence (Criterion 5) was interpreted by whether the debriefing process presented information on the performance gaps or if the learners had to identify these for themselves. Since performance gaps would be part of a performance report in the case of a self-debriefing, the four studies that used performance reports met Criterion 5. In contrast, the remaining studies' self-debriefing processes required learners to identify gaps from reviewing their performance on video. Playback of videotaped performance without comparison to ideal performance does not serve as the facilitator identifying the gap in learning.

From the overall scores, two of the studies (Verkuyl, Atack, et al., 2018; Verkuyl et al., 2019) had self-debriefing activities with high alignment to the debriefing SOBP. One study's self-debriefing activity showed low alignment (Kun et al., 2018) by meeting only 4 of the 14 items. The remaining studies' self-debriefing activities demonstrated moderate alignment (Boet et al., 2011; Fan et al., 2017; Gantt et al., 2018; Miller, Farra, & Simon, 2018; Sukalich, Elliott, & Ruffner, 2014; Welke et al., 2009).

Table 4

Self-Debriefing Activity Appraisal Tool

Criteria	Boet et al (2011)	Fan et al (2017)	Gantt et al (2018)	Kun et al (2018)	Miller et al (2018)	Sukalich et al (2014)	Verkuyl et al (2019)	Verkuyl et al (2018)	Welke et al (2009)
1-Debriefing Competence									
1.1 Is evidence of competence listed?	1	0	0	0	0	0	1	1	1
2-Learning Environment									
2.1 Is environment conducive to learning?	1	0	1	1	0	1	1	1	1
3-Attentive Facilitation									
Feedback									
3.1 Is feedback technique appropriate?	1	1	1	1	1	1	1	1	1
3.2 Is feedback from an external source?	0	1	0	0	1	0	1	1	0
3.3 Are performance examples given?	1	1	1	1	0	1	1	1	1
3.4 Is learning summarized to close the gap?	0	1	0	0	1	1	1	1	1
Reflection									
3.5 Is reflection promoted by questions?	1	0	1	0	1	1	1	1	0
3.6 Is engagement facilitated by questions?	0	0	1	0	1	0	1	1	0
3.7 Are future planning responses included?	1	0	1	0	0	0	1	1	0
User Experience									
3.8 Is climate respectful/confidential?	1	0	1	1	1	1	1	1	1
3.9 Is info/instructions given on the process?	1	0	1	0	0	1	1	1	1
3.10 Is debrief modifiable based on needs?	0	0	0	0	0	0	0	0	0
4-Debriefing Framework									
4.1 Is a framework described?	0	0	1	0	0	1	1	1	0
5-Outcomes Congruence									
5.1 Is performance gap info given to learners?	0	1	0	0	1	0	1	1	0
Total	**8**	**5**	**9**	**4**	**7**	**8**	**13**	**13**	**7**

Discussion

This literature review sought to explore the current evidence on the use of self-debriefing in healthcare simulation using the INACSL Standard of Best Practice: Simulation Debriefing. The analysis of self-debriefing activities with the newly developed SDAAT highlighted key factors for future self-debriefing activity creation. Despite the limited number of studies located during this review, several important findings emerged to support the use of self-debriefs in healthcare simulation, including equivalency to instructor-led debriefs and advantages in this alternative form of debriefing. In addition to these findings, topics for further research also emerged.

Self-Debriefing Design Considerations

All five criteria within the debriefing standard represent important considerations for any debrief. The first criterion emphasizes the need for training and knowledge to provide sound debriefing experiences. The second recommends a confidential learning environment that shows positive regard for the learner. A debriefing framework is the focus of the fourth criterion, and the fifth criterion emphasizes congruence to the outcomes of learning. Because of its size and the many elements within it that address functional considerations, Criterion 3-Attentive Facilitation is particularly crucial when it comes to creating a self-debriefing activity. The core of the self-debriefing processes is addressed within this criterion. Design choices that serve the three categories within Criterion 3, feedback, reflection, and user experience, can impact the success of a self-debriefing event.

Feedback

Two principal methods accomplish delivery of feedback in self-debriefs: self-assessment (Boet et al., 2011; Gantt et al., 2018; Kun et al., 2018; Sukalich et al., 2014; Welke et al., 2009) and performance report (Fan et al., 2017; Miller et al., 2018; Verkuyl, Atack, et al., 2018; Verkuyl et al., 2019). For the self-assessment style of feedback, learners can watch their performance on video and compare it to their prior knowledge about the topic to determine correct and incorrect actions. This method seems to rely on learners having enough prior knowledge and a maturity level in critiquing themselves. The other method, performance report, requires some process to automatically score the actions or decisions so that learners can immediately debrief themselves. Specific equipment such as programmable task-training manikins or computer-based simulations can document performances and create reports for learners to review. These reports offer an independent assessment of performance and can be used by learners who have limited understanding of the skill or have difficulty in critiquing themselves objectively. A type of feedback that bridges the gap between self-assessment and performance report would be the provision of optimal and poor exemplar performance presentations, such as those used by Welke et al. (2009). With this method, learners would still need to assess their performances, possibly from memory, if not recorded, but would have objective correct and incorrect examples to use as a comparison. Research has not compared different forms of feedback within the same population to identify which format is better.

Reflection

Providing questions to stimulate reflection appears to be a common practice, although the method of provision varies across self-debriefing designs. From the studies found in this

review, the two options appear to be verbal or written questions. For live simulations with graduate students (Boet et al., 2011; Sukalich et al., 2014), facilitators verbally advised learners to consider what went well and what could be improved. A live simulation with undergraduate students (Gantt et al., 2018) and virtual simulations (Miller et al., 2018; Verkuyl, Atack, et al., 2018; Verkuyl et al., 2019) furnished those questions in writing. Delivering the questions in a written format would seem to increase the likelihood that learners will review and respond to each question. The provision of questions also engages the learner, which is especially important during a self-debrief. Simply asking students to consider their mistakes is unlikely to engage them in a reflective process fully. Students may not remember verbal questions if there are more than one or two provided. Using verbal questions would not be practical in the case of independent, self-run simulations.

While Plus/Delta questions are popular, it is unknown if they can adequately encourage in-depth reflection. Only three studies used questions that went beyond the simple 'what went well' and 'what could be improved' approach (Miller et al., 2018; Verkuyl, Atack, et al., 2018; Verkuyl et al., 2019). Going beyond answering what went well and what went poorly gets to the 'why' of a situation (Oriot & Alinier, 2018), which leads to deeper reflective thinking.

Responding to questions serves to support reflection, which is a necessary component of debriefing (Dreifuerst, 2009; INACSL Standards Committee, 2016). A concern about self-debriefing is the uncertainty of managing reflection activities without a facilitator. Not all, but a few of the studies used written responses to the supplied questions as part of the self-debriefing design. Evidence exists to support the choice for written debriefing (Petranek, 2000; van der

Meij, Leemkuil, & Li, 2013). Writing down the thoughts that the questions generate may deepen reflection and enhance learning (Moon, 1999).

User Experience

Although few of the studies measured the perception of self-debriefs, the findings suggest that potential design choices may have an impact on improving the user's perception. Providing clear instructions on how to conduct the self-debrief, including when to complete it and how much time to set aside, may decrease confusion and increase the user's experience. For learners who may not have considerable prior knowledge of concepts within the event, the inclusion of a video showing poor and optimal performances, such as that used by Welke and colleagues, may help to answer learners' questions about correct or expected behaviors. This information may help reduce frustration. This feedback may be labor-intensive initially but could go on to serve countless learners when they are ready for a self-debrief.

Equivalency

The evidence found in this review generally confirms the equivalency of self-debriefing. Findings from those studies that compared different types of debriefs demonstrate that self-debriefs can match facilitator-led debriefs in desired outcomes. Learners in both live and virtual simulations achieve similar gains in knowledge (Verkuyl, Atack, et al., 2018; Verkuyl et al., 2019), self-efficacy (Sukalich et al., 2014; Verkuyl, Atack, et al., 2018), or later performance (Boet et al., 2011; Sukalich et al., 2014; Welke et al., 2009).

A lone study that compared debriefing modalities (Gantt et al., 2018) does not lend support for self-debriefs over instructor-led debriefing due to finding significantly higher scores

for students debriefed by the instructor. Possible explanations for these findings include study design and self-debrief design. For example, performance scoring was completed by multiple graders with no mention of inter-rater reliability. The researchers describe randomizing the final skill simulation, but there was no information to substantiate the equivalence of skill types distributed across the groups. Also, the article describes the debriefing tool in the faculty-led debrief condition was used inconsistently by the faculty members. Finally, the approach to learner feedback may have been flawed for this group of learners. The undergraduate students had to score themselves by watching a video of their performance. This approach does not provide an outside source of feedback, which can offer some confirmation to learners who are unsure about their understanding of the event. Independent video review may work well for advanced learners, such as the graduate-level students found in other studies (Boet et al., 2011; Sukalich et al., 2014), but it may not be an excellent choice for less-experienced students.

Advantages

In addition to savings in resources and reduced need for instructors for facilitation, there are other advantages to self-debriefing. Learners who debrief themselves describe having time to think, feeling less pressure to respond right away, and having privacy (Verkuyl, Lapum, et al., 2018). The concept of psychological safety or the perceived consequence of taking a risk in front of others (Edmondson & Lei, 2014) is essential in simulation. Psychological safety is a recommended inclusion for simulation design (Rudolph, Raemer, & Simon, 2014). Risk-taking for learners, such as making a wrong choice or answering a question incorrectly, is removed during a self-debrief. There is also no restriction on combining modes of debriefing to reap the

benefits of multiple forms. Like the design in the study by Verkuyl et al. (2019), learners can initially participate in a self-debrief, where there is privacy and ample time to reflect, then join up with a group for a facilitated debrief. By offering a group session afterward, students with any unresolved questions may receive answers, and shared learning can occur.

Implications for Further Research

The limited number of studies found for this review and their varied designs represent a need for more research on self-debriefing. There are very few studies on any given population which limit generalizability. More comparisons between modes of debriefing while considering the design features found in the more successful self-debriefs need to be conducted. For instance, an examination of differences between modes of feedback in a self-debrief, self-assessment of video performance compared to external feedback on performance by scoring device, may confirm which feedback mode students at different experience levels prefer.

Another priority of future research is in establishing the functionality of the elements recommended by the SOBP. While it is helpful to have evidence of outcomes of a debrief, such as learning or performance gains, evidence is also necessary to confirm a self-debrief has the requisite features of any debrief, namely a means of delivering feedback and also the stimulation of reflection. From this review, an adequate description of feedback delivery is available, but reflection ability is not. Demonstrating reflection ability remains the next piece of evidence sought to support self-debriefing as a potential replacement for or addition to instructor-led debriefs. Further, finding answers to whether theory-based questions are more successful at stimulating reflection over the generic ‘Plus/Delta’ questions would guide the

design of effective self-debriefs. Since standards of best practice for debriefing (INACSL Standards Committee, 2016) recommend the inclusion of feedback and reflection for any debrief, evidence is necessary to determine if reflection occurs with self-debriefing to consider its continued use.

Conclusion

Evidence demonstrates the ability for self-debriefing to result in comparable learning outcomes, such as performance or knowledge gains. Self-debriefing designs identified in the literature vary in levels of alignment to recommended standards of best practice. Features of self-debriefing design have an impact on students as they independently review their learning experiences in SBE; however, researchers have yet to test these features for optimal efficacy. Capacity for promoting reflection, even in well-designed self-debriefing exercises, remains unknown. User perception, in some instances, indicates that design considerations are not always a priority. The review of prior self-debriefing applications against the standard points out successes, needed changes, and directions for more research in support of the innovation of self-debriefing.

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CHAPTER 3:
MEASURING DEPTH OF REFLECTION FROM SELF-DEBRIEFING MANUSCRIPT

Abstract

Background: Nursing educators are turning to virtual simulations to expand experiential learning opportunities. The asynchronous nature of virtual simulation makes it challenging to provide facilitator-led debriefs to occur immediately afterward, as recommended. Self-debriefing may be a solution for virtual simulation, but evidence is lacking as to what extent students can reflect when using self-debriefing. *Objectives:* This study aimed to identify the depth of reflection found in undergraduate nursing students' written responses to questions in a self-debriefing activity. *Design:* This study used an exploratory, descriptive design. *Setting*: A public university in central Florida. *Participants:* A convenience sample of 120 junior-level baccalaureate nursing students. *Methods:* Mezirow's definitions of reflective thinking informed a 4-level rating rubric; habitual action (L-1), understanding (L-2), reflection (L-3), and critical reflection (L-4). Following two virtual simulations, nursing students were assigned a researcher-developed self-debriefing activity. The activity, based on Gibbs' Reflective Cycle, contained six questions (Description, Emotion, Evaluation, Analysis, Conclusion, and Future Plan). Students accessed the activity and submitted written responses through Qualtrics. *Results:* Data from 176 submissions were rated using the MacKenna Self-Debriefing Reflection Rubric. Mean ratings for all submissions equaled 2.92. The two highest-rated questions were Q1-Description (μ=3.40) and Q4-Analysis (μ=3.10). *Conclusions:* Students showed varying levels of reflective thinking as a result of using the self-debriefing activity.

Keywords: self-debriefing, reflection, assessment, virtual simulation, reflective thinking

Introduction

Nursing educators are turning to alternative methods of experiential learning, such as virtual simulation (Foronda et al., 2017). Virtual simulation offers learner-centered benefits with features such as unlimited access and repeatability. Because of the way virtual simulation is accessed, educators have concerns about how to debrief students appropriately (Lapum et al., 2019). Recommendations state that all simulations have a debrief, or a session traditionally facilitated by a trained instructor, in which learners reflect on the experience with a goal toward improvement in performance (INACSL Standards Committee, 2016). Evidence suggests that facilitator-led debriefing should occur immediately after a simulation (Cantrell, 2008; Ryoo & Ha, 2015), but providing a debrief led by a facilitator is problematic when student access to virtual simulation is unlimited and asynchronous. Restricting virtual simulation use to only those times when a facilitator is available seems impractical, as it would constrain the schedule that the virtual simulation was selected to mitigate in the first place. This stalemate signals a need to explore alternative forms of debriefing for virtual simulation.

