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CAN YOU TALK YOUR WAY OUT OF THIS? AN EDUCATIONAL ESCAPE ROOM

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by

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ABSTRACT

Despite being a top healthcare priority, patient safety remains a problem in the U.S. with hundreds of thousands of annual patient deaths due to medical errors. Communication breakdowns within the healthcare team are a key factor in poor patient outcomes and in relatively low retention rates among healthcare professionals, especially nurses. To prepare nursing students for a successful entry into the profession, nurse educators must consider alternate strategies for teaching communication skills to a new generation of students. This qualitative study explored the use of a game-based escape room as part of a multi-part communication lesson plan and its impact on student perceptions of the value of communication in healthcare. The data for the current study was collected from a small sample of nursing students representing multiple generations at a Midwestern community college. The study found that the educational escape room raised awareness among nursing students of the importance of communication to a healthcare team. It also highlighted the greater affinity of younger students for immersive game approaches in education. These findings indicate the need and opportunity of including non-traditional teaching methods in nursing curriculum tailored for the unique learning profiles of a new generation of nursing students.

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CHAPTER I: INTRODUCTION

It is not a surprise that patient safety is a top priority in healthcare, yet at least 400,000 Americans die due to medical errors in hospitals every year (Makary & Daniel, 2016). Studies have identified ineffective teams as the root cause of numerous fatal medical errors (Brock et al., 2013; Reid & Bromiley, 2012; Salas et al., 2008). The collaboration of nurses with other members of the healthcare team, including physicians, pharmacists, and therapists, is a key function of the nursing role. The interdepartmental team must be effective to meet the desired patient outcomes; however, employers report a lack of readiness in new graduate nurses (Missen et al., 2016). Teams rely heavily on effective communication among team members. Communication skills are fundamental as a nurse, both with patients and with members of the interdepartmental team. Nurses adapt their communication style to the current context and situation. Although communication skills have been identified as a critical component of nursing education and effective teamwork, it has not always translated into competency in practice (O'Shea et al., 2013; Pfaff et al., 2014; Pines et al., 2014).

Ineffective communication and teamwork lead to medical errors, some potentially fatal. (Makary & Daniel, 2016). New nurses must enter practice with effective fundamental communication and teamwork skills to competently practice and reduce the potential for these errors. Also, due to lack of this readiness, many new nurses leave their job within the first year, citing ineffective teamwork training or lack of support (Sanchez

& Fuselier, 2020). It is important for nursing students to be prepared to enter the workforce as an active team member in the nursing profession. Adequate training may alleviate retention issues, in addition to reducing errors which are often due to miscommunication (Brock et al., 2013). Students begin learning healthcare specific communication skills during their nursing education. Nursing educators are responsible for teaching students how to competently function in the role of the nurse, including effective communication, but how that is done can vary among schools, programs, and educators.

Nursing educators must continuously adapt their teaching strategies to nursing student preferences as well as meet professional standards that change often. While nursing education has utilized simulation in addition to traditional teaching strategies, such as lecture, for as many as 50 years, newer technology has brought about more realistic and creative ways to educate future nurses. One example of a teaching innovation based on newer technology is the use of immersive games. Studies show that many college students prefer immersive games over traditional didactic approaches (Brull & Finlayson 2016; Cain, 2019). Research conducted using immersive games rarely focuses on communication skills, and no researchers have explored using a standardized communication curriculum embedded into an immersive game, such as an escape room, to develop communication skills. The purpose of the current study was to explore students' experiences utilizing communication skills learned from the TeamSTEPPS teamwork curriculum in order to incorporate those skills into an escape room patient simulation.

In this chapter, seven main sections are covered. The statement of the problem and the background sections include the most recent research concerning immersive games and how they may be incorporated into the nursing curriculum. The sections detailing the research questions and significance provide the focus and the importance of the study. The overview of the methodology provides the rationale for the research plan and the methods that were used, and a summary will conclude this chapter.

Background

Experiential learning is not a new concept. There have been several theories outlining the importance of students experiencing new concepts instead of just receiving them in a lecture. After comparing experiential learning models, Hill (2017) stated that learners learn best when they can construct their own understanding of a concept by experiencing it and reflecting on that experience. Students of all ages are demanding more immersive and engaging curriculums. The newest generation of college students, born approximately 1995 to 2010, also referred to as Gen Z, are digital natives, born into a world with the internet and cellular phones and computers used in school as early as Kindergarten. Research has shown that Gen Z students require a curriculum that is technologically advanced as well as immersive and more hands-on compared to traditional didactic lecture (Christopher et al., 2017). Experiential learning lends itself well to nursing education since much of what nurses need to learn is practical, such as caring for patients and managing difficult situations (Hill). Students can apply the theoretical knowledge they gain from the classroom to a practical exercise to help reinforce the content and create a personal experience for the student to reflect upon.

As technology in the classroom advanced, so did the opportunities to create experiential learning activities, such as educational games. *Serious* games are currently used in many fields to increase knowledge, skills, and confidence (Cant & Cooper, 2014). A serious game is an educational game based on computer technology, with gameplay aspects, which allows the player to change the course of action based on their logical and emotional responses (Nascimento et al., 2021). The serious game has been incorporated into health care education because it allows students to immerse themselves in a realistic environment to practice clinical decision making, while there is no actual risk for patient harm (Cant & Cooper). Serious games are not just for fun; they support learners in ways that are situation-based, problem focused, and they provide context for critical thinking and decision making (Cain & Piascik, 2015).

Gamification strategies have been used successfully in the nursing classroom to teach critical thinking skills (Bean 2017; Brull et al., 2017; Gomez-Urquiza et al., 2019; Roche et al., 2018), but the findings of the existing research have been varied without a clear consensus among researchers about whether a serious game is more effective for nursing students than traditional methods (Graafland et al., 2014). One area that lacked research using serious games was in the clinical simulation realm. Very few studies sought to compare the serious game as a clinical simulation teaching modality to traditional patient simulation experiences (Nascimento et al., 2021).

One gaming style that has made its way from the recreational arena to the classroom is an escape room. Educators began using escape rooms because they increased students' motivation and encouraged teamwork and reflexive learning (Hunt-Gómez et al., 2020). Rouse (2017) incorporated the concept in his history courses, where

students did not have to escape a room, but they had to break into locked boxes by solving puzzles and clues. Rouse reported that an escape room had the potential to increase teamwork and collaboration. Escape rooms started gaining popularity in nursing education and appearing in the literature in 2017 (Zhang et al., 2018). Since they were first introduced, several studies have explored their effectiveness in nursing education. One study, conducted by Brown et al. (2019), used an escape room to reinforce concepts surrounding early recognition of urosepsis. Researchers began with a lecture regarding the kidneys, including a review of the anatomy and physiology and on renal dysfunction (Brown et al.). Of the 33 undergraduate nursing students that participated, nine completed the post activity survey and reported that their critical thinking skills were improved after the activity and found that the immersive activity promoted communication, teamwork, and critical thinking skills (Brown et al.). Similarly, Friedrich et al. (2018) conducted an interprofessional escape room with 181 participants from five different healthcare professions. A survey using a 7-point Likert-like scale was administered to participants during the debriefing and the results confirmed that the escape room activity encouraged teamwork and communication among the various professions. Eukel et al. (2017) used an escape room design to explore students' perception of the activity and how it helped them learn and practice patient communication and care skills, while Adams et al. (2018) conducted an escape room at a large medical center with 167 new nursing graduates and 43 experienced nurses. The narrative responses from the participants concluded that the activity allowed the nurses to work together to solve problems (Adams et al.).

Nurse Retention

Retention of nurses, especially new grads, is of particular concern to the nursing profession. Many new nurses leave their positions, or even the entire profession, within only a few months of graduation (Sanchez & Fuselier, 2020). These nurses state various reasons, including high patient to nurse ratios, a lack of support, and inability to develop relationships with peers and managers, which can also be interpreted as lack of teamwork (Sanchez & Fuselier). Vermeir et al. (2018) conducted a study that included 303 ICU nurses who completed the Communication Satisfaction Questionnaire, which assesses eight dimensions of communication using a Likert-like scale. Researchers found a correlation between the results of the Communication Satisfaction Questionnaire and job satisfaction, citing the importance of effective communication in the workplace to improve job satisfaction, and therefore retention of nurses (Vermeir et al.). Robbins et al. (2019) found that health care providers that reported higher levels of burnout also noted poor relationship-building communication with their patients, often leading to suboptimal patient care. Based on these findings, communication plays an important role, not just in nurses' job satisfaction, but in the patient outcomes as well.

