ORIGINAL RESEARCH

Gamification: A pedagogical strategy for generation Z nursing students

Nina M. Russell*, Megan S. Wayne

Department of Nursing, School of Health Sciences, Francis Marion University, United States

Received: February 5, 2022 **Accepted:** March 13, 2022 **Online Published:** March 20, 2022
DOI: 10.5430/jnep.v12n7p38 **URL:** https://doi.org/10.5430/jnep.v12n7p38

ABSTRACT

Background: Nurse educators must develop teaching strategies to meet the growing needs of healthcare and engage Generation Z nursing students. Gamification based learning activities, such as educational escape rooms, combine multiple modalities that appeal to the current generation of nursing students. Educational escape rooms have the potential to improve teamwork and achievement of learning outcomes among nursing students. However, few studies have been done to identify nursing student perception of the educational and teambuilding value of these activities.
Methods: A longitudinal exploratory study was conducted to determine baccalaureate nursing student perceptions of the value of team-based escape rooms as an educational tool and compare self-reported teamwork scores after completing a series of escape activities. Students were recruited from a baccalaureate nursing course to participate in five escape room activities and asked to complete anonymous online surveys to determine perceptions of educational value and teamwork after each activity.
Results: A total of 33 participants responded positively to educational escape rooms with 100% of participants stating they would recommend this activity to others. Teamwork assessments were also positive with improvement as the study progressed.
Conclusions: Educational escape rooms are an appropriate tool for nurse educators today that students value and enjoy. The use of escape rooms in nursing education engages students in learning while also improving teamwork.

Key Words: Nursing education research, Baccalaureate nursing education, Nursing students, Gamification, Interpersonal skills, Nursing team, Technology

1. INTRODUCTION

Nursing education has long been tasked with revamping pedagogy to meet the demands and complexity of medicine. Typically, educational institutions have utilized lecture, skills lab, and clinical site rotation as teaching modalities in nursing education. Nonetheless, medical breakthroughs have increased human longevity, and nurses are faced with caring for patients with a long list of medical ailments. Thus, nursing education is challenged with the responsibility of equipping graduates to tackle a variety of complex patient care scenarios.

Inarguably, a multifaceted approach to patient care has become the norm given the complexity and needs of today's patient. Not only are nurses required to function singularly, but collaboratively with interprofessional healthcare teams to ensure optimal patient care. Unlike many disciplines, nurses hold a central role and often function as interdisciplinary mediators between all healthcare team members. In fact, there is a tacit knowledge and expectation of nurses to don many hats in service to others.

*Correspondence: Nina M. Russell; Email: nrussell@fmarion.edu; Address: Department of Nursing, School of Health Sciences, Francis Marion University, United States.

Clinical sites are, at times, scarce and may not afford each student with an opportunity to perform skills. What's more, facilities limit the students' participation in patient care such as calling a provider, taking verbal orders, obtaining consent forms, or performing basic life support. Nonetheless, educational institutions are charged with preparing future nurse graduates as ambassadors for patients' holistic welfare by being proficient in the aforementioned skills. It is essential to include innovative educational strategies to facilitate communication, strengthen collaboration, and promote teamwork among student nurses to address these knowledge gaps. One such strategy that has recently grown in popularity among educators is the use of gamification and educational escape rooms however there is little research available to support their use in nurse education. Therefore, this study aims to determine baccalaureate nursing student perceptions of the value of team-based escape rooms as an educational tool for reviewing medical-surgical nursing concepts while also identifying and comparing student assessments of teamwork after completing a series of escape room activities.

2. LITERATURE REVIEW

2.1 Generation Z

As medicine evolves, so must undergraduate nursing curricula. Educators must now consider the cultural and generational evolution of today's students, referred to as Generation Z. Students born between 1995 and 2012 fall within this category.[1] Traditional teaching strategies such as, reading assignments, classroom lectures, and clinical experiences fall short for this generation. Generation Z students crave excitement and sensorineural stimulation and therefore, technology, audiovisual strategies, and games are optimal.[1] Gamification incorporates components of a game to facilitate student engagement and ultimately, offers an immersive teaching-learning experience. Escape rooms are an example of gamification and are extremely popular.