Self-debriefing is a type of debriefing that does not restrict the learner's autonomy or access to virtual simulation. For clarification, self-debriefing is considered a post-simulation process completed by an individual learner (Lapum et al., 2019). The intention behind self-debriefing is to allow learners to review whatever feedback is available and to reflect on performance with a goal to improve. Standards of best practice state that a core function of any debrief is to promote reflection (INACSL Standards Committee, 2016). During typical facilitator-led debriefs, the instructor is responsible for guiding the group discussion and asking questions to stimulate reflection. The absence of a facilitator makes determining if reflection

occurred difficult. Another concern is whether students will take the self-debriefing activity seriously or commit to the task to reflect on the simulation without in-person facilitation. As such, a determination of the presence and depth of reflection achievable through self-debriefing is an essential step in lending support for its future use and in offering suggestions to increase its effectiveness.

Literature Review

Self-debriefing is comparable to instructor-led debriefs in outcomes such as knowledge gains, improved performance, and increased self-efficacy for graduate-level medical students (Boet et al., 2011; Sukalich, Elliott, & Ruffner, 2014; Welke et al., 2009). In studies with undergraduate nursing students, results are mixed. Knowledge gains and self-efficacy improvements were comparable to instructor-led debriefs (Verkuyl et al., 2018), yet another study found later performance scores significantly higher for those students debriefed by an instructor (Gantt, Overton, Avery, Swanson, & Elhammoumi, 2018). Reasons for the discrepancy may be attributable to the self-debriefing framework used. While these findings offer some support for self-debriefing, none of the research sought or provided evidence of reflection.

Reflection is an integral component of experiential learning events like those found in simulation-based education. Reflective thinking is essential to learning because it helps the user recognize and make connections between aspects of the experience, leading to better problem-solving (Dewey, 1933). Learning does not emerge from experience itself but through a focused re-exploration of that experience (Boud, Keogh, & Walker, 1985; Gibbs, 1988). Various

learning theories explain how reflection contributes to learning. Reflection is one of the four components in Kolb's (1984) Experiential Learning Theory. Gibbs (1988) and Boud et al. (1985) expand Kolb's theory to illustrate steps or events that comprise effective reflective thinking that contribute to learning. Commonalities of both models include describing the experience, exploring emotions tied to the experience, analyzing the events that stand out by comparing them to prior knowledge, and finally considering how to apply the resulting ideas to future events.

Researchers have used Mezirow's (1990, 1991) definitions of reflection to create guides for categorizing and measuring written reflective activities for medical or dental hygiene students (Wald, Borkan, Taylor, Anthony, & Reis, 2012; Wetmore, Boyd, Bowen, & Pattillo, 2010). Wald et al. (2012) and Wetmore et al. (2010) use a four-category scheme to distinguish levels of reflective thinking similar to one by Kember, McKay, Sinclair, and Wong (2008): habitual action, understanding, reflection, and critical reflection. According to Kember et al. (2008), the first two levels, habitual action and understanding, represent non-reflective thinking. Habitual action is a rote response without thought, while understanding shows comprehension of theory, albeit no connection to personal experience. The last two levels demonstrate thinking that is reflective by relating personal experience to theory during the act of reflection or transforming one's perspective during an episode of critical reflection. Because of the clear divisions between the levels, this four-category framework serves to identify levels of reflection.

Even though reflection is an instinctive, natural occurrence, it is rarely structured by the individual user (Fanning & Gaba, 2007). Left alone to think about experience, a person tends to

either get stuck on something or jump to conclusions and miss important insights (Gibbs, 1988). Gibbs' model, in particular, includes a structure for students to follow to gain the full benefit of reflection. Any debrief should include a means to guide the learner through the phases of a structured reflection. In the case of self-debriefing, since the facilitator is not present to guide the discussion, the instructions and activities must provide the necessary guidance to promote reflection.

A review of the current research on self-debriefing demonstrates the inconsistent use of structure to assist with reflection. Four studies describe a formal process as part of the self-debriefing activity (SDA), which may promote reflection (Gantt et al., 2018; Miller, Farra, & Simon, 2018; Verkuyl et al., 2018; Verkuyl et al., 2019). Learners in these studies wrote responses to guiding questions. The remaining research either described the delivery of spoken questions given to students prior to a self-debrief (Boet et al., 2011; Sukalich et al., 2014) or did not describe any process for reflection (Fan et al., 2017; Kun, Hubert, Bin, & Huan, 2018; Welke et al., 2009).

While the designs of some SDAs have the potential for promoting reflection, no evidence is available to confirm their ability to do so. Two studies that used structured self-debriefing designs identified outcomes such as learning gains and increased self-efficacy (Verkuyl et al., 2018; Verkuyl et al., 2019); however, they did not measure reflection itself. With the emphasis placed on any debriefing to provide a means for reflection, there is an unexplored need to confirm that reflection occurs during self-debriefing. Therefore, the purpose of this study is to identify the presence and depth of reflective thinking as a result of participating in a self-debriefing activity.

Methods

Study design

This study used an exploratory, descriptive design to answer the following question: What is the depth of reflection found in undergraduate nursing students' written responses to a self-debriefing activity after a virtual simulation?

Ethical considerations

This study was reviewed and determined to be exempt by the University of Central Florida Institutional Review Board. Students' submissions were anonymous to protect confidentiality. Prospective participants granted permission for analysis of their submission by responding affirmatively to an opt-in question.

Participants

The population for this study consisted of 120 junior-level pre-licensure nursing students enrolled in the Nursing Care of Families clinical course at the University of Central Florida's College of Nursing during the Spring 2020 semester. This site and sample were selected due to the placement of an initial virtual simulation assignment for the undergraduate students in this nursing program.

Procedure

At the beginning of the semester, the course instructor posted an announcement in the online learning platform to advertise the study. All 120 students enrolled in the course were

eligible to participate. The announcement advised that the virtual simulations and self-debriefing were mandatory course assignments, but that granting permission for the researcher to access students' submissions was optional.

Students were divided into four cohorts and assigned a due date that corresponded to one on-campus clinical day in either January, February, March, or April. Students had permission to complete the virtual simulation on any date and time up to the day before the on-campus event. The virtual simulation product for the assignment was vSim for Nursing™. The scenarios included an obstetric patient with pre-eclampsia and a pediatric patient during a sickle cell event.

After completing each scenario, students accessed the SDA through Qualtrics (Provo, UT). The online survey allowed for student anonymity and a means of capturing their reflective thinking related to the virtual simulation experience. Students received separate links for each of the two identical SDAs, one for the pediatric scenario and one for the maternity scenario, to keep each scenario's responses separated. The two links also served as a cue for students to complete an SDA for each virtual simulation. The course instructor posted these links in the online learning platform.

Self-Debriefing Activity

In order to measure reflection during self-debriefing, the SDA design for this study needed to include a process to capture students' reflective thinking. Measuring reflection is difficult due to its internal and cognitive nature. A way to address this challenge is to have a person externalize their thoughts by either speaking or writing. Analysis of these externalized

thoughts provides evidence of reflective thinking (Wong, Kember, Chung & Yan, 1995). This method is not a perfect solution, as it relies on the willingness of individuals to speak about or write down their thoughts. Regardless of the type of debriefing, the person who is reflecting is in control of externalizing any reflective thinking. The SDA used in this study required a written response for each question to allow the measurement of reflective thinking.

For this study, the researcher developed the SDA around a structure for reflection that promotes learning from experience. The SDA comprised a set of six guiding questions intended to assist with reflecting on the experience based on Gibbs' (1988) Reflective Cycle. This model for the SDA was chosen for its simple structure and similarities to many other models of debriefing (Husebø, O'Regan, & Nestel, 2015). In the SDA, students started by describing important aspects of the experience for Q1-Description. The second question, Q2-Emotion, encouraged students to identify what emotions they felt related to the actions or events. Next, Q3-Evaluation asked students to judge their actions or decisions as positive and negative. The fourth question, Q4-Analysis, prompted students to make sense of the situation, while Q5-Conclusion asked students to identify any alternative actions that could have been made and connect outcomes to those actions. The final question, Q6-Future Plan, prompted students to lay out a plan of action for similar future instances. A response to this final question represented the overall goal of reflection, an intention to change behavior based on examining an experience.

Instruments

Self-Debriefing Reflection Rubric

Reflection has yet to be measured in self-debriefing for healthcare simulation, but there have been efforts to measure reflection in other applications, such as educational gaming and reflective journals. Therefore, the first step in approaching the measurement of reflection during self-debriefing was to search for any existing rubrics that could be used or adapted. The existing rubrics found in the literature did not align well with the SDA for this study and could not be used directly. However, the frameworks of the rubrics served as guidance in developing one that would fit. The two common structures found among other rubric designs included distinct levels or types of reflection, and a stepwise process of reflection (Lucas et al., 2017; Tsingos, Bosnic-Anticevich, Lonie, & Smith, 2015; Wetmore et al., 2010). This information, along with Mezirow's definitions of reflection levels, informed the design of the rubric for this study. The reflection rubric was designed with six items related to each of the six questions in the SDA, each with four possible rating levels, L-1 (habitual action), L-2 (understanding), L-3 (reflection), or L-4 (critical reflection). A student with at least four L-3 or L-4 ratings demonstrates evidence of reflection, and a student's mean rating of 3.0 or higher for all six questions in the submission demonstrates overall reflective thinking.

The researcher next explored validity and reliability testing for the newly designed rubric. Four doctorally-prepared educators, with experience in adult education and nursing, reviewed the first draft of the rubric for content and face validity. Feedback from the educators included adding sample statements for scoring clarity and defining each level of reflective

thinking within the context of each stage in the cycle. The incorporation of these suggestions resulted in the final version of the rubric used in this study. (Figure 2)

	Level 1	Level 2	Level 3	Level 4
Q1. Description What happened?	**Does not describe 2 or more events** expected from simulation	**Lists 2 events** from the simulation	**Describes 3 or more** events from simulation	Level 3 PLUS **chronologic, rich details**, paints a picture to assist with reflection
Examples to assist with determining levels: ***L1*** *– "I took care of a patient with (condition)"* ***L2*** *– "I did an assessment and I followed the doctor's orders"* ***L3*** *– "I started with an assessment, I reviewed the orders, I gave XYZ med through the IV"* ***L4*** *– "I entered the room; the patient was struggling to breathe. I raised the HOB, her breathing became less labored. Then I assessed and reviewed the orders (etc)"*				
Q2. Emotions What were your feelings or reactions?	**Does not list a feeling about own action** or the clinical experience (i.e. reacts to VS technology)	**Lists at least 1 feeling** (actual or implied)	Level 2 PLUS **cause of feeling**	Level 3 PLUS **additional insight**
L1 *– "I enjoy doing virtual simulation" OR "It's really frustrating when you click on something but still get it wrong"* ***L2*** *– "I felt nervous about caring for a patient with (condition)"* ***L3*** *– "I felt nervous about caring for a patient with (condition) because I haven't learned about that in class."* ***L4*** *– "I felt nervous as I haven't learned about this, and I might make mistakes that could result in patient harm."*				
Q3. Evaluation What was good or bad?	**Does not evaluate own action** or behavior	Lists at least **1 action that went well** or not well	Level 2 PLUS **Reason why**	Level 3 PLUS **additional insight**
L1 *– "It was good that the VS lets you repeat the scenario"* ***L2*** *– "I think my assessment was good"* ***L3*** *– "My assessment was good because I made sure to include all the body systems."* ***L4*** *– "My assessment was good – I did a complete head to toe before giving meds, and this allowed me to catch something I wasn't expecting with this patient's diagnosis"*				
Q4. Analysis What sense can you make of the situation?	**Does not analyze** clinical experience	Lists at least **1 outcome/ consequence** resulting from stated or implied action	Level 2 PLUS **Reason why** outcome occurred	Level 3 PLUS **additional insight** about consequence of action/outcome
L1 *– "The system marked me wrong even tho I did X, Y, and Z - I like real sims better"* ***L2*** *– "Assessments let you gather information."* ***L3*** *– "Doing the head-to-toe first meant I had the info ready when the doctor called"* ***L4*** *– "Doing the head-to-toe first meant I had info ready when the doctor called. This let me give meds quicker. Keeping others up to date means she's getting accurate care."*				
Q5. Conclusion What else could you have done? What did you learn?	**Does not answer the question**	Lists at **least 1 alternative action**	Level 2 PLUS **Describes outcome** for alternate action	Level 3 PLUS **additional insight** (summarizes lesson learned)
L1 *– "I learned that I have to do the vSim multiple times to get a good score"* ***L2*** *– "I could have listened to the patient more."* ***L3*** *– "I could have listened to the patient more instead of my task list – I would have been able to treat her faster."* ***L4*** *– I could have listened more instead of my task list – I would have been able to treat her faster. Both are important, but the priority has to be re-evaluated throughout."*				
Q6. Future Action Plan What will you do if you see this again?	**Does not answer the question** with specific action plan	Lists at least **1 plan for future** experience	Level 2 PLUS **rationale for chosen plan**	Level 3 PLUS any **additional insight**
L1 *– "I did the best I could."* ***L2*** *– "I would do a more thorough assessment"* ***L3*** *– "I will do a more thorough assessment because I missed checking her reflexes after giving mag sulfate."* ***L4*** *– "I will check her DTR's before and after giving mag sulfate because this med decreases CNS activity and a change points to toxicity"*				

Figure 2 MacKenna Self-Debriefing Reflection Rubric

Seven certified healthcare simulation educators with extensive facilitation experience assisted with testing for reliability. The educators rated a sample of ten students' written responses to an SDA. Interrater reliability was calculated from the scores by using the intraclass correlation coefficient (ICC) (Shrout & Fleiss, 1979). The conditions of a fixed set of raters and a sample of responses led to choosing a two-way ANOVA model with mixed effects, average measures, and absolute agreement design. The calculations generated additional descriptive

statistics. All calculated reliability coefficients were equal to or greater than .75 and deemed as excellent (Cicchetti, 1994). Table 5 shows the complete findings from this reliability testing.

Table 5

Interrater Reliability Testing

		95% Confidence Interval			
Question	ICC	Lower Bound	Upper Bound	F Test	Sig
Q1-Description	.962	.910	.989	26.858	<.001
Q2-Emotion	.746	.417	.926	4.106	<.001
Q3-Evaluation	.848	.650	.955	7.208	<.001
Q4-Analysis	.926	.827	.978	14.414	<.001
Q5-Conclusion	.957	.900	.988	27.158	<.001
Q6-Future Plan	.934	.845	.981	18.641	<.001
All Questions	.921	.886	.948	13.296	<.001

An evaluation of interrater reliability was also performed on a sample of submissions from the study data by the lead researcher and one of the seven previous raters before the entire dataset was analyzed. An initial weighted Kappa was calculated (K_w = .555). Since the result did not reach the recommended .60, the raters discussed the differences in scoring and came to a consensus on how to score the submissions. Another sample was independently rated, and the second weighted Kappa was calculated with a higher-level agreement (K_w = .712), considered a good level of significance (Cicchetti, 1994).