Communication Skills and Teamwork

Communication skills are important to successful team performance. Teamwork is a key factor in many occupations, but in healthcare, teamwork plays a critical role (Agency for Healthcare Research and Quality, 2017). Nurses are expected to communicate with patients, nurses and support staff, physicians, and other members of the interdisciplinary health care team, such as physical therapists, pharmacists, and social workers. Studies show that lack of communication and teamwork often leads to nurses

leaving their positions, which can lead to staff shortages, reductions in quality patient care, and increased expense to hire and train new nurses (Robbins et al., 2019; Sanchez & Fuselier, 2020; Vermeir et al., 2018).

The National Academy of Medicine (NAM), formerly known as the Institute of Medicine (IOM), is a professional organization that was established in 1970 by the National Academy of Sciences to provide evidence-based advisory information to inform policymakers, leaders in all sectors, and the public at large, with the overarching goal to improve health for all Americans (National Academy of Medicine, 2021). In 2000, the IOM released a report in response to the high incidence of medical errors leading to patient death. The report called for an urgent response from physicians, pharmacists, nurses, and administrators to address patient safety concerns (Institute of Medicine, 2000). This was the first time the interdisciplinary health care team was called to collaborate and create a patient-centered team. The Institute of Medicine established a National Center for Patient Safety under the Agency for Healthcare Research and Quality (AHRQ). The impetus for the urgency was the startling statistical findings, citing at least 44,000, and as many as 98,000, Americans die annually due to medical errors (Institute of Medicine). The Institute of Medicine report stated that these errors were not due to negligence, but to systemic flaws in the structure of American healthcare. The healthcare system was changing more quickly than healthcare workers could keep their medical knowledge and technological skills current. The Institute of Medicine then released a report addressing the education and quality of healthcare, stressing the need for educating all health professionals with core competencies including to provide patient-centered

care, work in interdisciplinary teams, utilize evidence-based practice, address quality improvement, and employ informatics (Institute of Medicine, 2003).

The Institute of Medicine (2003) report triggered a reassessment among nursing educators. Nursing programs needed guidance about what skills and concepts would be most important to include in curriculum. The Quality and Safety for the Education of Nurses (QSEN) began as a project, funded by The Robert Wood Johnson Foundation, in 2005. The project was a response to the Institute of Medicine report which sought to improve and standardize key areas of health professionals' education. The QSEN project was designed specifically for nursing education. The goal was to identify key knowledge, skills, and attitudes required by nurses and to prepare future nurses for their careers to improve patient safety and quality (Quality and Safety for the Education of Nurses, 2019). Teamwork, including effective communication, was identified in the IOM report as being critical to positive patient outcomes and QSEN reflected this in their competencies, identifying teamwork and collaboration as one of the six competencies. Nursing programs must be in alignment with QSEN competencies to receive accreditation (Quality and Safety for the Education of Nurses).

After the Affordable Care Act was passed in 2010, the IOM was again called to advise the healthcare profession in ways to improve their quality of health care while also preparing for 32 million more Americans to be covered by insurance (Institute of Medicine, 2011). The landmark follow-up report recognized the importance of the nurse's role in healthcare (Institute of Medicine). The Institute of Medicine stated that

> Nurses' regular close proximity to patients and scientific understanding of care processes across the continuum of care give them a unique ability to act as

> partners with other health professionals and to lead in the improvement and redesign of the health care system and its many practice environments. (p. 3).

It is true that nurses comprise the largest sector of health care and should, therefore, serve in a capacity to inform the industry as healthcare reforms are developed (Institute of Medicine).

Based on the determination of the nurse's role in patient outcomes, the IOM provided competencies specifically targeted to empower nursing students to enter the workforce prepared to practice to the extent of their scope. Competencies listed in The Future of Nursing: Leading Change, Advancing Health report (Institute of Medicine, 2011) included decision making, quality improvement, teamwork and team leadership, patient-centered care, and working on interprofessional teams. After the IOM report was released, the American Association of Colleges of Nursing (AACN) and the Quality and Safety Education for Nurses (QSEN) mandated these competencies in their nursing education requirements for accreditation (American Association of Colleges of Nursing, 2008; Quality and Safety Education for Nurses, 2019). Nursing programs around the country began to incorporate ways to teach these competencies and ensure new graduate nurses were better prepared to enter practice.

After the QSEN competencies were published as required guidelines that nursing education programs must teach to receive accreditation, content related to communication skills was included in nursing program curricula in various ways nationwide. There were no specific modalities of *how* to teach teamwork or communication skills, only that the concept must be covered in the curriculum. Some schools used lectures and PowerPoint presentations to teach communication skills; others implemented case studies that the

students could work through together. There were also schools that implemented more unique ways to teach students about effective communication, including patient simulation and various games, such as role playing or scavenger hunts. Altmiller and Armstrong (2017) surveyed 2,037 nursing faculty members and results demonstrated that although many nursing education programs are incorporating the six QSEN competencies into their curriculum (86%), there is still much variability in the amount and format of the content among programs (Altmiller & Armstrong).

TeamSTEPPS

Nursing program administrators desired an evidence-based, quality teamwork teaching tool to assist them in teaching nursing students how to communicate with the members of the healthcare team. Recognizing the demand for evidence-based curriculum to train future nurses and other healthcare personnel, the AHRQ responded. As the lead federal government agency responsible for the safety and healthcare of all Americans, the AHRQ provides guidelines and public-domain training materials for many topics related to healthcare. They developed a training program in 2006, along with the Department of Defense's Patient Safety program, to help healthcare professionals learn and practice critical teamwork skills to address the new requirements. The program is called TeamSTEPPS, an acronym which stands for Team Strategies and Tools to Enhance Performance and Patient Safety (Agency for Healthcare Research and Quality, 2017).

TeamSTEPPS is a teambuilding curriculum, designed to improve communication and teamwork skills among the members of a healthcare team. Teamwork is a key factor for patient safety in healthcare and can be transformative of the culture in a healthcare setting (Agency for Healthcare Research and Quality, 2017). The TeamSTEPPS

curriculum is evidence-based, with more than 25 years of scientific research surrounding teams and teamwork (Agency for Healthcare Research and Quality). The extent of research and practice using TeamSTEPPS makes it a strong tool to incorporate into a nursing education program. Research has shown that students demonstrated improvements in perceptions of teamwork and in communication skills when exposed to the TeamSTEPPS principles in their undergraduate curriculum (Baker & Durham, 2013; Brock et al., 2013; Liaw et al., 2014; Maguire et al., 2015). Maguire et al. recruited 108 undergraduate nursing students who received the TeamSTEPPS content embedded into their curriculum, while 77 undergraduate students did not learn the material. The results reported differences in the students' attitudes regarding teamwork. The researchers concluded that the TeamSTEPPS principles should be incorporated into all undergraduate nursing curricula (Maguire et al.).

The TeamSTEPPS curriculum includes modules that cover communication, team structure, leading teams, situation monitoring, and mutual support. The curriculum is in the public domain and includes modules to train the trainer (Agency for Healthcare Research and Quality, 2019). The coursework includes informational slides and sample case studies and hands-on activities that students can complete to help incorporate the concepts into practice. There is also content that can be utilized in a patient simulation activity.

