Assigning Roles in Educational Escape Rooms for Nursing Students- Effective or Not?

Abstract

While a growing number of clinical simulation scenarios for nursing education have added role assignments in their script, the impact of such design was not sufficiently examined. This study explored how role assignment affects collaborative problem-solving (CPS) among nursing students in an educational escape room (EER) based on a sepsis simulation. Twenty baccalaureate nursing students participated: 10 with assigned roles (experimental) and 10 without (control). Audio recordings and transcripts were manually coded using a CPS framework, and Ordered Network Analysis (ONA) examined behavioral patterns. Both groups frequently worked to establish a shared conceptual space, but the role-assigned group showed greater negotiation and coordination. Findings suggest that incorporating role assignments into clinical simulations may enhance systematic CPS discourse in nursing education.

Introduction

Professions in nursing require diverse sets of skills that do not limit to clinical expertise, but also extend to communication and teamwork with team members. They share different but adjacently related roles in terms of operating protocols and clinical decision-making. Nursing students have been trained with high-fidelity simulations to equip such competencies, which were traditionally proven to be an effective instructional strategy (Inayat et al., 2021). To complement the potential high-pressure nature of high-fidelity clinical simulations, educational escape rooms (EER) have emerged to better engage students (Bonaduce, 2024; Valdes et al., 2021). EERs depict a playful environment where students participate as a team in a series of problem-solving activities from puzzles and step forward to achieve the final objective of "escaping" the room. These procedures align with elements of collaborative problem-solving (CPS) that involves building a common understanding and utilizing it to resolve the problem situation (Sun et al., 2020).

Along with incorporating the EER, another main topic of this study is a role assignment as a design element in the high-fidelity simulations. Assigning roles to nursing students means providing them an opportunity to practice a certain clinical role and demonstrate knowledge and professional communication skills. There are existing studies that examine effects of role assignment in clinical simulation practices (Alexander, 2020; Weiler et al., 2018). However, it is necessary to transfer such effects to the emergent simulation environment such as EER with CPS activities, and resolve potential inconsistencies in previous findings.

Moreover, this study aims to capture students' engagement in an ordered network analysis (ONA) which visualizes temporal dynamics of epistemic activities. While epistemic network analysis (ENA) is relatively a well-established method for examining epistemic relationships in CPS discourses (Swieki et al., 2020), it primarily focuses on co-occurrence patterns and provides limited insight into the sequential flow of interactions (Fogel et al., 2021). ONA addresses this by analyzing the order of behavioral transitions, allowing for a more detailed understanding of CPS processes (Tan et al., 2024). Thus, this study aims to provide evidence on the effectiveness of role assignment on nursing students' engagement in CPS within EER. The research question is as follows: How do students' ordered process of CPS associate with each other, and differ between the group with and without role assignment?

Background

Role assignment has become an integral part of traditional high-fidelity simulations in nursing education. These roles often reflect actual clinical positions—primary nurse, assessment nurse, and medication nurse—and are used to simulate real-world responsibilities, enabling students to rehearse the dynamics of healthcare delivery in a team-based environment (Hooper & Carlson, 2024).

However, this practice is rarely transferred into the escape room design. In most escape room scenarios, tasks are approached collaboratively and organically, with little to no formal distribution of responsibilities. This free-form style of problem-solving is flexible but raises questions about equity in participation. Do all learners engage equally? Does natural leadership emerge and affect team dynamics? More importantly, how do these dynamics affect learning outcomes such as clinical reasoning, communication, and decision-making?

Such exploration has already been conducted in high-fidelity simulations with some perplexing results. Weiler et al. (2018) conducted an experimental study on role assignment in high-fidelity simulations and found that assigning specific roles significantly influenced students' critical thinking skills and various aspects of self-efficacy. Similarly, Litke-Wager et al. (2021) demonstrated that task-oriented role assignments positively affected performance in a neonatal resuscitation simulation. These findings suggest that purposeful role distribution may enhance individual learning outcomes, task ownership, and interprofessional collaboration. However, some evidence indicate that it may not be always true and in some cases, the methods may not be educationally sound. For example, in Alexander's (2020) study, roles were assigned based on perceived learning

styles—a model widely criticized in educational psychology for lacking empirical support (Kirschner, 2017). Additionally, Hooper and Carlson (2024) found no difference in knowledge acquisition based on role assignment in a high-fidelity nursing simulation. While this suggests that role assignment may not impact cognitive outcomes like knowledge retention, it leaves questions about affective outcomes (e.g., engagement, confidence) and teamwork-related competencies unanswered.