As a pedagogical strategy, escape rooms, embrace the cognitive, affective, and psychomotor domains of learning. To escape the room and beat the game, students must analyze clues and solve a series of puzzles in 60 minutes. Peer interaction is key to student success and promotes critical thinking, communication, and collaboration. As a result, most students and novice nurses enjoy this interactive way of discovering or improving techniques.

2.2 Gamification

It has been well recognized throughout the literature that traditional lecture-based approaches to education are no longer enough to meet the learning needs of the new, technology driven generations, especially in light of the increasingly complex patients seen in today's healthcare system. This recognition has led to the development and adoption of many active learning strategies throughout nursing programs such as simulation and gamification. Gamification, or the application of a playful competitive dynamic to a learning activity, has been associated with improvements in student motivation, attitude, and achievement of didactic objectives.[2,3]

Many educators have turned to this strategy to meet the needs of the millennial student[4] however the benefits of gamification need not stop with that generation. Research suggests that the current generation of nursing students, Gen Z, prefer learning activities that are exciting, immersive, visually enriched and have the capacity to incorporate technology and provide immediate feedback to the learner.[1] Gamification has the potential to meet these needs while also aiding in the improvement of social skills, an area that research suggests is a weakness for this population.[2,4,5] A more recent emergence in the gamification trend that meets these criteria, and more, is the use of educational escape rooms.

2.3 Educational escape rooms

Often considered a subclassification of simulated learning, educational escape rooms are active learning strategies that require students to work together to solve a number of sequential problems or puzzles within a pre-determined amount of time. Immediately prior to the activity, escape room participants are presented with a fictional scenario providing background information relevant to the room they are about to enter. Once inside the room, students are figuratively locked inside with the goal of unlocking the door and escaping before their timer runs out. This typically requires participants to search for clues, complete riddles, unlock boxes/cabinets, and assemble puzzles to obtain the final key and escape.

Once initiated, escape rooms are entirely participant led resulting in a high level of autonomy for the students as they work together to escape. When adapted to an academic curriculum, escape rooms have been shown to require high amounts of critical thinking among participants[6] and produce statistically significant improvements in knowledge retention.[3] Furthermore, students reported a high degree of personal engagement and commitment to the learning process when participating in educational escape rooms.[2,3]

Given the specific needs of this generation, one of the greatest benefits attributed to the use of escape rooms might be its effects on communication and collaborative problem solving among participants. The collaborative and inclusive nature of escape rooms requires participants to frequently and clearly communicate clues and knowledge throughout the scenario

in order to solve puzzles and succeed.[2,3] Participants in educational escape rooms consistently report the required use of communication and teamwork throughout the activity.[2–4] Educational escape room usage among physicians showed improved communication, morale, and awareness of responsibilities upon completion of the activity.[4] An article published in the Journal of Nursing Education found that nursing students reported their experience was positively received and helped them further develop teamwork, communication, and leadership skills.[3] More specifically, students reported that the experience taught them how to give and receive correction in a time sensitive environment,[3] a valuable lesson that is often difficult or embarrassing for students/new nurses to learn in a professional setting.

An additional educational benefit attributed to the use of escape rooms is the creation of a high stake's environment without risk to patients or students. The time sensitive and urgent nature of an escape room can mimic any number of emergent patient situations that arise in practice. This aspect allows participants to learn various 'real-life' lessons.[3,4] Nursing students reported that the teamwork and collaboration required in the escape room was similar to that required in real situations they had witnessed.[3] The use of educational escape rooms enforced the need for constant communication with team members and the importance of delegation and effective leadership;[4] all of which are necessary skills for effective participation in the modern healthcare team.

Theoretical foundation

Regardless of the potential benefits of educational escape rooms, some might argue that this recent trend in education lacks the theoretical background of more established teaching strategies. While literature regarding the theoretical foundation of escape rooms is scarce at this time, it is important to recognize that certain aspects of this teaching strategy align with several educational theories in addition to satisfying all of Bloom's identified learning domains. Escape rooms efficiently combine three evidence based active learning strategies, gamification, flipped learning, and problem-based learning[2] satisfying the affective, cognitive, and psychomotor learning domains in a single activity.[6] The simulated aspect of escape rooms coincides with Kolb's experiential learning cycle while the added gamification lends itself strongly to the self-determination educational theory.[4] Additionally, the nexus of the of cognitive, environmental, and behavioral aspects of Bandura's Social Cognitive Theory (SCT) supports the educational pedagogy such as gamification and escape rooms for generation Z nursing students.