Simulation

The use of simulation in nursing education has evolved over the years to be more realistic and technologically advanced. Simulators were first used by the aviation and military industries and then made their way into other areas, including medicine and since

the 1980s the use of simulation in nursing education continued to grow and advance. All nursing education programs include some form of simulation (Rystedt & Lindstrom, 2001). Simulation equipment, such as manikins, can be expensive and some nursing programs are not able to afford them. Offering in-person simulations also requires space, with only a couple of students at a time able to participate. In the United States, virtually all nursing programs have implemented some form of simulation into nursing education (Tolarba, 2021). Initially, simulations required students to be on campus, present in the *simulation room*. But as technology has evolved, and with demand having increased during the COVID-19 pandemic, there has been an increase in the use of virtual simulation. Virtual simulation is defined as a computer-generated, three-dimensional image or environment that can be interacted with in a realistic way by a person using special equipment (Tolarba). Virtual simulation can be conducted on a computer from home, or from anywhere with an internet connection. It does not require students to be on campus or any faculty supervision. Students can engage in the virtual simulation repeatedly to practice their skills. This form of simulation can reduce the space needed on campus for the activity and the faculty costs associated with simulation as well.

Simulation, whether in person or virtual, can help students learn critical thinking skills and physical assessment techniques, as well as many other concepts, including communication skills. Many simulation software programs offer the ability to customize student experiences to teach concepts selected by faculty. One drawback of virtual simulation is the lack of human interaction and potential limitations of the software, as it may not be designed to allow for unlimited decision-making capabilities by the student (Tolarba, 2021).

Generation Z

With the Generation Z (Gen Z) students entering college, educators have had to adapt to their learning styles. These students, born approximately from 1995-2010 are digital natives, having been raised with technology (Seemiller & Grace, 2017; Shatto & Erwin, 2016). According to Shatto and Erwin Gen Z students spend approximately nine hours a day actively using their smartphones and additional time using other modes of digital communication. Gen Z students require different approaches to learning, including individualized learning and a desire for broad applicability of concepts (Seemiller & Grace). Gen Z students also prefer to learn by observation and performing tasks or skills as opposed to reading content without application; therefore, the correct demonstration of a skill, even by video, appeals to them before they attempt to perform the skill on their own (Seemiller & Grace). Schawbel (2014) reported that even though Gen Z students are comfortable with digital communication and technology, 53% of 1008 Gen Z students surveyed still prefer face-to-face interaction over digital methods.

Learning through observation and the overall desire to be face-to-face when communicating fits well into simulation-based teaching. Simulation allows students the opportunity for individualized learning as well as collaboration with peers and appeals to the Gen Z students' desire to learn through hands-on activities (Shatto & Erwin, 2016). Research shows that Gen Z college students' learning is enhanced when faculty utilizes collaborative activities, with self-directed learning opportunities and student led discussions, in addition to traditional pedagogy, instead of didactic methods alone (Gilboy et al., 2015; Yew & Goh, 2016). Gen Z students also prefer immersive and competitive activities where they can be actively engaged (Schwieger & Ladwig, 2018).

Chicca and Shellenbarger (2018) state that the traditional model of learning (lecture, speakers, slide presentations) will not be optimal for the Gen Z learner. They suggest utilizing technology by incorporating interactive learning activities as well as *a day in the life* type of comprehensive simulation, where the Gen Z student would experience what it is like to be a nurse for a day. Gamification – specifically the use of escape rooms as learning tools – provides an alternative to the traditional learning model.

Escape Rooms

Escape rooms began in video games, where players would solve puzzles to unlock clues, and the first player to solve all the clues would win the game. The first adaptation of an escape room from a video game to a live version was implemented by SCRAP entertainment in Kyoto, Japan in 2007 (Berenson, 2015). The game gained popularity and SCRAP entertainment opened a live escape room game center in California in 2012. Sites quickly spread across the country after that. As with many games, the escape room was brought into the classroom to be used as a teaching tool. This style of learning is valuable because it provides the opportunity for students to practice skills in an immersive, engaging virtual experience (Cain, 2019).

The escape room has also made its way into nursing education, and the approach began appearing in the research in 2017 (Zhang et al., 2018). Feedback from students regarding an escape room activity has been positive (Gomez-Urquiza et al., 2019). Eighty-nine nursing students participated in an escape room activity and rated the activity as 4.8 out of 5 in helping them recall and apply concepts (Gomez-Urquiza et al.). Adams et al. (2018) used an escape room to reinforce 10 nursing skills at a Midwestern medical center. Adams et al. surveyed 167 new graduate nurses after they completed the escape

room activity, and 134 participants reported that the escape room empowered them to improve their nursing practice. The escape room design appeals to Gen Z students because these students enjoy the competitive, gaming nature of the design. It appeals to their preference for technology and active learning as well (Schwieger & Ladwig, 2018). Adams et al. also found that 91% (152) of the new graduate nurses that engaged in an escape room activity at a medical center, designed to allow participants to practice 10 nursing skills, stated that their knowledge increased (Adams et al.). Morrell et al. (2020) conducted a qualitative study with 57 undergraduate nursing students participating in a cardiovascular escape room. The results of the study included participant comments that the activity helped them with collaborative communication and soft skills, such as building consensus, building confidence, and teaching others (Morrell et al.). Friedrich et al. (2018) incorporated an escape room into an academic curriculum where students across five health care professions came together to participate in the interdisciplinary escape room. The students reported increased teamwork, communication, and interprofessionalism utilizing a seven-point Likert-like scale (Friedrich et al.).

Several studies have been conducted with nursing students using an escape room, but few have attempted to use the escape room to teach and apply specific communication skills among the nursing team (Cain, 2019; Eukel et al., 2017; Gomez-Urquiza et al., 2019; Kinio et al., 2018; Roman et al., 2019). Most researchers have sought to measure critical thinking skills while keeping students engaged (Cain; Eukel et al.; Kinio et al.), and some qualitative researchers have explored whether the students enjoyed the activity (Eukel et al.; Gomez-Urquiza et al.; Roman et al.).

Situation to Self

I chose this research topic because of its relevance to my career and chosen profession. As an assistant professor in nursing in a college program I am confronted daily with the challenge of preparing students for the rigors of a nursing career. In my work, I have been struck by the distinctive learning styles of my younger students, specifically their inclination to relate course material to their own life experience. Their constructivist mindset is a contrast to my own experience as a student which focused on simply acquiring the established knowledge of nursing concepts. I recognized that my students exhibit a tension that combines social and technological preferences with a weakness in both verbal and written communication skills. In my search for new ways to motivate my students I explored non-traditional teaching methods such as gamification. This led me to consider escape rooms as a mode of nursing education and ultimately formed the basis for the current study.

Problem Statement

Communication has been identified in the research as a critical component of a health care team to lessen the opportunity for errors and poor patient outcomes (Liaw et al., 2014; Makary et al., 2016, Sarfati et al., 2018). Effective communication may also increase the retention of new nurses. New nursing graduate job retention is an expensive, chronic issue. NSI Nursing Solutions (2021) states that the average rate nurses leave their jobs within the first year of practice remained high, at 23.9%. Some reported causes leading to poor retention are heavy workloads, incivility, lack of relationships with managers and, most significantly, lack of effective communication and relationships within the nursing team (Cochran, 2017; Mikaelian & Stanley, 2016; Sanchez & Fuselier,

2020). Improved communication and teamwork, taught in nursing school, may help to alleviate the loss of new nurses, especially in their first year of practice.

Effective communication and teamwork result in faster response times and earlier recognition of patient deterioration (Lavoie et al., 2020). Constructive communication leads to shorter hospital stays for patients and improved utilization of resources (Agency for Healthcare Research and Quality, 2017). Barton et al. (2018) found that effective teams lead to improvements in the quality of patient care across the entire healthcare sector. Healthy teams, with successful communication strategies, have led to increased job satisfaction and retention of nurses as well (Vermeir et al., 2018).

Though communication has been identified as a critical component of the nursing role, the teaching focus in nursing education can vary among schools, with some schools concentrating on communication with the interprofessional team or the patient, and other schools focusing on communication within the registered nurses' team (Barton et al., 2018; Howard & Becker, 2016; Wagner, 2018). While the interprofessional team is important, the nursing team (nurses along with assistive personnel) comprises the largest direct patient care team in hospitals and should be developed independently, as well as part of the interprofessional team (Barton et al.).

Despite nursing program efforts to teach nursing students how to be effective communicators and health care team members, some nursing graduates have not been prepared to practice independently. Nurses continue to lack the ability to translate communication skills into nursing practice (Kesten, 2011; McKeon et al., 2009).