In the existing EER literature, the transfer of this concept has not occurred at scale. In their scoping review, Burbage and Pace (2024) reported that most educational escape rooms in healthcare fail to report on foundational design elements, including role structures. This oversight prevents researchers and educators from identifying patterns that might improve the instructional value of EERs. Based on the existing literature from high-fidelity simulation settings, it is sensible to expect thoughtfully designed role assignments in EERs to help structure collaboration, evenly distribute the cognitive load, and ensure balanced participation. It may also reveal leadership tendencies and foster professional identity formation. However, without rigorous study, these hypotheses remain speculative. Understanding the influence of structured roles is not only a matter of pedagogical interest but of practical value, as it would allow educators to design escape rooms that are both equitable and educationally impactful.

Method

Escape Room

The EER used in this study was co-designed with an experienced nursing educator. In this scenario, students encountered four steps of the nursing process model: notice, interpret, intervene, and reflect (Tanner, 2006). There were six lockboxes in the room, each of which led participants to engage in a specific clinical task, which included dosage calculation and lab results interpretation. There were puzzles associated with each task, of which solutions were three-digit codes used to unlock the boxes. Students would find a gold coin marked with a letter in each box. When all six boxes were unlocked, the coins were then put together to uncover the final solution, which formed the word "advocacy." It links to one of the core virtues of nursing, and to successfully "escape" the patient room (Figure 1).

[Insert Figure 1]

The activity lasted approximately 30 minutes for all teams. Assigned roles for the experimental group included primary nurse, medication nurse, assessment nurse, and, when applicable, a monitoring nurse for four-member teams. Students brought their own stethoscopes and could request hints from the researcher at any point. Facilitators observed without intervening, except when student safety was at risk.

Participants

The participants were 20 second-semester baccalaureate nursing students from a public university in the southeastern United States. Ten students were placed in control groups, and ten in experimental groups, with role assignment as the intervention. Participants were recruited through convenience sampling and participated voluntarily without incentives. All had prior experience with clinical simulations, but none had participated in educational or entertainment-based escape rooms. Audio recordings were made with participants' consent, and each student was assigned a pseudonym to ensure confidentiality. The study was approved by the institutional review board.

Data Collection & Analysis

Data were drawn from transcripts of audio recordings capturing student conversations during the EER. Recordings were collected using internal audiovisual equipment in the university's simulation lab, then exported, cleaned, and transcribed for analysis. To address the research question, transcripts were segmented into message units and coded using a collaborative problem-solving (CPS) framework (Table 1), adapted from Sun et al. (2020) and Buseyne et al. (2024). Initial coding was conducted by all researchers, achieving interrater reliability with Cohen's kappa exceeding .76. We used Ordered Network Analysis (ONA) to investigate temporal dynamics of CPS, offering an extension to traditional Epistemic Network Analysis (ENA). The analysis, including statistical testing and network visualization, was conducted using the ENA web tool (https://www.epistemicnetwork.org/).

[Insert Table 1]

Results

Figure 1a and 1b show ordered network models from the control group and the experimental group, respectively. Both groups generally showed the most frequency in re-occurrence of *Establishing Common Ground* (A2), and

it was mostly directed from other sharing and negotiating movements. For the control group, this behavior was mostly preceded by codes A1 and B3. In other words, the control group tended to seek a common understanding based on shared knowledge and potential solutions.
On the other hand, the experimental group showed strong directions from *Sharing Knowledge and Understanding* (A1) and *Responding to Ideas or Proposed Solutions* (B1) to *Establishing Common Ground* (A2). In addition, both groups often repeated *Sharing Knowledge* (A1), but the experimental group showed Responding to Others' Ideas as frequently as A1. And though relatively moderate, the control group's behavior of *Discussing Strategy* (B3) often recurred in a sequence, as shown by the bigger node of B3 in Figure 1a.

Upon comparison between the two groups, a non-parametric Mann-Whitney test was conducted to prove statistical significance. The control group was shown to be significantly different from the experimental group along the X-axis (U=380.00, p=.00, r=-.98) instead of the Y-axis (U=197.00, p=.90, r=-.03). Based on this result, Figure 2 depicts how each group shows CPS behaviors in proximity within a moving stanza size of 4, on the horizontal dimension. For instance, while the control group frequently showed an ordered sequence from *Discussing Strategy* (B3) to *Establishing Common Ground* (A2), the experimental group frequently proceeded from *Sharing Knowledge and Understanding* (A1) and *Monitoring Execution* (B2) to *Establishing Common Ground* (A2). In addition, the experimental group showed a strong connection from A2 to *Responding to Ideas or Proposed Solutions* (B1).
These findings from the comparison reveal that the experimental group attempted to form the common conceptual space from current information and the team's progress, while the control group's common space is directed by conversations on potential strategy and solutions. The experimental group also vividly presents behaviors of moving on from the common space with consensus to negotiating moves.