The SCT postulates that one's actions are secondary to a tridimensional relationship amid an individual, his or her environment, and ultimately their behavior.[5] The SCT emphasizes three elements which coalesce to impact human behavior including cognition, environment, and behavior.[5] The cognitive aspect refers to one's knowledge of the subject matter but more so, their personal belief.[5] One must believe that the task or accomplishment is attainable to succeed.[5] Thus, one's core belief determines behavior.[5] The environmental aspect serves to shape cognition through various learning experiences and peer interactions.[5] Peer exposure provides an opportunity to observe and emulate the attitude and behavior of another.[5] Therefore, one's cognitive state combined with environmental experiences influence learning and behavior.[5] As such, instructors may facilitate learning by allowing the student to apply newly acquired knowledge into practice. For educators, this approach offers flexibility giving them the ability to alter scenarios to meet the student's need or level of proficiency. Essentially, escape scenarios affords one an opportunity for hands on care, augments critical thinking, increases awareness and self-esteem, and improves psychomotor skills. One is able to reflect inwardly on the various methods for problem resolution which previously may have been overlooked.[5]

3. METHODS

After approval was obtained from the Institutional Review Board (IRB) of the parent institution, a convenience sample of senior baccalaureate nursing students was recruited from the Fall 2021 Clinical Decision-Making class, a review class with the sole purpose of reinforcing previously learned content. Following written consent, participants completed an anonymous, online demographic survey on the first day of class which included questions regarding previous experiences with escape room exercises. Students were then randomly assigned to one of five teams using blind selection. Teams first completed one 60-minute, professional, non-nursing related escape room off campus at a private business to familiarize participants with the mechanics and processes involved in completing an escape room activity.

Throughout the remaining semester, each team participated in a total of four nurse-based educational escape rooms designed and conducted by nursing faculty on campus. Nursing topics included: hypertension, diabetes, rhythm analysis, stroke, fluid and electrolyte imbalances, acid/base imbalances, blood compatibility, to name a few. Each educational escape room consisted of five to ten nursing related riddles or puzzles from topics previously reviewed in the Clinical Decision-Making class. Prior to each escape activity, participants were given a brief overview of the rules, orientation to the types of locks used, and an audio presentation setting up the escape scenario. Teams had 20-25 minutes to complete

each escape room scenario; additionally, teams could utilize a total of four clues, as needed, to complete each escape room. All teams were monitored via video and audio feed from a central control room where faculty were available to assist, if needed. Upon completion of each escape activity, participants were asked to complete two anonymous online Likert-style surveys: the Escape Room Perception Scale (ERPS),[7] modified with permission from the original author, and the Escape Room Teamwork Self-Assessment Scale (ERTSA), developed by the authors for this study. ERTSA development was guided by Bandura's SCT with the purpose of measuring student perceptions of teamwork. Bandura highlights the importance of personal self-efficacy relevant to the task or activity; consequently, the ERTSA was developed and tailored for inquiry of the cognitive and environmental aspects of each classroom escape.[5] The ERPS instrument was used to assess the value of the educational escape rooms from the student perspective. Participants were not required to complete the ERPS after the initial, professional escape activity as this assessment asks questions regarding the educational benefits of the escape rooms. Finally, frequencies, percentages, and measures of central tendency from the surveys were obtained using SPSS v. 25. Given the exploratory nature of this study and the lack of psychometrically sound instruments, no further analyses were completed.

4. RESULTS

All students enrolled in the Fall 2021 Clinical Decision-Making course (N = 33) agreed to participate in the escape room learning activities. Participants were predominantly Caucasian females who had never been married with a median age of 22 (see Table 1). Barring one participant, all were enrolled in full time study and 75.8% were attempting their first college degree. Most participants (97%) were actively employed during the Fall 2021 semester with 90.9% employed in a healthcare setting at the time of the study. Slightly more than one third of participants (39.4%) reported that they were "offtrack" nursing students; meaning, they had either previously failed at least one nursing course or opted to take a leave of absence at some point during the nursing program. The majority of participants (78.98%) indicated that they had never participated in any type of escape room making participation in this study their first experience of interactive escape team activities.