Due to reports from employers of new graduate nurses' lack of readiness to enter practice, colleges are now implementing curriculum specifically designed to teach

communication skills to nursing students, such as TeamSTEPPS training. Researchers have explored the TeamSTEPPS didactic curriculum for numerous healthcare students, including nurses, showing positive results (Cooke & Valentine, 2021; Maneval et al., 2020; Manning & Jones, 2021). However, current students demand more immersive and engaging curriculum and activities (Christopher et al., 2017; Schwieger & Ladwig, 2018; Shatto & Erwin, 2016). Today, college students expect a high level of technology embedded into their education, as they are accustomed to technology in their daily lives. To date, there is no research on nursing students' perceptions of their communication skills based on an immersive game (such as an escape room) and the TeamSTEPPS training curriculum, combined.

Purpose Statement

The purpose of this case study was to explore how a patient simulation designed as an escape room when combined with a traditional communication training curriculum would affect undergraduate nursing students' perceptions of communication. The students received a didactic lesson, specifically the TeamSTEPPS communication training. The core of the TeamSTEPPS communication content is a set of strategies that can lead to effective team communication. Those strategies include specific techniques such as *call out* (verbally announcing each action taken) and *check back* (verbally confirming the receipt of information). Those strategies are especially useful in a chaotic environment (Agency for Healthcare Research and Quality, 2019) and were emphasized in the current study's lecture to the students. Immediately after receiving the TeamSTEPPS training, the students engaged in the escape room simulation. The undergraduate students, in this case, were students in an associate degree nursing

program. The TeamSTEPPS communication training curriculum included a PowerPoint presentation that teaches communication techniques that are intended to be used when making patient care decisions under the pressure of time. The escape room provided students the opportunity to practice communication techniques while also experiencing a patient simulation activity where the participants must communicate and work together as a team to make patient care decisions and solve the embedded puzzles to escape the room within 30 minutes.

Significance of the Study

The current study is important to the future of nursing education, specifically in regard to the teaching of communication skills. A gap in nursing education curriculum, covering the concept of communication within the nursing team, was identified in the research (Choi et al., 2021; Cooke & Valentine, 2021; Maneval et al., 2020). As hospitals and other employers continue to experience loss of nursing staff, with the reason often cited as lack of communication, teaching communication skills in nursing education remains a key component in the curriculum. As technology continues to advance and Gen Z students enter college, there are more opportunities to bring the escape room into the classroom.

Population and Sample

The study took place at a Midwestern community college. The college offers an associate degree program in nursing which takes four semesters to complete. The curriculum includes didactic nursing courses, nursing skills lab courses, as well as clinical experiences and simulation courses offered in the nursing laboratory. The study was conducted on campus in the nursing laboratory and simulation room.

A convenience sample of third semester students was recruited for this case study. All 11 participating students had enrolled in the Nursing Simulation course and agreed to be part of the study. A case study approach was an appropriate study design because the goals of the study were to ascertain whether nursing students' perceptions of their communication techniques would improve after the TeamSTEPPS curriculum and whether the escape room patient simulation would further enhance their perceptions of communication techniques. This method allowed for exploration of each nursing student's experience with two approaches to learning communication techniques, a traditional method, and an immersive gaming method.

Research Questions

The guiding research questions for the current study include the following:

1. When TeamSTEPPS training is utilized in an escape room patient scenario, what impact does it have on nursing students' perception of their communication and its relevance to teamwork?
2. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students explain their perceived changes in attitudes towards communication as it relates to teamwork?
3. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students perceive didactic and immersive game approaches to their development of communication techniques?

Because research has established that Gen Z students will dominate new student enrollment in healthcare education in the coming decade (Plochocki, 2019) the exploration of the current study's research questions included a generational analysis of its findings.

Description of Terms

Clinical simulation. For the purposes of this research, this term "refers to a variety of activities using patient simulators, including devices, trained persons, lifelike virtual environments, and role-playing" (Kim, J. et al., 2016, p. 1) for the purpose of providing nursing students with situational learning opportunities in an authentic clinical setting. As in the current study's escape room exercise, clinical simulations often make use of life-like manikins to provide tangible patient responses in medical intervention scenarios (Kim, J).

Heparin protocol. This term refers to a set of written instructions that guide a healthcare provider in the administration of the medication Heparin. Heparin is an anticoagulant drug that is used to treat a variety of medical conditions arising from blood clots in the veins (Warnock LB et al., 2022). For the purpose of the current study, a Heparin protocol (Exhibit F) was used during the escape room scenario as the basis for two of the room's puzzles.

Likert-like scale. This term refers to a rating system that is commonly used in questionnaires to quantify people's perceptions of a statement or question (Jamieson, 2022). The scale provides a defined set of response options that range from strong agreement to strong disagreement. The Teamwork Attitudes Questionnaire used in the current study (Exhibit B) presents statements with a 5-point Likert scale for a response.

PT/INR. This term is an acronym which translates to Prothrombin Time / International Normalized Ratio. It refers to a common lab test administered in a clinical setting to evaluate a patient's coagulation status, or ability to form blood clots. The test result provides a ratio of the elapsed time a patient's blood sample will begin to coagulate relative to an international standard reference (Yang R, 2022). The Heparin Protocol used in the current study includes a calculation based on the patient's PT/INR value.

SBAR. This term is an acronym which translates to Situation, Background, Assessment, and Recommendation. It is an educational tool originally developed by Kaiser Permanente and is commonly used in nursing education. The tool provides a concise, standardized way for healthcare professionals to communicate pertinent patient information (Achrekar et al., 2016). In the current study, the SBAR tool was defined in the lecture material that was presented to the student participants and formed the basis for one of the puzzles used in the escape room.

Theory-practice gap. This term refers to the lack of ability to translate nursing knowledge into practice, usually as a new nurse. (Haddad et al., 2017). It is a key factor in assessing a nurse’s readiness to transition from a student to a professional role.

Summary

The current study contributes to the existing research surrounding the need for more communication and teamwork training and application in nursing education. Communication is a critical skill for a nurse to possess to become an effective member of the nursing team and to serve as a member of the interdisciplinary healthcare team as well. Communication training will contribute to the improvement of safe practice and teamwork, leading to improved patient outcomes and fewer errors.

In the following chapter, a review of the literature is provided to describe the various teamwork teaching strategies that have been used in nursing education, as well as the use of gamification in nursing curriculum and the need for nurse educators to adapt to the learning styles of Gen Z students.

CHAPTER II: REVIEW OF THE LITERATURE

Introduction

Chapter 1 of the current study identified several questions pertaining to the centrality of communication skills in nursing education and their relevance to patient safety and practice readiness. To explore those questions, a thorough review of the existing research was conducted, focusing on themes related to nursing students' attitudes towards communication and its relevance to teamwork and nursing practice that emphasizes patient safety. The details of the TeamSTEPPS teaching tool were examined with particular emphasis on its communication and teamwork aspects. Finally, to address the unique learning style of the newest generation of college students, Gen Z's particular learning characteristics were explored, including that generation's receptiveness to more engaging tools, such as simulations, games, and escape rooms. The following sections contain a summary of the research findings.

Patient Safety

Although patient care has improved in the past 100 years with the adoption of improved technology and standardized practices, patient safety remains a critical concern for the medical industry and the subject of ongoing research (Leonard, 2014). A 2013 study by James reported that medical errors are the leading cause of preventable hospital deaths, killing 210,000 to 440,000 Americans annually. This would make medical error the third leading cause of death in the U.S behind heart disease and cancer (Carver et al.,

2021). A more recent study by Austin and Derek (2019) reported that 161,000 people die annually from preventable medical errors. The disparity between the two studies does not necessarily signal a drastic improvement in healthcare, but rather a debate surrounding the accuracy of the statistics. Some experts believe medical errors are underreported (Austin & Derek). Many researchers claim that some errors are never reported if there was no significant harm done to the patient.