[Insert Figures 2 and 3]

Discussion
Our findings extend the associations among CPS behaviors to an ordered sequence and directed relationship. In other words, we were able to track orders of actions that led to certain behaviors during the CPS in EER simulations. At most of the times, both groups engaged in sharing concepts and individual understanding with others during the intervention. Due to the nature of nursing, the participants considered confirming knowledge together, such as understanding the patient status, with teammates as an important initial step to progress further. This is implied by the largest node that represents establishing a common space, which was the most frequently occurring action as a response to other collaborative moves. In the EER where students had to deal with the problems with minimal interference from the facilitator, they had to understand the task and elicit responses from others to clarify the ideas.
The participants with role assignment frequently repeated responses to other's actions and proposed solutions as a coordinating move. As they occasionally thought-aloud their meandering ideas, others had to jump in to provide evidence that support these or questions that prompt clarifications. This suggests that being aware of roles facilitated them for critical thinking and supplement each other's reasonings. While we expected the experimental group to repeat behaviors of *Maintaining Team Functions* (C-codes), the recurrence was seldom observed. In the raw transcript of student conversations, the experimental group tended to systematically approach the tasks, but the results show a weak association to this status with the role assignment. Potential difference due to role assignment could be seen from the difference in *Discussing Strategies* (B3). From the node sizes, the control group showed stronger recurrence of this behavior, meaning that the members spent more time refining the proposed strategies to resolve problems. This could be interpreted that they have built a collective responsibility to equally contribute to the resolution phase, since there were no distinct roles assigned to individuals.
The comparison between the control and experimental groups highlights the function of role assignment–the context in which the students were aware of one's own and other's position and tasks. The most significant difference pertains to the behaviors that preceded building the common space of ideas and information. When there was a role assignment, forming consensus and collective ideas were based on individually shared knowledge and monitoring of problem-solving procedures. On the other hand, participants without the role assignment tended to confirm the group's common ideas more for the solution to the problems. This implies that the experimental group was able to move on from individually gained knowledge to monitoring the team's progress, while the control group had to stay to reconfirm the group's understanding that could have been verified at the individual level. Because the experimental group members have been perceiving each teammate's roles and potential knowledge, the individuals could be more entrusted and pay attention to advancing the progress. In addition, unlike the control group who had to make agreement on strategies that link to individual

task assignment, the experimental group were already aware of these and expected certain students to take over the procedure. Thus, the students with a clearer idea of individual roles and status were able to dedicate more to speculating on the situation and the progress. This indicates the function of role assignment in leading to a more sophisticated common space that consists of essential information and reflections necessary to move forward with efficiency.

Conclusion

The analysis of group discourse in CPS provides implications for simulating a role assignment during clinical simulation to align with actual practice settings. Findings prove that a role assignment facilitates students to structure common space for concepts, ideas and strategies based on accommodating and coordinating moves between individuals. Extended from previous studies in effectiveness of EER in nursing education, this experimental study contributes to designing collaborative simulation activities with an aim to develop communication and CPS skills. Further studies may associate the role assignment and group progress to factors that influence individual learning outcomes such as engagement, motivation, and transfer of learning.

References

Alexander, E. (2020). Purposeful simulation role assignment. *Clinical Simulation in Nursing, 48*, 1-7.

Bonaduce, S. (2024). Escaping traditional instruction: The use of escape room simulation to enhance nursing students' clinical judgment skills. *Teaching and Learning in Nursing, 19*(2), e427-e431.

Buseyne, S., Vrijdags, A., Said-Metwaly, S., Danquigny, T., Heutte, J., Depaepe, F., & Raes, A. (2024). Peering into the team role kaleidoscope: the interplay of personal characteristics and verbal interactions in collaborative problem solving. *Frontiers in Psychology, 15*, 1345892.

Fogel, A., Swiecki, Z., Marquart, C., Cai, Z., Wang, Y., Brohinsky, J., ... & Shaffer, D. W. (2021, January). Directed epistemic network analysis. In *International Conference on Quantitative Ethnography* (pp. 122-136). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-67788-6_9

Inayat, S., Younas, A., Sundus, A., & Khan, F. H. (2021). Nursing students' preparedness and practice in critical care settings: A scoping review. *Journal of Professional Nursing, 37*(1), 122-134.

Sun, C., Shute, V. J., Stewart, A., Yonehiro, J., Duran, N., & D'Mello, S. (2020). Towards a generalized competency model of collaborative problem solving. *Computers & Education, 143*, 103672.