4.1 Teamwork perceptions

Results from the ERTSA are noted in Table 2. Participant assessments of teamwork were primarily positive (always/often) across all escape room activities in all items excluding the final statement (Item 10). Item 10 assessed how often team members ignored the input of individuals and had mostly never/rarely responses which indicated positive assessments by the participants. A decrease in positive responses on the ERTSA was noted after completion of the first nursing-related educational escape room. Percentages of always/often teamwork assessments ranged from 90.9% to 100% on nine out of ten items after the initial professional escape room reflecting an overwhelmingly positive participant response to the non-nursing related activity. Once nursing concepts were added however, positive teamwork assessments dropped to 71.9%-90.6%. These assessments increased gradually after completion of second escape room and continued to increase across the remaining activities resulting in the highest range noted among the data (93.8%-100%). Contrary to the other nine, the final survey item (regarding ignoring input) showed a steady increase in positive responses from the initial activity to ER 3 (60.6%-84.8%) with a slight drop noted after the final escape.

Table 1. Demographics (n = 33)

Characteristic	Mean ± SD	Median	Range
Age	25.18 ± 5.56	22	19
	Frequency	**%**	
Female	31	93.9	
Full-Time Student	32	97.0	
Nursing Track			
Standard	20	60.6	
Offtrack	13	39.4	
Race			
White/Caucasian	28	84.8	
Black/African American	5	15.2	
Current Marital Status			
Never married	26	78.8	
Married	6	18.2	
Separated or divorced	1	3.0	
Employment Status			
Employed-Healthcare	30	90.9	
Employed-Nonhealthcare	2	6.1	
Unemployed	1	3.0	
Previous Secondary Degree			
None	25	75.8	
Associates	5	15.2	
Bachelors	3	9.1	
Escape Room (ER) Experience			
No ER attempts	26	78.8	
1 ER attempt	3	9.1	
2-4 ERs attempts	4	12.1	

4.2 Educational value perceptions

Items included on the ERPS (see Table 3) assessed two key aspects of the educational escape room exercises: participant perception of value as an educational tool (Items 1, 3, 4, 6, and 7) and participant preferences related to learning throughout the study (Items 2, 5, 8, 10, and 11). Overall, participant responses indicated that the escape rooms were

useful as educational tools by encouraging new ways of thinking, facilitating learning from/engagement with peers, requiring engagement with the content to assist learning, and effectively reviewing various content areas. The percentages of positive ratings (agree/strongly agree) across all of these items ranged from 87.9% to 100% with three out of five educational value items receiving positive ratings from the entire study group after the final escape room.

Table 2. Teamwork self-assessment scale responses (n = 33)