The underlying causes for medical errors and lapses in patient safety have also been the subject of research. Lind et al. (2020) interviewed 1,010 Iowa residents to identify their perceptions of the causes of medical errors. Poor communication and teamwork among the medical staff ranked the third highest perceived cause, behind overworked staff and medical providers not knowing the patient's full medical history. Further research confirmed that patient safety issues are often related to poor communication among the healthcare staff (Longhini et al., 2021). Researchers analyzed 332 emergency department claims of medical error during 2007-2013 and found that communication issues were among the top three causes for the medical errors. The communication issues included failure to communicate among the providers, poor professional rapport, and poor communication between health care providers and patients and their families (Carver et al., 2021).

The relevance of this research to nursing is based upon the nurse's unique responsibilities. In the hospital setting, the nurse is the communication hub for the entire healthcare team (Fairbanks et al., 2007). Nurses are the only members of the team that interact with every member of a functionally diverse team and spend the most time in contact with the patient. As such, the nurse is expected to be the first to notice any change

in the patient's condition (Lavoie et al., 2020). Missing any deterioration in the patient, or not communicating a change in patient condition properly, can lead to missed patient care and potentially a poor outcome for the patient.

Communication between nurses is most critical during the staff's shift change (Lavoie et al., 2020). Delayed or missed treatment, inadequate care, and possibly dire events can be attributed to the failure of a nurse to communicate relevant information in a timely manner (Pun, 2021). Traditionally, nurses pass patient information to the nurse taking over care of the patient for the next shift. The communication is called a nursing handoff or shift report. It is important for nurses to know what needs to be included in this communication, as well as how to effectively communicate with each other throughout the shift. Nurses in acute settings begin making clinical judgments about their patients and their needs when they receive their patient assignment. Therefore, it is critical to patient safety that nurses communicate the patient status effectively at the change of shift (Lavoie et al.).

Researchers have noted that health care professionals and educators have become aware of the link between communication and patient safety and have taken steps to address it. A study by Longhini et al. (2021) in which 35 nurse managers were interviewed regarding what strategies they found most useful in reducing missed patient care by nurses reported that establishing and maintaining constructive communication and collaboration related to patient safety was a key factor in reducing nursing error. Interventions that were suggested to meet this goal include maintaining effective communication not just on the unit but between the different units of the hospital. Also, providing interdisciplinary educational opportunities for nurses, such as patient

simulations, helped nurses be better prepared for potential communication needs outside of their nursing role. One final intervention identified in the Longhini et al. study suggested the inclusion of the external stakeholders in the development of more effective communication practices. This could include efforts to communicate with professional organizations outside of the hospital as well as requesting feedback from patients and families to better understand if their needs were met.

Practice Readiness and Retention

In order to equip nursing students with the communication skills needed for a successful entry into the profession, nursing programs employ a variety of teaching methods, including classroom study and clinical practice. Recent research has established that it is critical that nurse educators incorporate standardized communication frameworks to help undergraduate nursing students organize and disseminate critical information (Stevens et al., 2020). To be accredited by QSEN, nursing programs are required to teach teamwork and collaboration, but there is not a standard curriculum approved. Therefore, schools may determine independently how to include these concepts in the program outcomes (Quality and Safety for the Education of Nurses, 2020).

The link between practice readiness and training for a clinical work setting is important to note and is born out in additional research. According to Pillai (2014) new nurses that are practice ready enter the profession confident and demonstrate enhanced communication and collaboration skills with interprofessional team members and, crucially, can utilize those skills in a real-world clinical setting. Henderson et al. (2015) noted that training for new nurses that includes supportive preceptors and opportunities to

network with other new nurses resulted in a more successful transition to practice. Data collected from 78 novice nurses listed *sense of belonging* and *sense of engagement* in the top four most important components needed for a successful transition to practice (Henderson et al.).

Relatedly, researchers have examined the correlation between practice readiness and job satisfaction and retention of new nurses. Qualitative studies conducted by McCalla-Graham and DeGagne (2015) found that a supportive environment that promotes teamwork and communication made the new nurse feel less stressed and more competent. Nurses noted that their transition to practice was facilitated by a team that was willing to answer their questions and check on their well-being as they completed patient care tasks (Henderson et al., 2015). Providing lifelike patient experiences, such as patient simulations, in nursing education and in the clinical practice setting, has led to better communication skills among nursing students and new nurses, especially regarding patient safety and prevention of medical errors, enabling these nurses to be more confident and practice ready.

Despite nursing educators' recent attempts to improve the teaching of practical skills, the research of Henderson et al. (2015), McCalla-Graham et al. (2015), and Pillai (2014) suggests that there remains a disconnect between course work and real-world practice. The lack of ability to translate nursing knowledge into practice, usually as a new nurse, is referred to as the theory practice gap (Haddad et al., 2017; Monaghan, 2015). The idea of the theory-practice gap is not new (Monaghan), but there is still some debate about what it means for a new graduate to be *practice ready*. Gallagher (2004) defined the gap as "dissonance between desired learning and demonstrated learning" (p. 264).

Haddad et al. state that much of the debate surrounding a new nurse's practice readiness may be between nurse educators and nurses in clinical practice sectors. Educators are not always teaching the concepts that nurses in the field might consider to be critical to the new nurse's success (Johanson, 2012). Another factor that exacerbates the practice gap is the difference between what actually happens in the clinical setting as opposed to what students learn in the classroom. Johanson found that nurses are not executing tasks in the clinical setting the way they were taught in school. Johanson reported that new nurses often draw upon their personal experience rather than their nursing education, when in the clinical environment, and therefore educators should provide more experiential learning opportunities for students, to better prepare them for the clinical environment. The rationale is that the more the students were able to experience, the larger pool of knowledge they could draw from, when needed. Boychuk Duchscher et al. (2021) reported that new graduate nurses struggle with work expectations that are often unachievable. They express frustration and demoralization with the inconsistency between their perception of the nurse role and the reality of it.

The theory practice gap in new nurses has been observed by employers as well as educators and researchers. Employers report a lack of readiness in new graduate hires, often due to their underdeveloped communication skills (Walsh, 2018). Serafin et al. (2020) conducted a study of 29 Gen Z nurses and found that all the focus groups in the study reported that communication is important but underdeveloped in Gen Z nurses. Employers state other causes for this lack of readiness as well. Sometimes it is the practical nursing skills that are lacking. Sometimes the skills are strong, but the critical thinking and decision-making skills are subpar. Regardless, the common denominator is

that the new nurses do not feel that they have the proper skills and support in their new roles to communicate their, or their patients', needs. Many new nurses have been found to suffer from feelings of uncertainty and isolation and nurse executives have reported that new nurses lack confidence and adequate skills to uphold patient safety standards (Twibell et al., 2012).

The preparedness problem with new nurses will have increasingly acute societal effects as the need for high quality healthcare grows in coming years. The nursing profession is facing severe staff shortages brought on by an aging U.S. population and by staff attrition. The United States Department of Labor, Bureau of Labor Statistics (2019) reports that the number of registered nursing positions is projected to grow 7% from 2019 to 2029, which is greater than the 4% average growth in other fields. The increased demand for nurses has made the problem of nursing attrition more urgent. A recent 10-year study found that 17% of newly licensed registered nurses leave their first nursing job within the first year, 33% leave within two years, and 60% leave within eight years (Thew, 2019). The study noted that among the reasons for this high attrition, a lack of feeling like a member of the team was an important factor. Other reasons reported by nurses for this decision to leave the field include heavy workloads and lack of workplace rewards (Sanchez & Fuselier, 2020). New nurses' high first year turnover rate (17%) equals the overall national turnover rate of nurses with any number of years of experience (Sanchez & Fuselier). It is also costly, approximately $17,000, to train and mentor a new nurse and all that investment is lost when the nurse leaves the position within a year (Sanchez & Fuselier).

Taking into consideration these factors, in addition to the huge expansion of healthcare that was brought about by the Affordable Care Act in 2010, research suggests that hospital and nursing school administrators recognize and act upon their responsibilities in preparing new graduate nurses (Johanson, 2012; Sanchez & Fuselier, 2020; Thew, 2019; Twibell et al., 2012; Walsh, 2018). To do so, nurse leaders could devise strategies to ensure new nursing graduates are ready to enter the workforce and to join a supportive, competent team that communicates well. In the following section, various methods of teaching communication skills will be examined.