Data Collection

The completed responses to the SDA were downloaded from Qualtrics into two Excel spreadsheets, one for maternity responses and the other for pediatric responses. Students who

did not consent to participate in the study were removed before any analysis was performed. On the spreadsheet, each row represented a single student's responses to the six guiding questions in the SDA, and each column represented responses to a single question. An additional column was inserted next to each set of responses for easier rating and recording of scores. All student responses to a single question were analyzed together to ensure consistency in scoring. Any responses referring to a different scenario were moved to the correct scenario spreadsheet. Each submission was labeled by cohort, scenario, and sequentially numbered to keep the data organized., The data were then combined into a single master spreadsheet page and imported into IBM SPSS version 25 for statistical analysis.

Data Analysis

Descriptive statistics such as sums, frequencies, and means of the ratings were generated. In addition to descriptive statistical analyses, one-way ANOVA testing was conducted to determine any significant differences between scenarios and cohorts. Additionally, Pearson's product-moment correlation was run to assess relationships between SDA questions, cohorts, scenarios, and mean ratings.

Results

The extracted data contained 176 self-debriefing submissions. Mean ratings were calculated from totaling the ratings for all six questions per submission. The overall mean rating for all submissions was 2.92, and these mean ratings ranged from 1.67 to 3.83. Evidence of reflection, four or more items with Reflection ratings (L-3's and L-4's), was also noted. Over 76% (135/176) of the submissions had Reflection ratings (45 = 6/6; 47 = 5/6; 43 = 4/6). (Table 6)

Table 6

Number of L-3 or L-4 Ratings per Submission

L-3 or L-4 Ratings	Submissions	Percent	Cumulative Percent
6/6	45	25.6	25.6
5/6	47	26.7	52.3
4/6	43	24.4	76.7
3/6	29	16.5	93.2
2/6	9	5.1	98.3
1/6	3	1.7	100
Total	176	100	

Of the total submissions, 91 corresponded to the pediatric simulation, and 85 submissions corresponded to the maternity simulation. The mean ratings for the maternity and pediatric simulations were compared to identify any discrepancies or influence on ratings by scenario. While the mean rating for the maternity scenario were slightly higher (2.94) than the pediatric scenario (2.91), it lacked statistical significance ($p = .673$). Cohort mean ratings slightly improved over the course of the semester. Total mean ratings ranged from 2.81 in January to 3.07 in April and increased over the semester in a stepwise fashion. One-way ANOVA analysis revealed a significant difference in mean scores, $F (3, 172) = 3.10$, $p = .028$. Bonferroni post-hoc testing determined the increase between January to April (.266, 95% CI (.027-.505)) was statistically significant ($p = .020$). Differences between all other cohorts' mean scores lacked significance. Table 7 shows the total mean rating, the total mean rating by scenario, and by cohort.

Table 7

Mean Ratings by Student, Scenario, and Cohort

	n	M	SD	Min	Max	Range
All Students	176	2.92	.42	1.67	3.83	2.17
OB Scenario	85	2.93	.43	1.67	3.83	2.17
Peds Scenario	91	2.91	.41	2.00	3.83	1.83
Jan Cohort	53	2.81	.39	2.00	3.83	1.83
Feb Cohort	29	2.89	.41	2.17	3.67	1.50
Mar Cohort	58	2.95	.42	1.67	3.83	2.17
Apr Cohort	36	3.07	.44	2.17	3.83	1.66

When examining individual question ratings, Q1-Description had the highest mean (3.40) and the highest combined number of Reflection ratings, (173), while Q3-Evaluation had the lowest mean (2.64) and the second-fewest combined Reflection ratings, (104). The lowest number of Reflection ratings (102) was found for Q6-Future Action. The fourth question, Q-4 Analysis, was the only other question with a mean above a '3' (3.10). Q-4 also had a considerable number of Reflection ratings (148). Conversely, all six questions had 13 or fewer (< 8%) responses rated as L-1 (habitual action). Table 8 presents data for individual SDA questions.

Table 8

Individual SDA Question Ratings

Question #	n	M	SD	Non-Reflection Ratings			Reflection Ratings		
				L-1	L-2	NR Totals	L-3	L-4	R Totals
Q1-Description	176	3.40	.54	0	3	3	99	74	173
Q2-Emotion	176	2.80	.75	13	32	45	109	22	131
Q3-Evaluation	176	2.64	.69	6	66	72	89	15	104
Q4-Analysis	176	3.10	.76	7	21	28	95	53	148
Q5-Conclusion	176	2.93	.86	11	38	49	79	48	127
Q6-Future Plan	176	2.66	.76	8	66	74	79	23	102

The means for each individual question were analyzed for differences based on the scenario. Five of six questions for the maternity scenario were slightly higher than for the pediatric scenario; however, all differences in questions by scenario lacked significance. (Table 9)

Table 9

Question Mean Ratings by Scenario

	Scenario		
Question	Maternity	Pediatric	*p*
Q1	3.41	3.40	0.839
Q2	2.86	2.74	0.280
Q3	2.68	2.60	0.453
Q4	3.12	3.09	0.795
Q5	2.87	2.99	0.362
Q6	2.68	2.65	0.768

One-way ANOVA testing showed significant differences between cohorts for Q1-Description ($F(3, 172) = 5.32$, $p = .002$), and Q2-Emotion ($F(3, 172) = 6.30$, $p < .001$). Bonferroni post-hoc testing identified the increase in the Q1-Description score (.327 95% CI

(.030-.620)) from January (μ = 3.34) to April (μ = 3.67) was significant (p = .019). Since the homogeneity of variances was violated for Q2-Emotion, as assessed by a Levene's test (p <.001), Welch testing was performed instead (Proper, 1971), which identified significant differences for Q2-Emotion, Welch's F (3, 78.30) = 5.79, p = .001). The Q2-Emotion mean ratings increased from January (2.45) to February (2.79) to March (2.98) to April (3.00). Games-Howell post hoc analysis showed the increase from January to March (.530 95% CI (.18-.88)) was significant (p = .001), and the increase from January to April (.547 95% CI (.13-.97)) was also significant (p = .003). All other differences between cohorts were nonsignificant.

Pearson's product-moment correlations identified significant, weak to moderate positive correlations among several pairs of questions (see Table 10). Q5-Conclusion had the strongest significant correlation with Q6-Future Plan (r = .402, p <.001). There are significant, moderate positive correlations between students' SDA total mean ratings and all individual questions, with Q4-Analysis having the highest correlation to the SDA mean rating (r = .669, p <.001). There were no significant correlations found between question ratings and the type of scenario.

Table 10

Correlations Among Questions, Scenario, Cohort, and Total Mean Rating

	Q1	Q2	Q3	Q4	Q5	Q6	Scenario	Cohort	Mean
Q1 Description	1								
Q2 Emotion	.051	1							
Q3 Evaluate	.181*	.179*	1						
Q4 Analyze	.154*	.289**	.335**	1					
Q5 Conclude	.200**	.058	.191*	.301**	1				
Q6 Future Plan	.126	.139	.163*	.199**	.402**	1			
Scenario	-.015	-.082	-.057	-.020	.069	-.022	1		
Cohort	.135	.296**	.152*	.189*	-.064	.106	-.008	1	
Mean Rating	.424**	.503**	.575**	.669**	.661**	.608**	-.032	.224**	1

* p <.05; ** p <.01

Discussion

The results of this study illustrate the presence and varying depths of reflection found in undergraduate nursing students' responses to questions within the SDA. Although reflective thinking has been measured in nursing students' clinical journals using various rubrics or guides (Chirema, 2007; Jensen & Joy, 2005; Wong et al., 1995), this study represents the first assessment of nursing students' level of reflection in connection with self-debriefing and simulation.

With over 3/4^{ths} of the students having a majority of questions rated as Reflection or Critical Reflection, there is an indication that the SDA's design promotes reflective thinking. The activity was anonymous, and there was no associated letter grade with the assignment, which may suggest students' efforts were at least somewhat intrinsically motivated. The low percentage of L-1(habitual action) ratings for any question demonstrates additional evidence of students' efforts. Both the capacity and motivation for students to reflect seen in these findings lend support for using an SDA to promote reflective thinking about a learning experience.

The level of reflection varied from question to question for every student, and patterns found in the ratings suggest that students reflect more deeply in response to specific questions. The mean for Q1-Description was considerably higher than the other questions in the SDA. This difference may be due in part to the discrepant levels of complexity required in responding to the questions. Describing an event is more natural than evaluating actions or drawing conclusions and may have accounted for the 98% reflection rate. Wong et al. (1995) measured reflective thinking in written journals for nursing students but did not score students' efforts in describing the event, stating that the first stage (returning to the experience) was required for the exercise.

For questions related to feelings, evaluation, analysis, conclusions, and future planning, responses are not rote and require effort in thinking; therefore, those scores were lower.

Nonetheless, describing or retelling an event is important groundwork for reflection. Boud et al., (1985) assert this chronological exploration helps one uncover thoughts overlooked if the focus is only on the high and low points from an event., Despite not using the reflection model by Boud and colleagues for the overall design of the rubric or SDA, their assertion makes sense and informed the L-4 rating requirement for Q1-Description: to contain chronologic details to assist with the overall reflection. For future uses of this rubric, it may help to restructure or weight the scoring so that a high mark for Q1-Description is not confused with critical reflective thinking.

The mean rating for Q2-Emotion indicates that students may be able to identify their reactions to or decisions made during the simulation, but they may still have difficulty in exploring those reactions deeply to gain meaning. Many students provided a rationale for their feelings, as evidenced by the number of L-3 ratings for this question. Connecting a rationale to an emotion demonstrates reflection. However, compared to other questions, very few students went beyond this level. They may have viewed this question as more about their own feelings and not about how exploring their emotions connected to the event may assist with learning.

The lowest rated question was Q3-Evaluation. The ratings might be interpreted as students being able to easily identify actions that went well and others that went poorly but being unable to connect these ideas to prior knowledge in their writing. However, the fault may be a result of a design error in this study. When the SDA was created, hints were written into the questions to help students follow the structure of the reflective cycle. For Q3-Evaluation, the hint

"Do NOT include 'why' yet" was included to keep students from prematurely responding about content for the next question. This hint was written into the SDA before the rubric definition for an L-3 rating was written that requires a rationale to tie the good or bad action to a student's prior knowledge. This conflict between the reflection cycle process and the rubric may have negatively impacted the ratings for this question.

Students were better at responding to Q4-Analysis, which is encouraging since this question seeks information about the sensemaking of the situation. Regardless of how articulate students are when it comes to answering the other questions, if they can make sense of what the experience was about, they may likely have learned what was intended through the assignment.

The total Reflection ratings for Q5-Conclusion (127) is lower than for Q2-Emotion (131), but the distribution of ratings causes Q5's mean rating to be higher with 48 L-4 ratings over the 22 L-4 ratings for Q2. This discrepancy would suggest a higher percentage of students were able to explore the impact of their conclusion than to explore insights of their emotions.

Students had more difficulty demonstrating reflective thinking in the final question, Q6-Future Plan. The focus of this question is to show a change in thinking. Changes in thinking is a goal for debriefing after any simulation. A majority of the students' responses fell mostly across L-2 and L-3 ratings. There are a few possibilities for this finding. One is that students did not adequately achieve a change in thinking from the SDA. The other is that they did have a change in perspective, but they wrote about it in an earlier response or did not write it down at all. A holistic rating of the learner's reflection may account for those who demonstrate deeper reflections in an earlier response.

For all six questions, fewer than 8% of the responses received the lowest rating, Habitual Action. These low results are encouraging, as it suggests that most students earnestly responded to the questions and did not just go through the motions.

Differences in mean ratings for individual questions across the cohorts lacked significance aside from Q2-Emotion. A few theories may explain this difference. This study started during what was a typical semester and ended during the COVID-19 health pandemic, resulting in considerable disruptions to students' lives. During this period, all instruction migrated to online, and stress levels were understandably heightened for everyone. A second theory may involve other opportunities to practice writing reflections. These students write reflective journal entries for their clinical coursework; however, this additional exposure to journal writing did not significantly impact any other question besides Q2-Emotion. Another explanation is that the students in the April cohort were near the end of the term and may have felt freer to express emotions in responding to this particular question. Regardless, it is something to watch for again in the future.

The correlations between Q5-Conclusion and Q6-Future Plan suggest that students who tend to write about lessons learned may also be more apt to develop a plan for future situations. Also, students who tend to analyze and make sense of the simulation through answering questions, such as in Q4-Analysis, may be more likely to think reflectively throughout the exercise.

Limitations

This study has several limitations. Recruitment occurred from a single site, course, and semester, which limits any generalizability of the findings. Examining reflective thinking at multiple sites and with different levels of students would help address this limitation. Selection bias may have affected the results. Students who opted not to participate in the research may have had more difficulty with the activity or deliberately underperformed; adding their responses to the data may have lowered the rating outcomes. However, participation rates were higher than expected at 72-75% compared to an earlier pilot study (MacKenna & Diaz, 2020), where only 50% of the students agreed to participate.

Despite multiple strategies to promote inter-rater reliability, there is still a limitation due to the subjective nature of evaluating written responses for reflective thinking. Even after conferring on rating and performing repeated reliability testing with a good level of agreement with a weighted Kappa of >.70, a consensus was not absolute. Additional testing and refinements of the rubric and rating guidelines may improve the reliability of reflection assessment. Measuring reflective thinking in both beginning and advanced students may result in differences in reflection ability associated with growth in the nursing program. Measuring reflection by analyzing only written content does not account for any other reflective thinking that occurred and not captured. Since reflection is an internal, cognitive process, it is highly probable that the students did not document some thoughts.

Implications and Further Research

These results show that students are capable of reflectively thinking about their experience in virtual simulations. The results show a consistency in the depth of reflection across scenarios and across the semester, but a variation in depth of reflection based on the question. Determining reasons for the non-reflective responses as well as learning more about overall perceptions of the SDA will help drive improvements to the structure of the SDA and instructions for future use. One area of focus for improvement rests with initial instructions. Not all students completed both self-debriefing activities, as evidenced by the discrepancy in total submissions (130 pediatric and 114 maternity) or by the discrepancy of submissions for the study (91 pediatric and 85 maternity). These findings suggest there may be opportunities to improve guidance and instructions about self-debriefing, which may reduce any confusion or frustration and increase participation. Better instructions may encourage those who informally reflect to include those thoughts in writing. Another suggestion for improving the numbers of reflective answers would be deliberate training for undergraduate students on reflective thinking. The provision of worked examples that demonstrate the educator's expectations can act as a scaffold for emerging reflectors to help them understand what makes thoughts reflective. Because the Self-Debriefing Reflection Rubric scores each response separately, it is possible for students who engage in reflective thinking to receive lower ratings for questions if their reflective comments are misplaced. The apparent mismatch between the guidance within one of the questions in the SDA and the rating parameters may have negatively impacted the number of Reflection ratings for that question. These concerns may signal the need to explore revisions in the SDA design or instructions, or in the rubric itself.