	ER P*	ER 1**	ER 2	ER 3	ER 4**
	f (%)	f (%)	f (%)	f (%)	f (%)
1. My team worked together well.					
Always/Often	33 (100)	29 (90.6)	32 (97.0)	33 (100)	32 (100)
Sometimes	-	3 (9.4)	1 (3.0)	-	-
Rarely/Never	-	-	-	-	-
2. I felt that I was a valuable member of the team.					
Always/Often	30 (90.9)	23 (71.9)	30 (90.9)	30 (90.9)	31 (96.9)
Sometimes	3 (9.1)	8 (25.0)	2 (6.1)	2 (6.1)	1 (3.1)
Rarely/Never	-	1 (3.1)	1 (3.0)	1 (3.0)	-
3. I enjoyed working as a team to solve the puzzles.					
Always/Often	33 (100)	29 (90.6)	31 (94.0)	32 (97.0)	31 (96.9)
Sometimes	-	3 (9.4)	1 (3.0)	-	1 (3.1)
Rarely/Never	-	-	1 (3.0)	1 (3.0)	-
4. I was comfortable voicing my ideas to the group.					
Always/Often	33 (100)	27 (84.4)	30 (90.9)	31 (94.0)	31 (96.9)
Sometimes	-	5 (15.6)	2 (6.1)	1 (3.0)	1 (3.1)
Rarely/Never	-	-	1 (3.0)	1 (3.0)	-
5. I felt that my team members valued my input.					
Always/Often	33 (100)	27 (84.4)	27 (81.8)	32 (97.0)	30 (93.8)
Sometimes	-	4 (12.5)	3 (9.1)	-	2 (6.2)
Rarely/Never	-	1 (3.1)	3 (9.1)	1 (3.0)	-
6. I communicated all necessary clues and findings to my team.					
Always/Often	31 (93.9)	26 (81.3)	32 (97.0)	33 (100)	32 (100)
Sometimes	2 (6.1)	5 (15.6)	1 (3.0)	-	-
Rarely/Never	-	1 (3.1)	-	-	-
7. My team communicated all necessary clues and findings to me.					
Always/Often	33 (100)	23 (71.9)	29 (87.9)	33 (100)	30 (93.8)
Sometimes	-	8 (25.0)	3 (9.1)	-	1 (3.1)
Rarely/Never	-	1 (3.1)	1 (3.0)	-	1 (3.1)
8. My team members offered timely assistance to one another.					
Always/Often	32 (97.0)	27 (84.4)	31 (93.9)	32 (97.0)	31 (96.9)
Sometimes	1 (3.0)	5 (15.6)	2 (6.1)	1 (3.0)	1 (3.1)
Rarely/Never	-	-	-	-	-
9. My team quickly responded to my questions and requests for clarification.					
Always/Often	30 (90.9)	24 (75.0)	29 (87.9)	30 (90.9)	30 (93.8)
Sometimes	3 (9.1)	6 (18.8)	3 (9.1)	2 (6.1)	-
Rarely/Never	-	2 (6.2)	1 (3.0)	1 (3.0)	2 (6.2)
10. My team ignored the input of some members.					
Always/Often	13 (39.4)	8 (25.0)	8 (24.2)	4 (12.1)	5 (15.6)
Sometimes	-	4 (12.5)	3 (9.1)	1 (3.0)	1 (3.1)
Rarely/Never	20 (60.6)	20 (62.5)	22 (66.7)	28 (84.8)	26 (81.3)

*Professionally designed escape room; ** N = 32.

Most participant responses indicated that they preferred to learn using the various methods encompassed in an escape room activity (see Table 3). The majority reported that they preferred to learn from a variety of sources (81.8%-90.9%), enjoyed playing games (84.8%-96.9%) and learned better when content was presented in a game format than in didactic lectures (84.8%-96.9%). Notably, 100% of participants reported they would recommend escape rooms as a learning activity to others by the conclusion of the study. After the first educational escape room, a third of participants (33.3%) indicated that feelings of being overwhelmed or stressed interfered with their ability to learn during the activity. This could be due to the complexity of the initial escape room, participant unfamiliarity with educational escape rooms, or participant uncertainty regarding the nursing topic of focus. This percentage dropped to 18.8% after the final escape suggesting participants might have become more comfortable with the learning activity and nursing content by the conclusion of the study.

Table 3. Escape room perception scale responses (n = 33)