Communication in Nursing Education and Practice

Despite the recent focus on communication skills in nursing training, the impact of poor communication in the workplace is increasingly clear to researchers. Studies show that poor communication among the healthcare team leads to medical errors, which can sometimes result in patient fatalities (Hammoudi et al., 2018). Ineffective communication was found to be the cause of 65% of reported medical errors (Shapiro, 2017). It is the nurses' role to administer medication and report a medication administration error promptly (Aboshaiqah, 2014; Alshehri & Ismaile, 2016; Hammoudi et al.) This responsibility puts nurses first in line for preventing medication administration errors (Hammoudi et al.). Hammoudi recruited 367 nurses who were surveyed to rank the reasons they made medication administration errors. Poor communication ranked as the second highest reason, a 4.32 out of 6 on a Likert-like scale. These findings align with an older study, where Kim et al. (2011) found that 34.1% of 224 nurses surveyed reported that medication errors were caused by miscommunication.

Nurses are entering the workforce lacking the necessary communication skills to perform their job (Sowko et al., 2019). Although nursing schools are required by QSEN to teach communication skills, studies have found that lecturing about communication skills, but not providing students opportunities to practice the skills, is insufficient (Sowko et al.). Sowko et al. reported 88 nursing students who were provided with trigger videos, which were videos of various difficult conversations that nurses may encounter in the workplace. The students recorded their suggested therapeutic responses to the actors in the trigger videos and discussed the responses in small groups. This activity allowed students to actively practice therapeutic communication and use technology to make the activity more realistic. The 88 undergraduate students completed a pre-test before practicing communication and a posttest afterward and demonstrated an increase in comfort level in communicating a medication error (p=.011).

Health care teams are particularly susceptible to communication challenges because of their functional diversity. The care team in a health care facility draws individuals with varied backgrounds and expertise, including nurses, physicians, pharmacists, various therapists, and social workers (Zajac et al., 2021). As the hub of a care team, the nurse interacts with everyone and is especially vulnerable to communication problems. Nurses are unique in other ways as well. First, in the hospital setting it is common to have nurses and their aides as the only healthcare workers on the unit most of the time. Doctors and other interprofessional team members visit patients, but they do not remain on the unit around the clock, as do nurses. Second, the nursing team has its own responsibilities outside of the interprofessional patient healthcare team. The nursing team must be able to respond to changes in patient situations rapidly and

they must know the steps necessary to avoid medical errors or missed patient care (Fairbanks et al., 2007). Because of the nurse's unique role and responsibility, teamwork is paramount.

To improve the communication within healthcare teams, Kaiser Permanente developed an educational tool called Situation, Background, Assessment and Recommendation (SBAR) in 2002 that subsequently became an important teaching tool in nursing education (Achrekar et al., 2016). The standard format of the tool provides a concise, standardized way to convey pertinent patient information when necessary.

The Situation component directs the healthcare worker to state the current problem requiring an intervention. After the situation is defined, the healthcare worker should present some Background information specific to the patient that will allow the receiver to understand the contributing factors more thoroughly. The Background information will also identify any interventions that have already been implemented to rectify the situation and the effect of those interventions. After the Background has been provided, the healthcare worker will state their Assessment of the current situation. This Assessment can include which factors the healthcare worker finds to be the most concerning as well as what they think needs to be addressed. The final component of SBAR, is Recommendation. When a healthcare worker communicates with another using SBAR, he or she should have a Recommendation to offer about what he or she believes will solve the problem at hand.

A common example of SBAR in use occurs when a nurse calls a physician regarding a hospitalized patient. The physician does not have all the current data about that patient on hand, so it is important to be thorough, but concise, when phoning a

physician with a problem. It is not useful to call a physician and state that a patient has a high blood pressure, and ask what to do, if they do not also have available the most recent blood pressure readings as well as what current medications that patient has available and what and when they were administered, including the response observed to any medication.

The SBAR tool requires important skills to be developed in healthcare workers. Most importantly, SBAR requires that the healthcare worker be able to distinguish facts from feelings. The standardized format takes the emotion out of the communication and promotes the conveyance of facts, making it easier to determine the situation more clearly. Lack of clear communication can lead to missed care, longer length of stays in the hospital, increased cost of healthcare, and even patient mortality (Rahn, 2016).

Historically, teaching team communication skills to nursing students – even since incorporating the SBAR system into the curriculum - has been only partially successful. Barton et al. (2018) conducted an integrated review of 19 studies that assessed team communication instruction in nursing education. Eleven out of the 19 studies reported that nurses did not feel comfortable applying communication skills in real life team situations, even though they learned them (in some form) in nursing school (Barton et al.). In another of the studies, Husebø et al. (2011) conducted a simulation with 81 nursing students to teach them the importance of nonverbal communication, especially in a medical emergency. Husebø et al. claimed that there were few training tools available to help students practice the interplay of verbal and nonverbal communication and that simulation provided an effective solution. Kesten (2011) conducted an experiment with 115 nursing students, teaching SBAR communication using role play in addition to

didactic lecture, with the control group receiving didactic lecture alone. Results indicated that the students in the experimental group performed better at SBAR communication (p=0.005) than the control group, who received didactic lecture alone (Kesten).

In spite of its challenges, effective communication within the care team leads to clearly perceived benefits. Allenbaugh et al. (2019) conducted a study with 85 nurses, in which a communication training curriculum was delivered to the nurses via a PowerPoint presentation. The curriculum focused on patient communication and the utilization of layman terminology when talking with patients. A pretest and posttest administered to nurses found an improvement in communication skills and there was a corresponding improvement in patient satisfaction surveys in relation to the hospital stay and communication with the nursing staff (Allenbaugh et al.). The current study demonstrates that effective communication among nurses impacts patient satisfaction.

Teamwork in Nursing Education and Practice

There is a broad recognition in the industry that the nursing profession is changing, and the focus of nursing education needs to better align with the nurses' role on a healthcare team. The Institute of Medicine (2011) report identified teamwork as one of the most important skills needed for nurses to be successful in the coming years, as the Affordable Care Act expands medical coverage and millions more Americans will be insured. Research has found that effective teamwork is linked to better quality outcomes for patients (Bragadóttir et al., 2017; Chapman et al., 2016).

One barrier to effective teamwork within a healthcare team has been a long-standing stereotype of the nurse as a secondary care provider. The IOM warned against the detrimental effects of this stereotype. Within the leadership component, the IOM

stated that nurses need to be treated as an equal on the patient care team, alongside physicians, specialists, and therapists (Institute of Medicine, 2011). This was a new role for nurses, as they had usually been considered more of the support team, but not as an equal, along with these other decision makers. The IOM provided thorough support for this recommendation. The IOM noted that nurses comprise the largest sector of healthcare providers and are well positioned to play a role in creating policy. The stale perception of nurses as bystanders rather than policy leaders is not viable in today's healthcare environment. Of course, there were already many nurse leaders, but the IOM's suggestion that nurses be equal partners on the health care team was taking teamwork a step further. The IOM report suggested incorporating teamwork training within nursing education and in professional healthcare settings (Institute of Medicine).

As nursing education evolved in the aftermath of the IOM report, new research continued to provide insights into the necessity to build communication and teamwork skills in a new generation of nurses. Watson (2015) conducted a study that surveyed nurses and nurse aids, asking what three items prevented them from having a well-functioning team. The top choice was *workload* (60%), followed by *ineffective communication* (46.4%) and *stress* (41.1%). As for what factors would help the team be more effective, the answers were *improved communication skills* (45.9%), *development of trust and mutual respect for each other* (43.3%) and *more accountability* (37.1%). Communication was a factor in both questions: the reasons teams fail, and the reasons teams succeed. Communication goes hand in hand with teamwork. One cannot be an effective team member and lack effective communication skills.

Arroliga et al. (2014) warned that for healthcare leaders to be successful in the 21st Century, they need to understand that modern management of patients requires interdisciplinary teams and that any performance improvements will require teamwork. Chen et al. (2019) surveyed medical students regarding what constitutes healing behaviors and found the participant qualitative comments showed that it is no longer enough for a health care provider to take time with patients, remove barriers, listen to patients and be trustworthy. In today's complex health care delivery system, it is critical for providers to work together with the entire patient care team, which includes providers as well as the patient and their family members.