Conclusion

When given an SDA based on a model of experiential reflection, undergraduate nursing students' written responses showed evidence of varying amounts of reflection. Responses to an analytical-based question contained the highest percentage of critical reflection. Questions with the highest percentages of non-reflection dealt with evaluation and future planning. The variation signals a need to explore reasons and strategies for improving performance in the lower rated questions in future studies. Despite the variations, the evidence shows a theory-based self-debrief that includes guiding questions and written responses to promote engagement leads to reflection. This research aligns with prior evidence of the efficacy in self-debriefing while also adding new knowledge that self-debriefing acheives a requisite goal of best practice standards: the promotion and presence of reflection, despite the physical absence of a facilitator. This additional evidence moves the science forward on self-debriefing research.

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CHAPTER 4:
PERCEPTIONS OF A SELF-DEBRIEFING ACTIVITY AS AN AID FOR REFLECTION AFTER A VIRTUAL SIMULATION MANUSCRIPT

Abstract

Background: Virtual simulation has gained popularity in nursing education, in part due to its asynchronous capacity. Searching for a method to debrief these asynchronous simulations has pointed to self-debriefing as an option. Evidence supports the efficacy of self-debriefing, but less is known about students' experiences in its use. Discovering users' perceptions of a newly designed educational method, such as self-debriefing, can lend support or identify opportunities to revise for future use.

Objectives: To understand undergraduate nursing students' perceptions of a new self-debriefing activity as an aid for reflecting on a virtual simulation exercise.

Design & Methods: A qualitative descriptive approach was used for this study. Following a virtual simulation assignment that included a new self-debriefing activity, ten (10) junior-level baccalaureate nursing students agreed to participate in individual, semi-structured interviews. Conventional content analysis was used to analyze the data.

Results: Two main themes extracted from the data were facilitators and barriers. Subthemes for facilitators included feeling safe, self-determination, answering questions, and writing responses. Subthemes under barriers included priming by unfamiliar experience, preparation, and no outlet for validation.

Conclusion: Findings indicated some features of the self-debriefing activity promoted reflection while others may have inhibited students' ability to reflect on the virtual simulations fully.

Implications for using self-debriefing include ensuring adequate orientation to the activity to clarify expectations and consideration for collaboration opportunities to enhance learning.

Introduction

Virtual simulation has grown in popularity in nursing education (Foronda et al., 2017; Verkuyl et al., 2019). Features of virtual simulation allow for the expansion of clinical practice and decision-making opportunities for learners because it can be completed online and asynchronously (Cant & Cooper, 2014). Simulation educators are encouraged to provide a debrief following any simulation-based education, but the asynchronous use of virtual simulations introduce a challenge when attempting to schedule a traditional facilitator-led debrief.

Self-debriefing is an alternative method of debriefing that may be considered for virtual simulation. Support exists for self-debriefing, although the evidence comes mostly from in-person, high fidelity simulations (Boet et al., 2011; Fan et al., 2017; Sukalich, Elliott, & Ruffner, 2014; Welke et al., 2009). Other research has explored its use with virtual simulation and nursing students, with knowledge gains and increased self-efficacy reported (Verkuyl, Atack, et al., 2018). Despite these findings, little research has focused on nursing students' experiences using self-debriefing.

Uncovering the issues students have with an educational activity can lead to improvements in the existing activity or inform design considerations in future ones. One study did explore students' experiences during a focus group as part of a study comparing types of debriefs (Verkuyl, Lapum, et al., 2018). In a focus group, students described various benefits of

their self-debriefing experience, including the opportunity to defuse emotions, having time to explore errors and reflect on decision-making, as well as the ability to answer questions honestly. This evidence provides some encouragement for self-debriefing, but it was specific to the activity used by the participants in this study. With only one study to date on student perceptions of self-debriefing, more research is needed to either confirm or refute these findings.

The process of designing any educational activity, such as self-debriefing, should be done thoughtfully and be guided by theory and research. Further, such an endeavor should include some form of user evaluation to guide any revisions needed. User experience is helpful in the development process. Therefore, the purpose of this study was to explore undergraduate nursing students' perceptions of a new Self-Debriefing Activity (SDA) as an aid for reflecting on a virtual simulation.

Methods

Design

This study used a qualitative descriptive design. A desire to present findings that reflect the students' perceptions while staying close to the data motivated the choice for this design (Sandelowski, 2010).

Setting and Participants

A baccalaureate nursing program within a large, public university in the southeast was the site for this study. As part of the existing curriculum of this program, students have their first opportunity to complete virtual simulation assignments and follow up with a post-simulation

activity during their 2nd semester. A convenience sample of undergraduate pre-licensure nursing students (n=120) who were enrolled in the Nursing Care of Families Clinical course represents the accessible population. These students completed a researcher-designed self-debriefing activity (SDA) by writing responses to questions. The six questions, based on Gibbs' Reflective Cycle, guide the user through the stages of reflecting on a learning experience. The students completed two commercial virtual simulations and two SDAs before participating (Table 11).

Table 11

Self-Debriefing Activity Questions

DESCRIBE: What are all the main actions, events, or decisions that you can remember? Try to recall from memory or use the feedback log to write down what happened, what you did, or what the patient did throughout the scenario.	*HINT: Do NOT add judgments or evaluations in this section. (i.e., do not say what was right or wrong, just report what happened)*
EMOTIONS: Describe how you felt or reacted throughout the experience of the simulation. If your feelings changed from the beginning to the end, or you had different feelings or emotions, list each one along with when you had them.	*HINT: Do NOT analyze your feelings yet – just list them along with when you had them or what was happening when you noticed them.*
EVALUATE: What actions or events throughout the simulation went well? What positive actions or decisions did you make? What actions or events did not go well? What seemed to be a negative action or decision?	*HINT: You can use the information you wrote in question #1 or add new information. Do NOT include "why" yet.*
ANALYZE: What sense can you make about the sequence of events? What was really going on?	*Now it's time to analyze. Try to connect your actions to the responses you observed to describe WHY those responses occurred.*
CONCLUSIONS: What else could you have done during the scenario? What different outcomes you might expect?	*What have you learned from thinking about these questions?*
FUTURE PLAN: Based on your thoughts from this exercise, what are you going to do differently if you encounter a similar situation? What would you do the same? What could you do beforehand to be better prepared for a similar experience?	
COMMENTS: What comments or questions do you have about the scenario or this exercise?	

Self-Debriefing Activity © 2020 Valorie MacKenna

The Institutional Review Board determined the study to be Exempt from the need for signed consent. After IRB determination, recruitment of potential participants occurred during the Spring 2020 semester. Students over 18 years old, enrolled in the course, who completed a virtual simulation and SDA met inclusion criteria. An explanation of research was disseminated to students at an on-campus clinical event. A follow-up reminder was emailed to the group of students a few days later by the course instructor. The explanation of research contained a link to an online form for students to indicate interest in participating in the study.

Ethical Considerations

Participants were fully informed of the purpose of the study, voluntary nature of participation, confidential management of data during recruitment, and were provided a reminder of this information at the start of the interview. Further, the students were assured that their involvement and contents of interviews would have no bearing on their relationship with the university, college, or outcome in the course.

Data Collection

Study data were collected from January to April 2020. An effort was made to schedule interviews within one week of the on-campus clinical event date for the freshness of participants' recollections of their experience. The researcher-created interview guide contained ten questions and follow-up/probing questions used to get more detailed data. The first five interviews were held in a private office inside the college of nursing, however, due to the school's closure as a result of COVID-19, the final five interviews were conducted via Zoom, a web-conferencing platform. Demographic information (age, gender), date of an on-campus clinical event, and email

address were collected through the online interest form. A digital audio recorder was used to capture the contents of the in-person interviews, and the recording feature on Zoom allowed for audio capture of the web-based interviews. As a 'thank you' for their time, participants who completed an interview received a $15 gift card.

Time was set aside after each session to allow the investigator to make notes about impressions from the interview. These notes were referenced during data analysis. Soon after each interview, the audio file was uploaded to NVivo Transcription (QSR International, 2020), an automated, encrypted transcription service. The investigator then manually reviewed each transcript against the audio recording to check for accuracy. The transcript was downloaded from NVivo Transcription and uploaded to QSR International's NVivo 12 software for data analysis.

Data Analysis

All transcripts were read multiple times as a way to become familiar with the data. Conventional content analysis was used to allow the ideas to come directly from the data (Hsieh & Shannon, 2005). The dissertation chair served as a second researcher, who read and independently coded a portion of the transcripts. Discussions between the two researchers were held on initial findings and a comparison of codes, which led to a consensus on important passages and codes. This researcher (VM) continued with analyzing the transcripts over an extended period to allow recognition of patterns and relationships and developed a codebook with descriptions of context for each code to ensure similarity in meaning for each newly coded item. When new codes were identified in later transcripts, the transcripts were reviewed to identify any previously uncoded, but similar meaning unit. After initial coding was completed,

similar codes were collapsed into categories. Further grouping together of similar categories led to identifying themes.

Trustworthiness of the Data and the Findings

The adherence to prolonged engagement with data collection and adequate portrayal of the participants promoted study credibility. Transparent descriptions of the sampling strategy, verbatim transcriptions, use of computer-assisted data analysis software added to the efforts to demonstrate validity within the study. The coding was done in the language close to the participants' own words. A journal was used to document personal notes from interviews as well as memos on coding decisions, and an audit trail was maintained.

Findings

Ten students participated in an individual interview, which was held sometime between January to April 2020. All participants were female, ranging in age from 20 to 24 years. The participants were enthusiastic and expressive. They spoke freely about their experiences and perceptions of the virtual simulation assignment and SDA. The sessions lasted from 20 to 40 minutes.

The purpose of the interviews was to learn about students' perceptions of an SDA as an aid for reflection for the virtual simulation. After thoughtful analysis, two major themes were identified among the data: facilitators and barriers. Subthemes found for both were affective (emotional) attributes, such as students' feelings or attitudes in responses to the activity as a whole, and also functional attributes, or perceptions of the processes within the SDA.

Theme 1- Facilitators

Within the theme of facilitators are the affective attributes of 'feeling safe' and 'self-determination' along with the functional attributes of 'answering questions' and 'writing responses' during the SDA process. A few students had strong feelings related to these concepts, while others discussed them more objectively. Overall, these sub-themes were identified across almost every conversation.

Feeling Safe.

Most of the students appreciated a feeling of safety while completing the SDA. Compared to completing the SDA, with live group debriefs, students noted variations of feeling vulnerable. For instance, students recognized that with live group debriefs, they have to speak up in front of others in order to participate. The act of speaking in front of others was a significant concern for one student, "I think some people are really comfortable talking in public, like even this scares me. Like saying something out loud is intimidating to me." Another student recognized the benefit the SDA offers to those who have trouble expressing themselves "people who … are not able to do that in person can do that on the computer."

Several students described the ability to participate without fear being judged by those in a group debrief an advantage to participating in an SDA. The anonymity of the SDA also provided a sense of safety. One student remarked, "it's not going to get back to me, which means I'm completely safe to say what I need to say and learn that way."

Students made similar points about being honest. They recognized that with the SDA's use of individual written reflection, "you don't hold back or like you really just state how you feel." Another student theorized about the differences between the SDA and a live debrief. She

felt that in the case of a live debrief she would not want to talk about mistakes in front of her peers due to embarrassment, “because it can hurt your ego sometimes.” She felt safer and more comfortable without the risk of judgment.

Self-Determination.

Students valued the freedom to express themselves and take as much time as they needed to during the SDA. One described that she “can say as much as I want to and reflect in the time that I need instead of the time that I'm required in the actual in-person debrief.” Others liked being able to decide when to complete the work. One student commented,

> “you can pretty much do the [SDA] whenever you do the sim or whenever you feel like you're ready to think about what the sim was instead of like doing activity, debrief, activity, debrief, and it falls into like a routine. It's kind of … what's convenient for you. I think that's really valuable.”

Another student was glad to have one less day to drive to school and dress out in uniform but still complete a clinical activity. In general, students valued the ability to choose when and how to complete the activities. They appreciated the convenience and choice to complete the SDA when it fit within their weekly schedule. The students had control over the SDA experience: from when to complete it and how much time to spend on it.

Answering Questions.

Students felt answering the questions helped them in a variety of ways. They described how responding to the questions helped them to explore their emotions, analyze mistakes, and think back through the event. One student painted an image, saying that the SDA “makes you sit

in everything that happened and it makes you talk about everything." Some students viewed all the questions as beneficial, and others felt that only some were helpful. The first question (Q1-Description) won over one student, "when I was describing, it was something that was really helpful for me because there's a lot of different things that I did and that happened." Another student saw the question differently, "it was repetitive because the questions were like 'give a log of what you did' where [the simulation product] had given me the log." Still, for those who had to repeat the simulation for a required minimum score, students felt that answering the SDA questions helped them to improve their performance. One student mentioned, "after answering the reflection questions, I went back, and then I was able to significantly impact the score and just change the way I interacted with the patient."

The questions in the SDA were identical for both simulation scenarios that were assigned to the students. They were written purposely broad enough to be used across different scenarios or even for other situations. One student even commented on the potential for the SDA to be used by practicing nurses as a coping strategy.

> I know there's a lot of emotions that go along with nursing. So, having these types of questions asked that you can write it down, I feel like it helps to get it out of your head and on the paper. And so that you're not affected by it. It's like, 'OK, it's out, it's gone.' Now you can continue your quality work.

There were a few students, however, who did not enjoy answering all the questions within the SDA. While some liked the structure of moving through the steps of the reflective process, others felt the questions were redundant. One student thought at least one question could be removed because there were "questions that were very similar to one another, and it was

almost like repetition, but not in a good way." At least one student did not see the difference between the Evaluation question, which asks students to decide which actions were good or bad, and the Analysis question, which asks students to connect actions to outcomes and make sense of the situation.

Writing Responses.

Many of the students spoke positively about writing in general as an aid to learning. They also felt favorably toward writing in response to the SDA questions. Benefits the students shared included using writing to organize thinking, having a record, and being able to go back to confirm ideas. One shared that the act of writing allowed her to use "a different part of your brain, you know? So, it just helps me remember it." The students likened the experience of writing for the SDA to the familiar practice of clinical journals. One student shared that she also keeps a personal journal and noted, "which is probably why this [SDA] was just helpful for me in learning."