	ER 1	ER 2	ER 3	ER 4*
	f (%)	f (%)	f (%)	f (%)
1. The escape room encouraged me to think about material in a new way.				
Agree/Strongly Agree	32 (97.0)	32 (97.0)	32 (97.0)	32 (100)
Neutral	1 (3.0)	-	1 (3.0)	-
Disagree/Strongly Disagree	-	1 (3.0)	-	-
2. I would recommend this activity to other students.				
Agree/Strongly Agree	31 (93.9)	32 (97.0)	33 (100)	32 (100)
Neutral	2 (6.1)	1 (3.0)	-	-
Disagree/Strongly Disagree	-	-	-	-
3. I learned from my peers during the escape room.				
Agree/Strongly Agree	30 (90.9)	32 (97.0)	31 (93.9)	31 (96.9)
Neutral	3 (9.1)	1 (3.0)	2 (6.1)	1 (3.1)
Disagree/Strongly Disagree	-	-	-	-
4. The escape room was an effective way to review the topic.**				
Agree/Strongly Agree	30 (90.9)	33 (100)	33 (100)	32 (100)
Neutral	3 (9.1)	-	-	-
Disagree/Strongly Disagree	-	-	-	-
5. I learn better in a game format than in didactic lecture.				
Agree/Strongly Agree	28 (84.8)	30 (90.9)	30 (90.9)	31 (96.9)
Neutral	4 (12.1)	2 (6.1)	3 (9.1)	1 (3.1)
Disagree/Strongly Disagree	1 (3.1)	1 (3.0)	-	-
6. The escape room was an effective way to assist my learning of the topic.**				
Agree/Strongly Agree	29 (87.9)	32 (97.0)	31 (93.9)	32 (100)
Neutral	4 (12.1)	-	2 (6.1)	-
Disagree/Strongly Disagree	-	1 (3.0)	-	-
7. I feel I was able to engage with my teammates to learn new material.				
Agree/Strongly Agree	30 (90.9)	32 (97.0)	31 (94.0)	31 (96.9)
Neutral	3 (9.1)	-	1 (3.0)	-
Disagree/Strongly Disagree	-	1 (3.0)	1 (3.0)	1 (3.1)
8. It was difficult for me to focus on learning because I was stressed/overwhelmed.				
Agree/Strongly Agree	11 (33.3)	11 (33.4)	5 (15.2)	6 (18.8)
Neutral	9 (27.3)	1 (3.0)	1 (3.0)	-
Disagree/Strongly Disagree	13 (39.4)	21 (63.6)	27 (81.8)	26 (81.2)
9. The non-educational portions distracted me from learning about the topic.**				
Agree/Strongly Agree	10 (30.3)	8 (24.3)	6 (18.2)	6 (18.8)
Neutral	3 (9.1)	1 (3.0)	1 (3.0)	1 (3.1)
Disagree/Strongly Disagree	20 (60.6)	24 (72.7)	26 (78.8)	25 (78.1)
10. I prefer assembling information from a variety of sources when learning.				
Agree/Strongly Agree	27 (81.8)	30 (90.9)	30 (90.9)	29 (90.6)
Neutral	6 (18.2)	2 (6.1)	2 (6.1)	3 (9.4)
Disagree/Strongly Disagree	-	1 (3.0)	1 (3.0)	-
11. In general, I enjoy playing games.				
Agree/Strongly Agree	28 (84.8)	31 (93.9)	31 (93.9)	31 (93.9)
Neutral	3 (9.1)	-	2 (6.1)	1 (3.1)
Disagree/Strongly Disagree	2 (6.1)	2 (6.1)	-	-

*N = 32; **Item changed for each escape room to reflect topic of focus.

Finally, item nine on the ERPS was used as feedback for the authors to guide development of the remaining escape room activities. Because the goal of the educational escape rooms is to function as a learning activity, adjustments were made throughout the design process to ensure that the puzzle/riddle components did not overly distract participants from learning. The percentage of participants who agreed or strongly agreed that the puzzles were distracting gradually decreased from 30.3% to 18.2% indicating the design modifications were effective.

5. Discussion

The findings of this study reflect an increase in participants' teamwork, communication, collaboration, and application of content across multiple escape room interventions. These results correlate with current literature and support the implementation of innovative, interactive teaching learning strategies to engage generation Z nursing students. Previous studies examining escape room use in nursing education reported primarily positive student reactions.[3,8] Qualitative findings of two separate nursing escape room studies, one focusing on mental health[8] and the other on cardiovascular[3] concepts, showed that students found escape rooms a useful strategy for learning and reinforcement that encouraged teamwork and critical thinking. Other disciplines, including practicing physicians[2] and graduate students,[4] have reported similar results with the addition of improved communication[2] and motivation to learn.[4] These findings are supported by the overall increase in positive responses to both the ERPS and ERTSA in this study that indicated improved student perceptions of both teamwork and educational value. While these findings support the use of educational escape rooms, more research is needed to quantitatively assess the effects on nursing student outcomes and perceptions before the true value of this learning strategy is fully understood.

Previous research surveyed students after completion of one escape room, this study implemented multiple escape rooms over a period of four months allowing for multiple data collection points. This revealed a slight increase in student perceptions after subsequent escape experiences. It is unclear if this is due to increased comfort with escape activities or if this occurred in response to slight changes in escape room design implemented throughout the study.