Bragadóttir et al. (2019) identified staffing as a key component to effective teamwork because of the time pressure that short-staffed health care units experience. Lack of time as a result of inadequate staffing has been identified as a leading cause of miscommunication and poor teamwork (Kalisch et al., 2009). Bragadóttir et al. found a statistically significant difference in nurses' perceived adequacy of staffing on a unit and the expected variance in overall teamwork of the unit. Staffing accounted for 10% of the variance in teamwork. These results were collected using a survey of multiple units in two different types of hospitals, university and regional. The units surveyed included medical units, surgical units, and mixed medical-surgical units, as well as intensive care (ICU). Units where nurses felt the staffing was adequate reported higher teamwork scores, with the feeling that coworkers would support them and back them up. Units where there was inadequate staffing, even if by perception alone, had lower teamwork scores. Researchers explained one possible cause being if the unit is understaffed, the nurses do not have time to communicate with each other and back each other up, as

needed. The nurses spend their time just trying to keep up with the tasks that need to be completed (Bragadóttir et al.).

TeamSTEPPS in Nursing Education

The Institute of Medicine (2000) report that identified avoidable errors in health care led the U.S. Government to co-sponsor a major response. The Agency for Healthcare Research and Quality (AHRQ), in collaboration with the Department of Defense (DoD) developed a program called TeamSTEPPS, which is a series of training modules intended to develop communication, situation monitoring, mutual support and teamwork skills of healthcare workers. The AHRQ serves as a department within the federal government whose mission is to conduct research and produce evidence that makes healthcare safer, accessible to more people, of better quality, and more equitable for Americans (Agency for Healthcare, Research, and Quality, 2017). The TeamSTEPPS content is evidence-based and, as a published product of the United States government's AHRQ, is within the public domain and is freely available to anyone.

TeamSTEPPS aids healthcare workers in providing safe, quality patient care by teaching teams how to communicate effectively, increasing team awareness and identifying team member roles and responsibilities. The program also teaches teams how to resolve conflict and eliminate identified barriers that prevent quality, safe care (Agency for Healthcare, Research, and Quality, 2019). The TeamSTEPPS program has three phases, including an initial assessment to determine the need for the teamwork training, the planning and implementation phase of the program, and finally, the sustainment of the principles within the organization (Agency for Healthcare, Research, and Quality, 2019).

Several studies have reported positive results with the implementation of TeamSTEPPS tools to teach teamwork and communication skills to various healthcare workers (Baker & Durham, 2013; Brock et al., 2013; Liaw et al., 2014; Maguire et al., 2015; Peters et al., 2018; Robinson et al., 2018). The TeamSTEPPS curriculum can be implemented in the professional setting or with healthcare students. A Virginia hospital incorporated TeamSTEPPS teamwork training modules into their trauma nurse academy program and reported improvements in performance, patient outcomes, and quality of care (Peters et al.). Baker & Durham embedded TeamSTEPPS principles into a didactic course for medical, pharmacy, and nursing students and reported improved collaborative competencies. Brock et al. also implemented TeamSTEPPS in a study with medical, nursing, and pharmacy students and found a significant improvement in knowledge and attitudes toward situation monitoring, mutual support, and communicating in interprofessional teams. Liaw et al. reported improvement in communication after TeamSTEPPS principles were implemented in an interprofessional simulation experience with medical and nursing students. Maguire et al. studied the effect of the TeamSTEPPS communication principles incorporated into simulation activities over four semesters with a sample of 108 undergraduate nursing students, finding improvement in teamwork attitudes. Finally, a Kansas nursing school implemented the TeamSTEPPS communication curriculum into their nursing program, using didactic, simulation, clinical and community experiences to provide multiple opportunities to improve the skills and attitudes toward communication (Robinson et al.). As these research studies demonstrate, TeamSTEPPS is a proven tool for teaching communication skills for healthcare workers.

Most of these studies focused on the interprofessional team communication and less on the communication among the nurses as their own team.

Generation Z as Students

When considering the future of nursing instruction, it is necessary to consider the unique learning characteristics of a new generation of students, especially one as dominant as Generation Z (Gen Z) among incoming students. Gen Z (born approximately 1995-2010) makes up 24% of the U.S. population and the majority of current college students (Chicca & Shellenbarger, 2018). Categorizing people based on when they were born is not a new concept. Mannheim (1928) developed the historical-social generation approach. This way of categorizing people is based on the social, political, and cultural events that occur in society during their childhood and young adult years. They develop similar attitudes and identities based on these experiences. In the nursing workforce today, there are baby boomers (born 1946-1964), Gen X (born 1965-1980), Gen Y/Millennials (born 1981-1994), and the newest generation to enter college and the workforce is Gen Z (born between 1995 and 2010) (Seemiller & Grace, 2017). Even though there are multiple generations concurrently in the workplace, each generation brings different needs that must be recognized to successfully transition these students from theory to practice.

As each generation enters college, the generational differences, including how the members experience the world and workplace, should be considered when designing study and work environments (Serafin et al., 2020). Shorey et al. (2021) states that it is essential to update the educational framework to meet each generation's unique learning style and preferences. A qualitative exploratory-descriptive design, using focus groups,

conducted by Serafin et al. sought to identify the competencies required for Gen Z nursing students to transition into practice more successfully after college. Results indicated that communication skills are both especially important and poorly developed in new graduate nurses, also noting that participants felt they had weak skills communicating with the health care team (Serafin et al.). Shorey et al. found that Gen Z students preferred a learning environment where they were actively engaged, hands-on, and required use of their aural, visual, and kinesthetic senses.

Gen Z students demonstrate other unique attributes as well. Studies have shown that Gen Z students rely heavily on technology, are less adept with social skills, and require more support from faculty than previous generations (Chicca, 2018; Plochocki, 2019; Shatto & Erwin, 2016). The attention span of Gen Z students is shorter than previous generations. It is calculated to be only eight seconds, compared to millennials, who have a 12 second attention span (Shatto & Erwin). Gen Z students have grown up with a volatile economy, public issues of violence, and social justice. Though other generations have experienced some of these factors, this generation has never experienced a world without it (Seemiller & Grace, 2017). Some may discount the Gen Z students as having nothing to offer beyond their technological skill, but this generation is immensely powerful. They feel that they can change the world. They have been surrounded by human rights issues, and many have supported the legalization of same-sex marriage, Black Lives Matter, transgender rights, women's rights, and other social causes. They strive for equal human rights more than previous generations (Seemiller & Grace).

Gen Z students have been labeled as being underdeveloped in social and communication skills, making them at higher risk for social isolation. However, in the academic environment, Gen Z students enjoy collaborating with others and embrace diversity (Seemiller & Grace, 2017). Despite this openness, Gen Z students lack communication skills which inhibits their ability to connect socially and in person with patients as health care professionals (Seemiller & Grace; Chicca & Shellenbarger, 2018)

Gen Z students prefer to have hands-on learning of skills, as opposed to lecture. However, they want the skills demonstrated properly before they are willing to attempt them (Seemiller & Grace, 2017). Because Gen Z students are immersed in social media, it is important to teach them in fun and interesting ways, like moving rapidly between hands-on demonstrations and simulations, with immediate feedback desired (Cartwright-Stroupe & Shinners, 2021).

Two teaching methods that have shown promise in reaching Gen Z students are simulation and gamification. Simulation in education appeals to these preferences, as it gives the students a chance to practice skills in a safe environment, but it is more engaging than a lecture. Students also prefer learning in an immersive and competitive environment (Schwieger & Ladwig, 2018) and a gamification exercise (in the form of an escape room simulation design) can address these preferences as well. The following sections examine the use of simulations, immersive games, and escape rooms in nursing education.

Simulation as a Teaching Method

"For the things we have to learn before we can do them, we learn by doing them."