Not all the students described keeping journals, but they still value writing to help them. A few even distinguished between typing and writing and described their preference for handwriting. One shared that "in my first clinical, I submitted all my reflections written down … because for me, I am more able to process things that way." Another student described that writing allowed her to spend more time with the ideas. For her, it is "the process of like seeing the words on paper and you writing them out and taking longer to write them out – it does help."

The students appeared to value writing for its assistance in organizing thoughts, creating a tangible record of ideas, and assisting in the learning process. The use of written responses in the SDA was not perceived in a negative way from any of the respondents.

Theme 2 - Barriers

Students also talked about a few barriers within the SDA. Certain aspects of the experience interfered with students' ability to accomplish the goal of the activity, reflecting on the virtual simulation. Again, the barriers are divided among affective attributes (virtual simulation experience) and functional attributes (the instructions or missing validation).

Primed by Unfamiliarity

The commercial virtual simulation program was unfamiliar to the students and did not perform for them as they expected. The experience was unlike the live, manikin-based simulations that students had also recently experienced. Described by one student, "when it's virtual, like there's a huge disconnect for me." This student shared that she was expecting the patient care interactions to be like they were during manikin-based simulations, which to her, are much closer to her experiences in the clinical setting. When the virtual simulation was not what she expected, she lost interest in the activity.

Regarding the scenarios, students again shared their frustrations. Comments from almost every student focused on one issue where they were unable to make choices to appropriately care for a patient who was nauseated in the simulation. Regardless of their actions, the patient was always nauseated and uncomfortable. These comments varied from concern to anger. One student recalled that she "gave her the little basin and like I gave her the med she needed. But I was like, 'I don't know how to help you'!" Another felt helpless from the same issue. "All she would say was, 'I have to throw up.' And so, it was like, there's not more I could do. She didn't want nausea medicine or anything like that. So, it was kind of frustrating."

Some of the students then carried that frustration with them into the experience of completing the SDA and the frustration may have hindered learning. After sharing her reactions about the simulation, one of the students then remarked, “I wasn’t sure if I was giving the right responses or … did I miss something?” She also said the SDA did not make her “think any deeper into what had went on” because she was so frustrated.

Preparation.

Students felt less than prepared for the whole assignment, did not understand the purpose, and did not know what was expected of them. While most students completed the assignments, some shared they did so without feeling they understood why. One student said that she “had no idea what we were even supposed to do. There wasn't like any directions as to like- this is what to expect or anything.”

No Outlet for Validation.

Students described a desire to compare their ideas and experiences with others as a way to validate them. They wondered how others performed on the virtual simulation. Students wanted to know if their peers had the same experiences or if they were different. They believed that by knowing what others did, they would gain insight into their performance. Because it was not part of the SDA process, students sought out validation and met this need through informal debriefing conversations with peers. One student mentioned that comparing her choices to others helps her to understand more about her correct action. “I would see what they did wrong. And then I would say, oh, that's why.”

Students also expressed a need to get questions answered by the instructor. Despite the simulation providing a performance feedback log, students still had unanswered questions, that they and their peers were unable to clarify. By not reaching out to the instructor, one student expressed being, “still a little confused. Those questions weren't really answered because I didn't go to anyone.”

When asked for suggestions, almost every student described a variation of a follow-up session with the instructor, with peers, or with both. Having also experienced live group debriefs, they suggested adding a similar event after the SDA. Some thought an in-class small group session would help, while others suggested a discussion board or some other way to see how others did by viewing an anonymous report with percentages for correct and incorrect decisions. Most agreed that learning within the group sessions is “more complete learning because we talked, bounced ideas off of each other and saw different point of views.” In sharing her thoughts on the group debrief, a student stated, “I like [it] because it's not just my thoughts being heard. I'm hearing other thoughts of other people as well, whether it's different or something I can relate to.”

Overall, the students recognized the benefits gained from group learning. They found this benefit to be missing from the SDA. Some students also sought informal remedies to overcome this perceived limitation.

Discussion

The findings in this study demonstrate students’ perceptions of aspects related to the SDA that assisted or impeded in reflecting on their virtual simulation experiences. Some of the

elements to which they responded favorably are also recommended in standards of best practice and advocated by simulation educators, which increases support for the SDA design. These favorable elements include the individual, anonymous approach to completing the activity, and the autonomy to complete the assignment when and where convenient. These features encouraged students to fully explore their experience with the virtual simulation.

The confidential nature of writing about one's own experience and feeling free to discuss mistakes without fear of being judged aligns with the recommendation for psychological safety (Edmondson, 1999). Made popular by the organizational researcher, Amy Edmondson, psychological safety refers to a person's ability to feel safe in taking risks, such as admitting to a mistake in front of others. This concept has become essential for simulation facilitators to attend to, due to the vulnerability students may feel while discussing errors during live group debriefs. Promoting features that support psychological safety is recommended by the International Nursing Association for Clinical Simulation and Learning (INACSL) Standards of Best Practice: Simulation^{SM} Debriefing (INACSL Standards Committee, 2016). By exploring the experience, including mistakes, individually, self-debriefing and using the SDA removes the risks and fears and therefore ensures psychological safety.

Allowing students to decide when to access the virtual simulation and SDA aligns with concepts of Knowles' andragogy (Alford, 2013; Knowles, Holton & Swanson, 2015). Andragogy, or the practice of teaching adult learners, is distinctive from educating children due to the different needs that adults have for learning. Some of these needs include a comfortable learning environment, a sense of trust and respect, and the feeling of self-direction. Adult

learners also take on a share of responsibility for their learning. These aspects of andragogy are present in the logistics of the assignment; they influence students' participation in a positive way.

The questions within the SDA provide a structured guide to reflect on a learning experience. They are based on a cycle of steps that build on one another to reflect on the event fully (Gibbs, 1988). Since reflection is an instinctive process, the temptation may be just to allow learners to do whatever comes naturally. However, in the absence of a guide or substantial training, it is unlikely to be systematic or structured (Fanning & Gaba, 2007). This tendency to reflect without a developed process may lead to students missing important lessons or focus only on negative issues. Recommendations from the standards of best practice include debriefing activities based on a framework or theory (INACSL Standards Committee, 2016). The SDA was designed with these recommendations in mind. Some students liked the guidance afforded by the questions, and some did not necessarily appreciate the subtle differences between some of them. The critical viewpoint from some suggests a need to review the questions for clarity and to provide better information beforehand so that they may be considered more universally useful. It is also true that with any new educational process, there also exists a learning curve. After repeated use, student perception may change.

The use of writing as part of the SDA was seen as an overall positive. This positive view concurs with various theories on how writing assists with learning. Students who described the benefit of seeing their thinking, organizing thoughts, and using another part of the brain coincides with Emig's (1977) assertions that writing combines enactive (doing), iconic (image/visual), and symbolic (representational) traits to support learning.

A shortcoming of the current virtual simulation and SDA assignment that may have impacted reflection is the perception of an unclear purpose of the assignments. Adult students want to know and buy into the reasons for the work they are expected to perform (Alford, 2013). By not fully knowing the purpose or even seeing the potential benefit, it "violates principles of adult learning," which blocks the learner's motivation (Knowles, et al., 2015, p. 46).

Learners who are taking on new, complex tasks, expend excess mental energy trying to solve for unfamiliar problems. This situation can be found in simulation design, where intentional learning is clouded by some other distraction that may not be part of the lesson (Bong, Fraser, & Oriot, 2016). For the virtual simulation, practicing assessments and decision-making for patient care were the intended learning concepts, not necessarily the operation of the software. The frustration and extraneous cognitive load could have been mitigated with a demonstration or some other worked out example (Josephsen, 2015).

The process of formal, structured reflection is unfamiliar to many students. The more obvious aspects, such as identifying correct and incorrect actions, and naming what could be done differently, come more easily to people without much experience in using a structured reflection. There was a disconnect between the expectations of the SDA and the students' prior experiences with self-reflection. This disconnect signals another opportunity to provide a worked-out example, or some other type of orientation to set expectations for the learners.

The need students expressed to add some form of group session afterward is comparable to the findings in Verkuyl et al. (2019). In that study, students also verbalized a desire to know how their performance compared to others. Likewise, they also sought out informal peer debriefing sessions to discuss their performances. Hearing other perspectives that were

previously unconsidered helps to expand one's thinking about a topic and can lead to deeper learning. Many learning theories address this concept, such as cooperative learning (Johnson, Johnson, & Smith, 2014) and problem-based learning. From other studies and the findings in this one, it is apparent that the SDA would benefit from adding some form of peer or group interaction after the individual work is done.

Limitations

This study has a few limitations. There may be a sampling bias as the only voices were those who volunteered for the study. Other viewpoints may be missing. Also, there were no male participants, which could have enriched the diversity in findings. Despite recruiting multiple times throughout the semester, no male students volunteered to participate. Another unanticipated issue was the changeover from in-person interviews to Zoom interviews. While no apparent differences were noted in the transcripts from the last five students to the first five, this change may have introduced a subtle difference in the data that impacted the study.

Implications for Using Self-Debriefing

These findings outline the perceived benefits of the SDA, as well as opportunities to improve the SDA design and process. Additional measures need to be incorporated to orient the students to the SDA, including clarifying its purpose and performance expectations. This orientation may be accomplished with a tutorial or a frequently asked questions (FAQ) page. The perception some students had about question redundancy along with other feelings of uncertainty or frustration may be mitigated with more explicit instructions. Worked out examples may also aid students in approaching an unfamiliar process such as structured reflection. Although the

purpose of the SDA is to support students as they work asynchronously on individual virtual simulations, it may need to include an opportunity for students to confer with peers or their instructor to enhance students' reflection and learning from the overall assignment. As noted by one of the students, there is also potential for the SDA beyond its intended use after simulations. Responding to reflective questions as a means to explore unfamiliar or unsettling experiences supports learning from those experiences, regardless of the situation. Clinical post-conferences, graduate nurses during orientation, and during early months of practice are just some potential applications within nursing education.

Conclusion

Education in face to face scheduled learning sessions has fewer and fewer advantages. Virtual simulation experiences with SDA, particularly those with questions that prompt reflection, are able to assist students in seeing their own strengths in reasoning which my transfer to real world situations. The advantage of self-scheduling is valued by many, but students also want to have the opportunity to share their experiences with peers and faculty. Perceptions of self-debriefing may be improved through orientation and providing options for collaboration afterward. These insights will help drive design decisions for future versions of the SDA, which can be further examined in future research.

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APPENDIX A:
EXPLORING DEPTH OF REFLECTION FROM A THEORY-BASED SELF-DEBRIEF AFTER VIRTUAL SIMULATION: A DISSERTATION PROPOSAL

Abstract

Simulation-based education (SBE) provides experiential learning opportunities for students to transfer theoretical knowledge to practical situations. A central part of SBE that solidifies learning is the debrief when learners reflect on the experience. Typically, instructors facilitate debriefs where they deliver feedback and encourage reflection. Newer forms of asynchronous simulation, like virtual simulation, are not amenable to live facilitation of debriefs. In these circumstances, a self-debrief may be used. Virtual simulation is a growing trend in SBE throughout healthcare education, and debriefing standards for these events should mirror those for traditional simulations. To ensure comparable outcomes with self-debriefs, evidence of their efficacy is necessary. A review of the current research on self-debriefing has revealed few studies and inconclusive evidence of a self-debrief's ability to substitute for the facilitator's functions. Additionally, no evidence currently exists to show students' depth of reflection from a self-debrief. The purpose of this qualitative descriptive study is to explore evidence from an existing self-debriefing activity for a virtual simulation assignment in an undergraduate nursing student course to determine the depth of reflection achieved and students' perception of the self-debriefing activity. Multiple sources of data will include written responses to theory-based reflective questions and semi-structured interviews. Data analysis will include directed content analysis of written responses to guided reflective questions and conventional content analysis of interview transcripts. The results of this ground-breaking study will inform educators on the design implications of self-debriefing for virtual simulation to support reflection and enhance learning from this growing educational strategy.

Specific Aims

Simulation-based education (SBE) is an established teaching methodology used throughout nursing education programs (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014). SBE entails the creation and implementation of lifelike situations where learners engage in "problems, events, or conditions that arise in professional encounters" (Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005, p. 11). Debriefing is the opportunity to reflect on the simulation experience, which makes it an essential part of SBE (Cantrell, 2008; Sawyer, Fleegler, & Eppich, 2016). Reflection is an essential component of experiential learning events; however, reflection does not always come naturally for learners (Fanning & Gaba, 2007). To address this issue, trained facilitators use techniques to encourage reflection and provide feedback on performance during a debrief.

Limited training space and finite numbers of skilled facilitators place constraints on the amount of simulation possible. Newer modalities, such as virtual simulation, expand the availability of SBE; however, access to instructors for live, online debriefs is impractical. Alternative forms of debriefing, such as self-debriefing, may remove the restrictions caused by limited facilitator availability (Fanning & Gaba, 2007; Oikawa et al., 2016), but experts have concerns about what learners may miss out on in the absence of skilled facilitators. Research on self-debriefing may address these concerns and lend support for its use.

Prior studies comparing self-debriefs to instructor-led debriefs indicate no significant differences in learning gains or skill performances for graduate-level students (Boet et al., 2011; Sukalich, Elliott, & Ruffner, 2014; Welke et al., 2009). Only two studies focused on undergraduate nursing students and reported mixed results (Gantt, Overton, Avery, Swanson, &

Elhammoumi, 2018; Verkuyl, Atack, et al., 2018). Overall, the existing self-debriefing research has examined various indirect outcomes of a self-debrief, such as learning gains or subsequent performances. The research has not measured the extent or depth of reflection on the simulation, a direct outcome of debriefing that is essential for experiential learning. Since standards of best practice for simulation (INACSL Standards Committee, 2016a) recommend the provision of feedback and reflection in a debrief, it stands to reason that evidence of learners' reflections from self-debriefing activities is necessary to support the perpetuation of self-debriefs. Within the studies found, there is a lack of consistency in the self-debriefing activity designs, so insights about the designs are not reliable. Due to the limited number of studies overall and even fewer related to nursing, the inconsistent designs and findings, and the missing evidence regarding reflection, research is needed to learn what depths of reflection undergraduate nursing students achieve during a self-debrief with a virtual simulation.