This study showed that generation Z nursing students enjoy and value escape room learning experiences as they allow them to engage with peers and course content in entertaining, novel ways. The implementation and integration of escape room scenarios in nursing curricula may promote engagement as well as positively impact student achievement of course outcomes. However, educators interested in incorporating educational escape rooms in their curriculum must be mindful when designing escape scenarios. Not all students are initially comfortable with the riddles and puzzles involved in an escape room therefore care must be taken to ensure that the effort required to navigate the mechanics of escape activities does not overshadow or hinder achievement of nursing learning outcomes.

6. Conclusion

Baccalaureate nursing students responded positively to the implementation of nurse based educational escape rooms. Students demonstrated improvement in teamwork self-assessment responses as the study progressed. Additionally, all participants indicated that the use of educational escape rooms were an effective way to both learn and review nursing material and encouraged them to approach content in new ways. Our findings suggest that strategies such as gamification and educational escape rooms lead to increased critical thinking, communication, collaboration, and teamwork among participants. The auditory and visual aspects of these strategies create a highly immersive learning environment which appeals to students of this generation. Adopting such strategies provides an avenue for educators to meet the educational gaps of generation Z students, actively engage them in the learning process, and prepare them for effective participation in today's healthcare system.

Limitations/Recommendations

While the study was successful, some limitations did exist. The biggest limitation of the escape room intervention was lack of a detailed orientation. Because most of the sample had never participated in an escape room before, it is possible that our results were influenced by individual uncertainty, nervousness, or pre-conceived notions they had regarding how escape rooms work. Efforts were made to combat this by starting the study with a professionally developed escape room before introducing nursing concepts however it is unclear if one escape experience is enough to make all participants comfortable with the process. While students were briefed and oriented prior to each scenario, future learning activities, involving educational escape rooms, would benefit from a more detailed orientation to the mechanics of the escape (i.e., types of locks, number of boxes, etc.) so that more focus can be placed on achievement of learning outcomes. Additionally, there is currently a lack of psychometrically sound instruments available for evaluating the use of escape rooms in education which required the use of untested instruments. Future research is needed to develop psychometrically sound instruments in order to better determine the usefulness of escape rooms in nursing curriculum. Finally, generalizability may be threatened due to the homo-

geneity of the convenience sample. Efforts should be made in future studies to recruit more diverse samples to better reflect the nursing student population as a whole.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

REFERENCES

[1] Chicca J, Shellenbarger T. Connecting with generation Z: Approaches in nursing education. TEACH LEARN NURS. 2018; 13(3): 180-184. https://doi.org/10.1016/j.teln.2018.03.008

[2] Guckian J, Eveson L, May H. The great escape? the rise of the escape room in medical education. Future Healthc J. 2020; 7(2): 112-115. PMid:32550277 https://doi.org/10.7861/fhj.2020-0032

[3] Morrell BLM, Eukel HN. Escape the generational gap: A cardiovascular escape room for nursing education. J Nurs Educ. 2020; 59(2): 111-115. PMid:32003853 https://doi.org/10.3928/01484834-20200122-11

[4] López-Belmonte J, Segura-Robles A, Fuentes-Cabrera A, et al. Evaluating activation and absence of negative effect: Gamification and escape rooms for learning. Int J Environ Res Public Health. 2020; 17(7). PMid:32224978 https://doi.org/10.3390/ijerph17072224

[5] Burke H, Mancuso L. Social cognitive theory, metacognition, and simulation learning in nursing education. J Nurs Educ. 2012; 51(10): 543-548. PMid:22909039 https://doi.org/10.3928/01484834-20120820-02

[6] Bristol T, Hagler D, McMillian-Bohler J, et al. Nurse educators' use of lecture and active learning. TEACH LEARN NURS. 2019; 14(2): 94-96. https://doi.org/10.1016/j.teln.2018.12.003

[7] Eukel HN, Frenzel JE, Cernusca D. Educational Gaming for Pharmacy Students - Design and Evaluation of a Diabetes-themed Escape Room. American Journal of Pharmaceutical Education. 2017; 81(7): 1-5. PMid:29109566 https://doi.org/10.5688/ajpe8176265

[8] Garwood J. Escape to Learn! An Innovative Approach to Engage Students in Learning. J Nurs Educ 2020; 59(5): 278-282. PMid:32352543 https://doi.org/10.3928/01484834-20200422-08