Tan, Y., Swiecki, Z., Ruis, A.R., Shaffer, D. (2024). Epistemic Network Analysis and Ordered Network Analysis in Learning Analytics. In Saqr, M., López-Pernas, S. (eds.) *Learning Analytics Methods and Tutorials: A Practical Guide Using R* (pp. 569-636). Springer, Cham. https://doi.org/10.1007/978-3-031-54464-4_18

Valdes, B., Mckay, M., & Sanko, J. S. (2021). The impact of an escape room simulation to improve nursing teamwork, leadership and communication skills: A pilot project. *Simulation & gaming, 52*(1), 54-61.

Weiler, D. T., Gibson, A. L., & Saleem, J. J. (2018). The effect of role assignment in high fidelity patient simulation on nursing students: An experimental research study. *Nurse Education Today, 63*, 29-34.

Kirschner, P. A. (2017). Stop propagating the learning styles myth. *Computers & Education*, *106*, 166-171.

Swiecki, Z., Ruis, A. R., Farrell, C., & Shaffer, D. W. (2020). Assessing individual contributions to collaborative problem solving: A network analysis approach. *Computers in Human Behavior*, *104*, 105876.

Hooper, B. L., & Carlson, N. G. (2024). Knowledge Acquisition Based on Participant Role Assignment in a High-Fidelity Simulation. *Nurse Educator*, *49*(4), 212-216. https://doi.org/10.29333/ijj.2024.17413a

Litke-Wager, C., Delaney, H., Mu, T., & Sawyer, T. (2021). Impact of task-oriented role assignment on neonatal resuscitation performance: a simulation-based randomized controlled trial. *American Journal of Perinatology*, *38*(09), 914-921.

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of nursing education*, *45*(6), 204-211.

Burbage, A. K., & Pace, A. A. (2024). A scoping review of international allied health professions escape room practices and scholarship. *Medical Teacher*, 1-16.

Table 1. Coding scheme and examples

Category	Codes	Example Quote
A. Shared Knowledge	A1. Shares knowledge and understanding	*Respiratory is changing. Oh, there's a change in O2. We need to get to 94.*
	A2. Establishes common ground	*I feel like that could only be a level of consciousness, right?*
B. Negotiation & Coordination	B1. Responds to other's ideas or proposed solutions	*(Maybe the nasal cannula?) → It was at 91 and the respiratory rate is 26 so I think a nasal cannula should be okay.*
	B2. Monitors execution (progress and result)	*So breathing was probably the nasal cannula, and that's five. But then what else do we have?*
	B3. Discusses strategies	*We can take the first hint over there and just get started.*
C. Maintaining Team Function	C1. Takes initiatives to advance collaboration processes	*- When do you guys want to start on that?* *- Good job! Okay, let's get through this.*
	C2. Pays attention to task division & individual role	*Do you want me to just use the numbers for the thing?*

Figure 1. *The Escape Room Setup*

Figure 2. *Individual network models from control group (2a; left; red) and experimental group (2b; right; blue)*

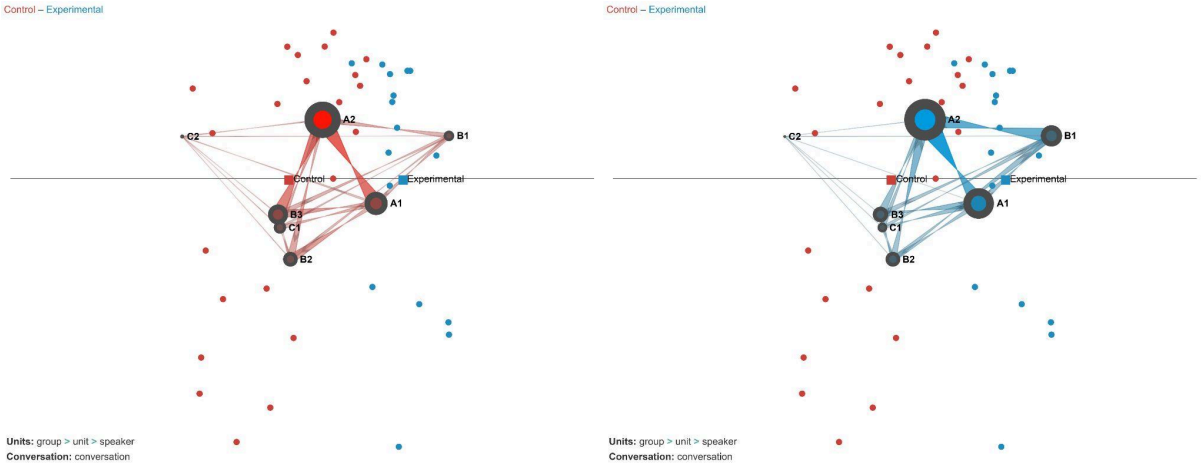

Figure 3. *Network model in comparison of two groups*