The immediate aims of the proposed study are to explore the evidence from a self-debriefing activity to identify undergraduate nursing students' depth of reflection and the students' perception of the self-debrief activity. Answers from this research will help determine if a self-debriefing activity designed with guided reflective questions that align with a reflective learning theory will lead to learners reflecting on actions and decisions within an SBE scenario. The long-term objective of this research is to build a program of study that determines best practices for self-debriefing following simulation. Uncovering the presence and depth of reflection following the completion of a self-debriefing activity will increase understanding of which design features may promote learning through reflection.

Research Questions

1. What is the depth of reflection found in undergraduate nursing students' written responses to a self-debriefing activity after a virtual simulation?
2. What are undergraduate nursing students' perceptions of the self-debriefing activity as an aid for reflecting on a virtual simulation activity?

As schools of nursing are facing the challenges of fewer clinical training sites, and as shortages of nursing educators and nurses continue, the need to create teaching methods that serve greater numbers of students continues to rise. The growing popularity of new content delivery, such as virtual simulation, also spurs on the necessity to find evidence-based strategies to support the learning without further burdening the dwindling numbers of educators. It is unknown if the designs for self-debriefing can support undergraduate nursing students' ability to reflect deeply enough on learning experiences to reach a change in thinking. This research is a first step in exploring this phenomenon.

Background

Reflection and Learning

As described earlier, reflection is a key process during experiential learning events such as those in SBE. Dewey (1933), a philosopher and early contributor on thinking and learning, states that reflective thinking is essential to learning. Reflective activity helps a user with problem-solving through the ability to recognize connections or relationships among aspects of experience (Dewey, 1933). Schön's (1983) theory of reflection-in-action describes how a mental

examination of surprises from experience leads to an increase in knowledge and expertise. Within the context of nursing professional development, a recent concept analysis lists the primary attribute of reflection as the process of learning from experience (Tashiro, Shimpuku, Naruse, Maftuhah, & Matsutani, 2013). This process includes "an emotional reaction, description, internal examination, critical analysis, evaluation, and planning new action" (Tashiro et al., 2013, p. 170). According to the authors, following this process leads to the promotion of professional development and improved patient care. The internal nature of reflection makes it difficult to assess, but educators and researchers frequently use writing as a means to promote and measure reflection (Dyment & O'Connell, 2011; Epp, 2008). Bjerkvik and Hilli (2019) conducted a literature review on reflective writing and found that nursing students who wrote in reflective journals enhanced their reasoning skills and awareness of clinical situations.

Simulation

Simulation in healthcare and nursing education may take many forms, but a large percentage of SBE occurs in person (Smiley, 2019). Students and faculty schedules are pre-arranged to participate in an SBE event on a specific day. Training space, equipment, and disposable supplies are necessary, depending on the type of patient and scenario. The simulation activity generally begins with the facilitator orienting students to the room and briefing them on the patient and situation (INACSL Standards Committee, 2016b). Students typically work together in groups of four to six as they provide care to a patient. During the scenario, students may practice a variety of psychomotor, cognitive, and affective skills in SBE (Leighton, 2014).

After working through the tasks of the scenario, learners participate in a debrief, led by the facilitator.

Debriefing

During the debrief of a standard simulation, the facilitator is responsible for providing feedback and encouraging reflection on the experience by asking questions and managing the discussion (INACSL Standards Committee, 2016a). Debriefs are conducted following the simulation in an environment that supports confidentiality and trust (Fanning & Gaba, 2007), such as a conference room that is separate from the simulation space. Facilitators follow an organizing framework to structure the debrief in reaction, analysis, and summary phases (Sawyer et al., 2016). Elements of an effective debrief include the use of questioning to promote learner reflection, asking open-ended questions, involving all learners, and using silence to encourage responses (Fanning & Gaba, 2007; Oriot & Alinier, 2018).

Virtual Simulation

Unlike traditional SBE, where educators use dedicated space and equipment to replicate an environment for learners to experience and respond to situations, virtual simulation provides the experience through a computer program. Educators describe virtual simulation in various ways, but a common theme involves a form of technology and the recreation of clinical situations with user interaction (Padilha, Machado, Ribeiro, & Ramos, 2018). Virtual simulation has gained in popularity due to advantages such as self-paced training, unlimited access, and independence from physical training space (Aebersold, 2016; Cant & Cooper, 2014). Learners

participate in virtual simulations autonomously and often remotely. Virtual simulation allows for repetition and rehearsal to improve learning outcomes (Cant & Cooper, 2014).

The very advantages of virtual simulation, unlimited access and repeatability, create an issue when it comes to following the SBE recommendation for debriefing. Experts universally agree that a debrief should follow immediately after a simulation (Cantrell, 2008; INACSL Standards Committee, 2016a). Students who opt to complete a virtual simulation at midnight or on the weekend will likely not have a facilitator waiting to debrief them. Live debriefs that are scheduled hours or days afterward may frustrate learners, who prefer to review the event while it is still fresh in their minds, and their focus is on the activity (Cantrell, 2008). To address the issue of providing a suitable debrief that follows directly after a simulation, educators and virtual simulation designers have looked to other strategies. One such solution is a self-debrief.

Self-Debriefing

Oriot and Alinier (2018) define self-debriefing as a learner's independent engagement in a reflective learning process following a simulated clinical event. What distinguishes self-debriefing from other forms of debriefs is the learner's responsibility to engage in reflection on the event without instructor facilitation beyond an initial orientation (Boet et al., 2011) or from peer interaction such as during a team or paired debrief (Oriot & Alinier, 2018). When learners perform a self-debrief, they may receive instructions to recall the actions and decisions from the preceding simulated event, but it is up to the learner to cognitively process and learn from the experience.

The general makeup of self-debriefs found in the current literature include some form of performance feedback, such as a video recording or a report of correct and incorrect actions (Boet et al., 2011; Fan et al., 2017; Verkuyl, Atack, et al., 2018; Welke et al., 2009). Another attribute found in these self-debriefs is a series of either verbal or written questions that serve to encourage learners to engage in reflection as they explore and evaluate their actions and decisions in the simulation (Boet et al., 2011; Verkuyl, Atack, et al., 2018). Like instructor-led debriefs, learners can reconsider those decisions while being out from under the pressure of the actual simulation. Reflecting on the event, instead of thinking during the event, allows for more and deeper thinking about the situation, and perhaps the achievement of a fresh perspective (Boud, Keogh, & Walker, 1985; Schön, 1983).

For self-debriefs, designers strive to formulate self-contained questions that trigger reflection and to devise a means to provide feedback (Lapum et al., 2018). These design features eliminate the need for a facilitator's presence yet still maintain standards of best practice. With access to feedback and reflective questions, students may then complete the self-debrief shortly after the simulation, which is also recommended (INACSL Standards Committee, 2016a).

Prior Research on Self-Debriefing

Within healthcare simulation, a mere eight studies on the use of self-debriefing exist in the current literature. Most of this research focused on self-debriefing in graduate students or professional populations. Six of the eight studies used live, in-person simulation, while two studies used virtual simulation. Regarding the self-debriefing designs, all eight studies included participant feedback, but only five of the eight refer to any type of reflection activity.

Equivalency to Other Debriefs.

Five studies compared self-debriefing to instructor-led debriefs (Boet et al., 2011; Gantt et al., 2018; Sukalich et al., 2014; Verkuyl, Atack, et al., 2018; Welke et al., 2009), and all but one (Gantt et al., 2018) showed equivalency. For example, no statistical differences were found between self-debriefs and instructor-led debriefs in subsequent performances for anesthesia residents (Boet et al., 2011; Welke et al., 2009) or medical residents (Sukalich et al., 2014) thereby establishing equivalency for self-debriefs. Knowledge gains and self-efficacy gains were also comparable between nursing students who completed a virtual simulation and either used a self-debrief or were debriefed by an instructor (Verkuyl, Atack, et al., 2018). A single study with an aim at comparing self-debriefs to faculty-led debriefs (Gantt et al., 2018) showed that self-debriefed nursing students scored lower on subsequent simulations as compared to those debriefed with faculty.

Comparing Self-Debriefing Variations.

Two studies compared groups receiving a type of self-debrief (Fan et al., 2017; Kun, Hubert, Bin, & Huan, 2018). The focus of both studies was on varying the type or amount of feedback given to learners. Fan et al. (2017) found no statistical differences in giving additional feedback to emergency medical technicians on chest compression performance, while Kun et al. (2018) found a significant difference in later performances between groups of surgical residents receiving either video feedback or receiving no feedback.

Perception of Self-Debriefing.

Three studies explored participant perceptions of self-debriefs (Gantt et al., 2018; Miller, Farra, & Simon, 2018; Verkuyl, Atack, et al., 2018). A multidisciplinary NICU team who

completed virtual simulations offered qualitative data in focus groups about their online, asynchronous debriefs. Overall perceptions indicated confusion about feedback and awareness of timely completion to aid in recollection and reflection (Miller et al., 2018). Students from the study by Gantt et al. (2018) also had a negative perception about the self-debrief and cited frustration with unanswered questions before moving to the next simulation. Verkuyl, Atack, et al. (2018) used an instrument to gather perception data about the debriefs. While the researchers noted all three groups had high overall satisfaction scores on the Debriefing Experience Scale, the self-debriefing group's scores were significantly lower than for the other two conditions.

Promoting Reflection.

The self-debriefs with nursing students (Gantt et al., 2018; Verkuyl, Atack, et al., 2018) and the interprofessional NICU team (Miller et al., 2018) provided written reflective debriefing questions and required participants to write down responses or reflections. Two of the graduate-level studies describe a less formal reflection activity, by use of verbal questions (Sukalich et al., 2014) or use of verbal questions along with a visual tool (Boet et al., 2011). The graduate students did not write their responses to the questions as part of their reflective thinking. The remaining self-debriefing research lacked any information about reflection.

Research with Nursing Students.

Only two studies focused on undergraduate nursing students (Gantt et al., 2018; Verkuyl, Atack, et al., 2018). Gantt et al. (2018) compared the impact of different modes of debriefing on later skill performance scores and student preferences on the fit of the debrief, while Verkuyl, Atack, et al. (2018) measured knowledge gains, self-efficacy scores, and students' debriefing experience ratings. Neither study examined the contents of students' writing for evidence or

depth of reflection. In the research by Gantt et al. (2018), students participated in a live simulation followed by a self-debrief, an instructor-led debrief with feedback only, or an instructor-led debrief with feedback and ability to ask questions. The self-debrief consisted of students responding to questions in writing while viewing a video of their performance. Participants were asked to write about what happened and what emotions they experienced in the simulation. The self-debrief activity also included a rating activity of 28 expected skills from the scenario. In the activity, participants labeled the right actions with a "plus sign" and actions that could have gone better with a "delta" symbol for change. Educators call this the "plus/delta" method of debriefing. This activity placed the responsibility to judge skills as good or bad on the students themselves. Gantt et al. (2018) reviewed the written responses and noted students as being "critical on themselves" for the skills portion or that some comments constituted misinformation about the content, but the researchers did not evaluate the responses for the depth of reflection.

Verkuyl, Atack, et al. (2018) also compared different types of debriefs, but with a virtual simulation. The types of debriefs included a self-debrief, an in-person instructor-led debrief, and a remote, instructor-led synchronous debrief via web-based teleconferencing. For the self-debrief group, participants wrote responses to questions after receiving a computer-generated report of the simulation performance. The written reflections were "viewed by a research team member to confirm completion" (Verkuyl, Atack, et al., 2018, p. 3), but they were not analyzed as data. The nine questions used in this virtual simulation self-debrief were based on the 3D Model of Debriefing, which is developed from learning theories and structured in stages to build knowledge (Verkuyl, Atack, et al., 2018).

There are almost no similarities between these two studies, except for the population, undergraduate nursing students, and written responses in the self-debrief. Differences include the type of simulation (virtual gaming versus in-person, manikin-based), the type of feedback (computer-generated report with links to content versus an unscored videotape of performance) and data collection method on perception or preferences (a debriefing experience survey instrument versus a single yes/no question on the fitness of the debriefing style). The debriefing models, plus/delta and 3D Model of Debriefing, both contain questions about what went well and what could be improved. However, the 3D Model is more sophisticated in design and included the learning outcomes for students to review (Verkuyl, Lapum, et al., 2018).

An examination of the feedback given to the learners in these two studies reveals an interesting difference in expectation placed on the learner. Students who watched a video of their performance (Gantt et al., 2018) had to decide for themselves which actions were right and wrong while the students in the virtual simulation study (Verkuyl, Atack, et al., 2018) received a report that provided that information to them. In both studies, the self-debriefs occurred without faculty presence, but because the computer-based virtual simulation scored the performance, the learners received an independent assessment of their actions. This provision of information allowed the learners to confirm their interpretations with an outside, objective source. For early-level learners, such as undergraduate students performing their first self-debrief, provision of the correct actions is a way of scaffolding support, so learners can devote their mental energy to reflecting on why an action was right instead of attempting to determine which actions were wrong or right beforehand (Schunk, 2012).

Limitations to the Current Body of Knowledge

Number of Studies

A significant limitation to the body of knowledge is that there have only been eight studies conducted on self-debriefing in healthcare simulation. Additionally, none of the studies are similar enough in design to provide corroborating support to one another. There are only two studies that represent the population of interest, undergraduate nursing students, and those studies' designs, as well as the self-debriefing designs, are too different to compare to one another. The dearth of evidence is clear support for more research.

Generalizability to Other Populations

Research conducted on non-comparable populations is another limitation. Findings for medical residents and clinical professionals do not necessarily fit the conditions for undergraduate nursing students or predict potential outcomes. Studies with graduate-level students provided informal reflection prompts or did not mention reflection at all. These more advanced participants reached success with self-debriefs despite a lack of reflection guidance; they may already be adept at using self-reflection to learn from experience.

Limited Evidence on Perception

Studies conducted with graduate students shared a goal of comparing types of debriefs for performance outcomes, but none of those studies sought information about learners' perceptions of the self-debrief. Therefore, it is unclear if these learners appreciated or valued the self-debriefing methods they used. Students who value an assignment will have higher levels of motivation to work on that assignment, which may, in turn, result in greater learning achievements (Schunk, 2012).

Missing Evidence on Self-Debrief Design.

None of the research on self-debriefing explored the design of the self-debrief itself. Evidence for self-debrief design may be especially important for students who require more support for reflection. If conditions call for self-debriefing in place of standard debriefing, where the self-debrief performs the functions of the facilitator, the need to establish a self-debrief's efficacy in providing those functions becomes evident. A few studies presented evidence regarding feedback. However, none of the studies looked at evidence of the other expected function of a self-debrief: reflection. As described earlier, during standard debriefs, facilitators encourage reflection and supply performance feedback. When a standard debrief is happening, the facilitator controls the delivery of feedback, and the facilitator monitors reflection through questions and discussion with the learners. Facilitators can determine when and how learners are reflecting by their responses. If a student's comments do not demonstrate insights about the actions and consequences, or new perspectives on the content, the facilitator can rephrase a question or dig deeper to stimulate the student to reflect on the event. By evaluating students' responses and recalibrating questions, the facilitator can maximize reflective thinking during the debrief.

For a self-debrief to replace a standard debrief, the activity should still provide feedback and encourage reflection for standards of best practice to be maintained. In the case of virtual simulation, the computer program routinely generates performance feedback, which addresses this requirement. The other major event, reflection, needs to be stimulated by the activities designed into the self-debrief. Without a facilitator's ability to monitor in real-time how effective the questions are at provoking students' reflective thinking, careful forethought needs to go into

the creation of and testing of those questions. Self-debriefing designers must rely on theories of learning and reflection to maximize the potential for pre-arranged questions to encourage reflection in learners. In reviewing all available evidence on self-debriefing in healthcare simulation, student responses to self-debriefing questions have not been explored for the presence and depth of reflection. Until such research is conducted, it will remain unknown if a self-debrief design may be considered to replace an instructor-led debrief.

The limited evidence available about self-debriefing and the lack of information about learners' depth of reflection from self-debriefing questions warrants foundational research. By conducting this study, the researcher hopes to have a better understanding of undergraduate nursing students' depth of reflection through their written responses to guiding reflective questions about experiences from a virtual simulation.

Conceptual Framework

The basis for this proposed study on exploring undergraduate nursing students' depth of reflection from a self-debriefing activity is supported by learning theories and definitions of reflection. Kolb's (1984) Experiential Learning Theory explains how people learn from experience. Gibbs' (1988) Reflective Cycle provides a sequential series of stages that, when followed, enhances reflective thinking. As a means of identifying levels of reflection, a rubric has been adapted from the work by Kember, McKay, Sinclair, and Wong (2008), who relied on Mezirow's (1990, 1991) theoretical definitions of reflection. A visual model that shows how these theories and concepts interact to describe the potential behaviors and means to explore them is presented in Figure A1.

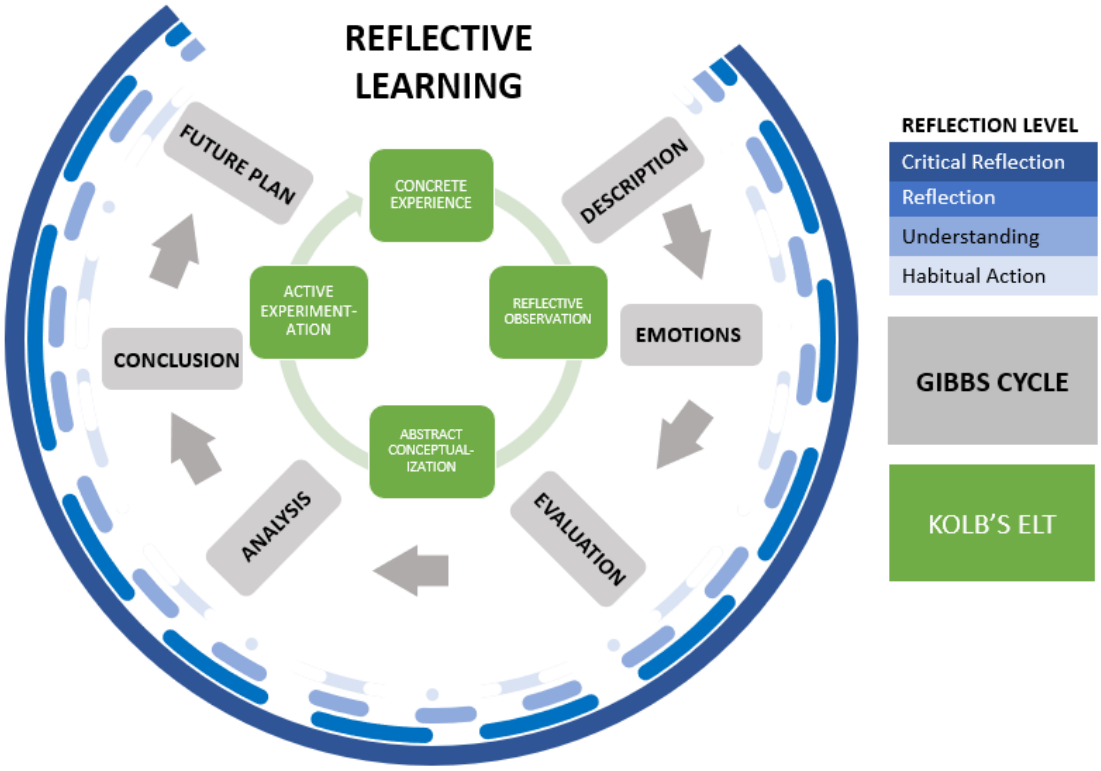


Figure A.1 Visual model of the conceptual framework.

Experiential Learning Theory

The theory that supports the systematic process of exploring events, such as during a debrief following simulation, is Kolb's (1984) Experiential Learning Theory (ELT). This learning theory is foundational to simulation-based education. It is also a starting point for many models of reflection. Kolb's theory proposes a four-stage cycle that supports learning from experience: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. A model shows the stages arranged in a circular format with progression arrows showing the direction of movement from one stage to the next. While this theory is a good fit in a broad sense for simulation or debriefing research, ELT does not provide

specific guidance on how to facilitate the stages of reflection. A guide to facilitating reflection after a learning event originates from a cycle developed by Graham Gibbs.

Gibbs' Reflective Cycle

Gibbs (1988) builds upon Kolb's theory to develop a reflective cycle. What makes Gibbs' cycle particularly relevant to debriefing is the deliberate pacing to prevent users from recalling an action and jumping straight to conclusions while bypassing analysis and reflection. This structured reflection cycle, if followed in order, attempts to keep users on track and remind them of aspects that one may overlook. Each component from the Gibbs cycle (Description, Emotion, Evaluation, Analysis, Conclusions, Future Action) supports reflection and critical thinking. The cycle takes the user from a simple retelling of an event, recognizing feelings about it, assigning a value to the actions taken, considering alternatives and making sense of the situation, drawing conclusions, and articulating a revised action or process should the situation occur again. While not unique, this reflective cycle is simple and easy to describe and follow.

Levels of Reflection

To examine the depth of reflection consistently, an evaluator must establish definitions that will discern among types or levels of reflection. In his seminal works, Mezirow (1990, 1991) has described levels of reflection and also non-reflection as a way of distinguishing among types of reflective thinking. Researchers have used Mezirow's definitions of reflection in creating guides to categorize and measure written reflective activities such as journals and online blogs (Wald, Borkan, Taylor, Anthony, & Reis, 2012; Wetmore, Boyd, Bowen, & Pattillo, 2010;

Wong, Kember, Chung, & Yan, 1995). The guides vary in numbers of categories, ranging from three to seven, depending on the interpretation of Mezirow's work.

From their earlier work that originally delineated seven categories, Kember et al. (2000) developed an instrument to measure reflective ability, which resulted in combining a few categories and the creation of a four-category coding structure for assessing levels of reflection (Kember et al., 2008). Those four categories are habitual action, understanding, reflection, and critical reflection. Kember et al. (2008) suggest that students who demonstrate habitual action in written work search for answers from a source and copy the text without understanding the meaning. Those who fall into the understanding category provide correct answers but rely on the authority of the textbook or lecture notes; they do not relate it to the practical situation. Kember et al. (2008) also deem this level as being non-reflective, which appears to match what Mezirow calls 'thoughtful action.' Thoughtful action occurs when learners check with prior knowledge to see if the current situation is right or wrong but omit any reappraisal of why they believe it to be right or wrong (Mezirow, 1991). The third category, labeled as reflection, happens as learners apply theory to the personal experience and make a connection between prior learning and the current situation. The final category, critical reflection, is equivalent to Mezirow's premise reflection, where a person may challenge assumptions about why something is believed and changes his or her perspective as a result. Critical reflection is a rare event since people perform many actions based on unconscious, deep-seated beliefs that go unquestioned.

This version of categorizing Mezirow's levels of reflection with clear distinctions between the levels has been referenced by other research (Alsina et al., 2017; Başol & Evin Gencel, 2013; Colomer, Serra, Canabate, & Serra, 2018) and has been used to assess written

reflective thinking by learners in a variety of settings. Therefore, these descriptions of reflection levels by Kember et al. (2008) provides a sound choice to assist in assessing the depth of reflection within the proposed study.

These theories and definitions underpin this study in the following way: The undergraduate nursing students' ability to learn from virtual simulation and debriefing stems from Kolb's ELT, and the self-debriefing questions they will answer will derive from the stages of Gibbs' Reflective Cycle. Directed qualitative content analysis of the students' written responses will be performed using a reflection rubric similar to Kember et al. (2008) and based on definitions of levels of reflection, as proposed by Mezirow.

Significance

This proposed study will be the first research to explore nursing students' depth of reflection during self-debriefing in conjunction with virtual simulation. The results will contribute to a better understanding of the depth of students' reflection from self-debriefing and students' perceptions of the self-debriefing activity. Evidence from this study will inform educators and curriculum designers about self-debriefing creation, which will inform their decisions on what to keep or change to impact learning. Positive findings may lend support to expanded virtual simulation use, which could increase SBE availability to larger groups of students. The achievement of learning outcomes with SBE would decrease the amount of imperfect practice with human patients, and thereby increase patient safety. The outcome of this study may provide support for self-debriefing use or reveal necessary changes, which could have financial implications for schools of nursing. For instance, if evidence shows that self-debriefing results in minimal reflection and change in learning, a change in the curriculum may be

necessary so that virtual simulation only happens on campus with an instructor present to facilitate the debrief. This sort of change would impact both the students' and faculty's schedules and may result in either additional staff for facilitation or limit the use of virtual simulation and return to live simulation only.

By not conducting this study, educators carry the risk of perpetuating an ineffective learning activity. Ineffective learning has many ramifications, such as wasted time, frustration, lower grades, delayed progression, and course or program failures. The missed opportunities from unexplored ineffective self-debriefing may result in wasted academic time, money, and other resources. Such a missed opportunity would be felt beyond the chosen study site; it would be experienced across all schools that similarly use self-debriefing. Failure to explore the self-debriefing activity may also prevent the opportunity to uncover learners' satisfaction and motivation levels, making it impossible to know if there is a need for change.

The long-term goal of this research is to establish debriefing practices supported by evidence that may serve in situations where nursing students must independently debrief themselves through reflection and cognitive processing of events so that they may increase their understanding, judgment, or decision-making abilities. These self-debriefing practices and skills have potential use within the ongoing adoption of virtual simulation into nursing education but may also serve students during clinical rotations and even beyond in professional practice. In their call for a transformation to nursing education, Benner and Shulman (2010) encourage educators to foster an apprenticeship approach where learners gain the skills of reflecting on practice to "develop a self-improving practice" (p. 26). Creating an effective self-debriefing activity and introducing it to students during virtual simulation activities may result in a

transferrable tool or method for educators and students to use in other situations where reflection would be beneficial.

Preliminary Studies

In preparation for the proposed study, this researcher completed a preliminary qualitative study with nursing students who completed a virtual simulation and self-debriefing activity. The purpose of the original study was to explore the extent of reflection students demonstrated from the existing self-debriefing activity of a virtual simulation. The self-debriefing activity consisted of answering the publisher's questions in writing for the self-debrief. All 122 students in the Spring 2019 Nursing Care of Families course were eligible, and 59 (48.4%) agreed to participate in the study. This response rate sets a precedent for the upcoming proposed study.

The students' written responses and publisher questions were analyzed using directed content analysis (Hsieh & Shannon, 2005), using predetermined codes of Gibbs' (1988) phases of the reflective cycle. Findings revealed some elements of reflection, but an analysis of the questions showed a gap in the stages of reflection when compared to theories of reflection. The first gap identified was no questions or responses that described the event. Both Gibbs (1988) and Boud et al. (1985) propose that reflection is most successful if users first review the event sequentially without applying judgments and explore emotions before they evaluate or analyze their actions or decisions. The publisher's questions do not ask learners to recount the event. Boud et al. (1985) suggest that going through this step makes the details available for analysis with a fresh perspective. The second gap was the absence of any analytical or sense-making questions. Gibbs (1988) recommends that users analyze the event after evaluating which actions

were right or wrong and attempt to explain why to get a sense of the whole situation. There are no questions that ask the learner to make sense of why specific actions are good or bad by connecting them to potential or real outcomes. Learners' responses did not contain this type of sensemaking reflections in almost all cases.

After comparing the publisher's questions to multiple theories of reflection for learning, the decision was made to write different questions for the proposed study. The revised questions most closely align with Gibbs' Reflective Cycle due to its clarity of intent with each phase. The new questions were crafted to stimulate deep levels of reflection. The complete set of new questions are provided for review in Table A1.

Table A.1

Self-Debriefing Activity Questions

Questions	Additional Hints
DESCRIBE:	
What are all the main actions, events, or decisions that you can remember? Try to recall from memory or use the feedback log to write down what happened, what you did, or what the patient did throughout the scenario.	*HINT: Do NOT add judgments or evaluations in this section. (i.e., do not say what was right or wrong, just report what happened)*
EMOTIONS:	
Describe how you felt or reacted throughout the experience of the simulation. If your feelings changed from the beginning to the end, or you had different feelings or emotions, list each one along with when you had them.	*HINT: Do NOT analyze your feelings yet – just list them along with when you had them or what was happening when you noticed them.*
EVALUATE:	
What actions or events throughout the simulation went well? What positive actions or decisions did you make? What actions or events did not go well? What seemed to be a negative action or decision?	*HINT: You can use the information you wrote in question #1 or add new information. Do NOT include "why" yet.*
ANALYZE:	
What sense can you make about the sequence of events? What was really going on?	*Now it's time to analyze. Try to connect your actions to the responses you observed to describe WHY those responses occurred.*
CONCLUSIONS:	
What else could you have done during the scenario? What different outcomes you might expect?	*What have you learned from thinking about these questions?*
FUTURE PLAN:	
Based on your thoughts from this exercise, what are you going to do differently if you encounter a similar situation? What would you do the same? What could you do beforehand to be better prepared for a similar experience?	
COMMENTS: What comments or questions do you have about the scenario or this exercise?	

Methods

Research Design

For this two-phased qualitative study, a qualitative descriptive design will be used. This design will assist in achieving the goals of answering the research questions:

1) What is the depth of reflection found in undergraduate nursing students' written responses to a self-debriefing activity after a virtual simulation?

2) What are undergraduate nursing students' perceptions of the self-debriefing activity as an aid for reflecting on a virtual simulation activity?

Opting for this study design allows the researcher to adopt specific techniques from other, more traditional qualitative research methods, such as phenomenology or grounded theory while avoiding the prescriptive nature of those methods. Despite criticisms of it being a 'generic' research design, qualitative description still requires the expected features found in other designs, such as approaches to sampling, data collection, and analysis (Sandelowski, 2000, 2010). Further, using this method does not preclude the researcher from interpreting the data collected (Sandelowski, 2010). The distinction with this method is that the data analysis is not so abstract, nor does it lead to building a theory, as in other methods. Therefore, the qualitative descriptive design is best suited to guide this research and to answer the research questions.

Site Selection

The site for this qualitative research study is the College of Nursing at the University of Central Florida. The site was selected due to the supportive nature of educational research initiatives throughout the college. Another reason this site was chosen is due to the voluntary participation of the faculty member who currently uses virtual simulation as a featured

assignment within her course. Since the cohort of students receives this assignment at different times throughout the semester, there are multiple opportunities to choose for the start of the study, which is another advantage to the site selection. This site uses a widely adopted virtual simulation product, vSim for Nursing™, that incorporates a series of guided reflective questions to debrief the individual user. By selecting a site that uses a popular virtual simulation product, there is greater possible generalizability from the results. Finally, a collegial relationship has been established with the faculty member, which helps in gaining buy-in and support for the study. The faculty member shares an interest in learning more about the self-debriefs following virtual simulation.

Sample

Undergraduate pre-licensure nursing students currently enrolled in the Nursing Care of Families Clinical course at the College of Nursing will be recruited for this study. A total of 120 students are anticipated to enroll in the course for Spring 2020 and constitute the accessible population (Polit & Beck, 2017). Based on the preliminary study's recruiting experience, approximately 55 students are anticipated to participate in the proposed study. These students already use virtual simulation as part of their assigned coursework, so the expectation for students to participate in a virtual simulation and complete a self-debriefing activity is established. Working within a pre-existing course and assignment for this group of students allows the researcher to treat this research as occurring in a naturalistic setting (Creswell & Poth, 2018). Convenience sampling will be used. Inclusion criteria: undergraduate nursing students at UCF, current enrollment in NUR 3445L, completion of specific virtual simulation activity,

willingness to participate. Exclusion criteria: repeat enrollment in NUR 3445L or completion of virtual simulation activity in the prior semester.

Relationship to the Site

The researcher is a doctoral student at the selected site. While employed as a graduate teaching assistant in the role of 'teacher' at the research site, during the timeframe of the study, the researcher will distance herself from the role as much as possible. By not participating in the grading of student work, this will minimize any perceived power relationship with this specific group of student participants. The researcher will not have had contact with these specific students in prior semesters, which should also help in avoiding a role that connotes a teacher/student dynamic during the study timeframe.

Study Procedures

The proposed study consists of two phases that will occur in up to four cycles during the Spring 2020 semester. Timelines of the overall study activities (Table A.2) and a detailed timeline of the Phase I and Phase II cycle (Table A.3) are provided. Also, an outline of the relationship between research questions and data collection and analysis methods is presented (Table A.4).

Table A.2
Study Timeline

Jan 30	1/31 – 2/7	Feb 20	2/21 – 2/28	Mar 26	3/27 – 4/3	Apr 16	4/17 – 4/24
OCC #1 Phase I	Interviews Phase II	OCC #2 Phase I	Interviews Phase II	OCC #3 Phase I	Interviews Phase II	OCC #4 Phase I	Interviews Phase II

Table A.3

Detailed Study Timeline

	M	T	W	Th	F	M	T	W	Th	F	M	T	W	Th	F
Recruit Phase I															
vSims Submitted															
Analysis Phase I															
OCC Day															
Recruit Phase II															
Interviews															
Analysis Phase II															

Table A.4

Research Question and Associated Data Collection and Analysis Methods

Question	Data Collection Method	Data Collection Artifacts	Data Analysis Method
1. What is the depth of reflection found in undergraduate nursing students' written responses to a self-debriefing activity after a virtual simulation?	Retrieval of Data Set from Qualtrics	Student responses to guided reflective questions within the Self-debriefing activity	Code for presence and types of reflection using adapted reflection rubric
2. What are undergraduate nursing students' perceptions of the self-debriefing activity as an aid in reflecting on a virtual simulation activity?	Semi-Structured Interviews with sample of students	Transcripts Field notes, Memos	Conventional Content Analysis Direct Interpretation

Study Procedures: Phase I

Recruitment

An announcement will be posted on the class learning management system, Webcourses, at the beginning of the term. The announcement will inform the class that a voluntary study will occur in conjunction with the upcoming virtual simulation assignment and self-debriefing activity and that all students may participate in this first phase of the study. An explanation of the research will be attached to the announcement and the assignment page in Webcourses. Instructions posted in the announcement, as well as on the assignment page, will inform students that the assignment is a mandatory part of the course, but allowing their work to be used in the study is optional. They will be informed of how they may indicate interest in participating in the study when they start the assignment. An opt-in question will be included in the online self-debriefing activity. Any "no" responses or blank responses to the opt-in question will result in the removal of that student's responses from the data set before any analysis.

Data Collection

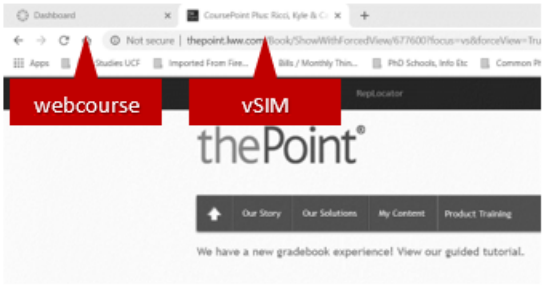
The source of data for Phase I of this study consists of the students' responses to the self-debriefing activity that follows a virtual simulation assignment. Students are required to complete this activity before their scheduled On-Campus Clinical (OCC) event. Twenty-five percent of the students, or about 30 of the 120, will be scheduled to attend the OCC event during each month in the spring term (January, February, March, April). Data will be collected on each OCC event day during the study. The set of reflective questions will be embedded into a Qualtrics survey. A link to the survey will be posted on the assignment page in Webcourses. A

set of detailed written and visual instructions for completing the virtual simulation and self-debriefing activity will be provided to the students. (Figure A.2)

What you will need to complete this assignment: your computer or laptop, reliable access to the internet, access to Webcourses, Log-in credentials for LWW The Point and vSim

1. Open a web browser and activate two (2) tabs or windows

2. Log into UCF Webcourses in one tab and the vSim program via thepoint.lww.com in the second tab



3. Complete the vSim scenario **ONE TIME ONLY**

4. Remain logged into the vSim portal to display the performance feedback log in one tab

5. Click on Webcourses (tab 1)
6. Go to vSim Assignment
7. Click link to access the self-debriefing exercise

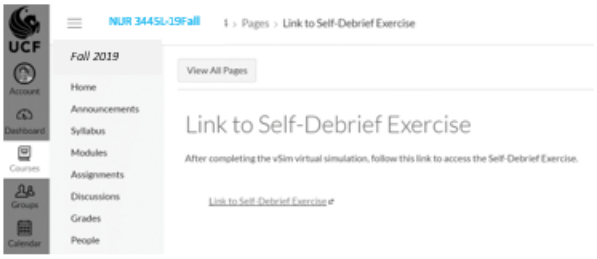


Figure A.2 Virtual Simulation Instructions

Transcription will not be necessary since the self-debriefing activity responses are already in text form and will be collected anonymously. After the assignment's due date, the responses will be downloaded from Qualtrics as a Microsoft Excel (Microsoft Office 365 ProPlus, Version 1909) file. The data will be screened for any participants who did not opt-in to the study, and they will be removed. The remaining data will be converted to individual Microsoft Word (Microsoft Office 365 ProPlus, Version 1909) files and uploaded into QSR International's NVivo 12 software for analysis.

Data Analysis

Responses to the self-debriefing activity will be first screened by using an adapted rubric from Wetmore et al. (2010) and reflection levels from the work of Kember et al. (2008). The reflective process elements in the Wetmore et al. (2010) rubric were replaced with corresponding phases from Gibbs' (1988) Reflective Cycle. The adapted rubric is included for review (Table A.).

The analysis will commence immediately following data collection and organization. Next, an analysis of the responses will be performed using conventional content analysis (Hsieh & Shannon, 2005) to identify themes in students' reflections. Reported findings will include the percentage of levels of reflection for each phase, for all participants, examples of each level of reflection found in each phase, and generated themes found in the content analysis.

Table A.5

Rubric for Analyzing Responses to Self-Debriefing Activity

Stage of Reflective Cycle (Matches Guided Questions) based on Gibbs (1988)	Response matches the stage of reflection?	Non-Reflection	Understanding	Reflection	Critical Reflection
Description – What happened?	Y/N				
Feelings – What were your feelings or reactions?	Y/N				
Evaluation – What was good or bad?	Y/N				
Analysis – What sense can you make of the situation?	Y/N				
Conclusions – What does the experience & analysis suggest?	Y/N				
Future Action Plan – What are you going to do differently?	Y/N				
Non-Reflection					
● The answer shows no evidence of the student attempting to reach an understanding of the concept or theory which underpins the topic ● Written without the student thinking seriously about it, trying to interpret the material, or forming a view ● Largely reproduction, with or without adaptation, of the work of others					
Understanding					
● Evidence of understanding of a concept or topic ● Material is confined to theory ● Reliance upon what was in the textbook, or the lecture notes ● Theory is not related to personal experiences, real-life applications or practical situations					
Reflection					
● Theory is applied to practical situations ● Situations encountered in practice will be considered and successfully discussed in relation to what has been taught ● There will be personal insights which go beyond book theory					
Critical Reflection					
● Evidence of a change in perspective over a fundamental belief of the understanding of a key concept or phenomenon ● Critical reflection is unlikely to occur frequently					

Study Procedures: Phase II

Recruitment

Participants for Phase II will be recruited from the students who attend the On-Campus Clinical events scheduled throughout the spring semester. Convenience sampling will be used while still striving to gather different perspectives in the data. Potential participants will fill in a form with age, gender, ethnicity, and self-reported virtual simulation score demographics as the criteria for determining the diversity in the sample.

An explanation of research for Phase II will be disseminated at the start of the day of the on-campus event. The course instructor will send an email message to the class after the OCC event as a reminder with a link to a short fill-in form for potential participants. All interviews will be scheduled to occur within one week following the OCC event to ensure students' fresh recollections. Verbal consent will be obtained from all participants before the actual interview. As a "thank you" for their time, $15 gift cards will be given to participants who complete the interview.

The initial sample size for Phase II is set at 10 participants, but the final sample size will depend upon when saturation is achieved. Saturation will be determined when no new codes are found in the data, and redundancy occurs (Polit & Beck, 2017).

Data Collection

For Phase II, semi-structured interviews will be conducted with selected participants. The scheduling of interviews will be based on availability and convenience to the participant. Either a private setting on the UCF College of Nursing campus or another convenient location of the participant's choosing will be selected as the venue for the interviews.

Participants will be informed of the purpose of the interview and the expected duration of 30 minutes for the session. Participants will also be reminded of their right to withdraw from the study and the researcher's plans for the interview results. Several open-ended questions will be used (Table A.6) in addition to follow-up questions as deemed necessary to elicit full, authentic responses to learn about students' perception of the self-debriefing activity as an aid to their reflection on the virtual simulation assignment.

Table A.6

Interview Guide

1. When you initially finished the virtual simulation, what did you originally think about the virtual simulation experience?
2. Were your thoughts on the simulation itself (like how it operated) or more on how you performed during the simulation?
3. How did your thoughts about the virtual simulation change after you completed the self-debriefing activity?
4. How did writing answers to the questions help you to think about the experience of the virtual simulation?
5. What did you enjoy about writing answers to the questions of the self-debriefing activity?
6. What do you wish was different about the self-debriefing activity?
7. What benefits do you believe the self-debriefing activity offers you as compared to a group debrief after a simulation in the lab?
8. What benefits do you believe a group debrief following a simulation offers you as compared to the self-debriefing activity?
9. How do you usually reflect on an experience where you may have been unsure or had a problem?
10. Since the time of the virtual simulation and self-debriefing activity, what changes in the way you reflect on challenging classroom or clinical experiences have you noticed about yourself?
11. What value did you place on the self-debriefing activity?

A digital audio recorder will be used to record the complete interview conversations. Back-up supplies such as extra batteries and memory cards will be available, and the equipment will be tested before each interview. The researcher will bring a notebook for field notes. At the end of the interview, the researcher will block time to reflect on the event and make notes of ideas from the session. After each interview, the researcher will transcribe the audio files with transcription software and verify a 100% match by listening and reviewing the text-based transcripts. The transcribed text will then be imported into QSR International's NVivo 12 software for data analysis.

Data Analysis

Phase II analysis will differ from the plan for Phase I. Analysis of each transcript will occur as soon as it is collected. The researcher will refine questions for subsequent interviews based on the initial analysis. As soon as a transcribed interview is available, it will be read and coded using inductive conventional content analysis (Hsieh & Shannon, 2005). Transcripts will be read multiple times. The researcher will mark words and phrases and label them with descriptive codes. Memos will be created on another document based on ideas and thoughts that the work generates. After coding is complete, the codes will be organized into categories while returning to the driving research question for guidance. A second investigator will analyze a portion of the data independently. Discussions between the researchers on the coding and organizing strategies will be scheduled as a means to form a consensus in interpretation.

Validity

To ensure rigor in this study, the researcher will focus attention on the concepts of credibility and authenticity, as described by Whittemore, Chase, and Mandle (2001). Validity is demonstrated through the transparent descriptions of various design decisions within this study proposal, including the sampling strategies, the data collection and analysis plans, and the acknowledgment of the researcher's relationship to the sample and site. In addition to these efforts, the researcher will maintain an audit trail throughout the study so that another person could follow the steps taken and reach similar findings.

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APPENDIX B:
INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

EXEMPTION DETERMINATION

December 11, 2019

Dear Valorie Mackenna:

On 12/11/2019, the IRB determined the following submission to be human subjects research that is exempt from regulation:

Type of Review:	Initial Study, Exempt Category
Title:	Exploring Depth of Reflection from Self-Debriefing of Virtual Simulation
Investigator:	Valorie Mackenna
IRB ID:	STUDY00001236
Funding:	None
Grant ID:	None

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Adrienne Showman
Designated Reviewer