- Aristotle, The Nicomachean Ethics (350 B.C.E)

As nurse educators sought ways to create an authentic, real-world experience for students to practice their skills, they developed the simulation. Simulation has been used as a teaching tool for many years in nursing education. The first manikin used in health care was in the 1960's and the concept continued to spread and evolve into most nursing programs (Rystedt & Lindstrom, 2001). In its early days, simple manikins were created for students to practice their nursing skills in a more realistic setting. These manikins were mostly just anatomically correct life size dolls, where students could role play physical assessment activities and pretend that the patient was real. The first computer-controlled simulators were expensive and did not add a lot of functionality to the manikins (Cooper & Taqueti, 2004). Many nursing schools could not afford to invest in the technology, especially as it improved, and many simulators quickly became outdated. But as technology evolved, so did simulation equipment. Hi-fidelity manikins are now the standard, and they provide an even more realistic experience (Davis et al., 2014).

These hi-fidelity manikins have a pulse, breathe, blink their eyes, offering students more opportunities to interact with their patient. Instructors can program the manikin to respond to the students' actions, including changes in vital signs or using a speaker inside the manikin that allows someone to *voice* the patient. One study found the immersive, realistic nature of simulation to be helpful for students to practice skills in an environment that is safe but provides some of the realism of an actual patient care experience (Brown et al., 2019). Qualitative studies have reported that the use of

simulations in nursing education has produced positive learning outcomes (Cant & Cooper, 2009; Smith & Roehrs, 2009) and an increase in critical thinking skills (Cant & Cooper). Students have also been able to practice communication and teamwork skills in an interprofessional format when using a simulation-based approach. Macdonald et al. (2018) conducted a study that allowed for students from pharmacy, nursing, and medicine to collaborate in a simulated patient experience. Calhoun et al. (2014) conducted a simulation also using an interdisciplinary group of nurses, doctors, and other members of the healthcare team in a hospital setting. Both research findings reported increased teamwork and communication skills after the simulation.

Simulation, both low and hi-fidelity, has improved nursing program learning outcomes and continues to be a popular tool among nurse educators (Davis et al., 2014). Simulation can replace some clinical hours as sites are becoming more difficult to obtain. The growth in nursing programs and enrolled students has generated competition among schools to obtain clinical sites and to have the most up-to-date technology. Ragsdale and Schuessler (2020) conducted a study of 24 nursing students to assess whether there was any significant difference in teaching practicum at a clinical site compared to a simulated environment. The researchers found no statistical difference when substituting some hours of practicum in a simulated environment (Ragsdale & Schuessler). As the clinical sites become more difficult to secure, it is important to explore and continue to study how much practicum learning can be replaced by simulation without compromising student abilities. Since the newer generations of students are technology natives, they prefer and thrive in the simulated environment (Chicca & Shellenbarger, 2018).

Gamification as a Teaching Method

Research has shown several benefits to incorporating a game into a simulation for nursing students. Educational games support various goals such as data collection, prioritization, problem solving, and critical thinking (Carvalho et al., 2015). Experiences help students to retain new material and skills. A game allows a student to have an individualized experience, which can be more customizable to their psychological needs. As the new generation of students entered college, they desired more technology and hands-on activities in the classroom. Gen Z students comprise most of the college student population today (Plochocki, 2019) and along with technology, they enjoy immersive, competitive games incorporated into their learning (Koivisto et al., 2018; Verkuyl et al., 2017).

Gamification allows students to think and act under competitive pressure while remaining in a safe environment. Health sciences utilize simulation games often because these types of games help students practice critical thinking skills in a low-risk environment (Dubovi, 2018; Koivisto et al., 2018; Peddle et al., 2019). This environment allows students to be less afraid of making a mistake and more willing to make decisions regarding patient care. The students can also prepare for emergency situations, where a patient's health status may decline rapidly (Koivisto et al.; Mawhirter & Garofalo., 2017). The life like scenario allows students to make decisions under time constraints which can also improve their confidence.

Although gamification in nursing education has demonstrated some positive outcomes, it is still not yet widely used as a teaching method. Havola et al. (2020) conducted a review of the research to determine the extent of game elements in

simulation. Results indicated that the use of game elements in simulation improves student outcomes and increases student satisfaction and that they are not utilized very often. The researchers suggested that an opportunity exists to improve nursing education by incorporating more game elements into the nursing curriculum (Havola et al.). Grant and Jenkins (2014) conducted a literature review and found that even though many nursing schools have implemented active learning methods, such as role playing and simulation, there is still inconsistency in the application of the theoretical frameworks and measurable outcomes from the activities.

Gen Z students are familiar with the concept of gaming because of their heavy exposure to technology and social media. College students today use multiple technologies, from podcasts, to YouTube, and other web-based sources (Roberts et al., 2012). Students engage in computerized and web-based games as well and a realistic simulation game resulted in a positive experience for students, according to Koivisto et al. (2018). Other studies have shown that utilizing a game in the classroom increases students' motivation to learn as well as increases engagement and skill proficiency (Alexiou & Schippers, 2018; Khaleel et al., 2016). Realism and authenticity, reported by participants, indicates a positive result (Alexiou & Schippers; Hamari et al., 2016; Koivisto et al.).

Recent research has combined virtual reality with simulation concepts to create a nursing simulation experience that can be accessed from anywhere and by an unlimited number of students simultaneously. Verkuyl et al. (2017) conducted a study using 20 first year nursing students, separated into focus groups, to assess their experience using a virtual reality simulation. Five themes emerged from the data, including experiential

learning, self-efficacy, and knowledge, suggesting that the design does provide modalities more desirable to the newer generations of students, who prefer immersive, competitive educational experiences.

Escape Rooms as a Teaching Method

Escape rooms were first enjoyed as a form of entertainment, but soon after their introduction, the concept appeared in the classroom (Breakout EDU, 2018). The concept of an escape room is that a team of participants must solve puzzles and riddles to receive further clues and to ultimately *escape* the room. The players must escape within the allotted time to win the game. Nicholson (2015) surveyed 175 escape room facilities worldwide and found that many were intended for educational use, and were focused on learning outcomes, such as teamwork and communication. Studies have shown that escape rooms have improved student learning outcomes in various academic disciplines, from chemistry to sports medicine (Clarke et al., 2017; Eukel et al., 2017; Humphrey, 2017; Vergne et al., 2019).

Various academic higher education disciplines utilized an escape room to teach communication skills. Egan et al. (2021) conducted a quantitative study with leadership students, finding significant improvement in self-reported communication skills after the escape room experience. Clarke et al. (2017) designed an escape room, also focused on communication and teamwork, to teach a diverse group of educators how to design their own escape rooms for use in their courses.

The escape room has also been incorporated into nursing education. Feedback from students regarding the escape room has been positive (Gomez-Urquiza et al., 2019). The escape room design appeals to many students because of its immersive, challenging

design. Gen Z students enjoy the competitive, gaming nature of the escape room. It appeals to their preference for technology and active learning as well (Schwieger & Ladwig, 2018).

Studies have shown that the escape room design is effective in teaching communication and teamwork skills to health professional students (Kutzin, 2019). Chou et al. (2014) utilized an escape room with medical students to help foster the medical school's leadership competencies of leading self, communication, problem-solving, teamwork, and systems thinking. Twenty-six students completed the post-participation survey and all of them reported using at least three of the competencies during the activity, with 15 (58%) stating that they used all five. Rhodes (2020) conducted a post-implementation survey of 152 students at the end of the school year, where the students had participated in a nursing escape room activity sometime during the school year. Rhodes surveyed the students to determine whether they found the escape room helpful in applying critical thinking and collaborative skills under pressure.

The escape room design has also been implemented with professional healthcare employees as the participants. Dacanay et al. (2021) utilized an escape room to reinforce communication skills for healthcare employees in a hospital setting. The training was designed to address poor outcomes related to the nurses' early recognition of sepsis patients, as well as to provide a continuing education opportunity for participants. The study incorporated TeamSTEPPS as well, using the SBAR communication teaching material embedded into the escape room. When comparing infection rates from six months prior to the activity to six months post escape room, there was a significant

reduction in catheter associated urinary tract infections, likely a result of the nurses' ability to recognize these patients early, before an infection was obvious (Dacanay et al.).

The potential benefits of incorporating escape rooms into Gen Z student education have been identified in recent studies. Study results have shown a relationship between communication skills, teamwork, and the escape room. Morrell et al. (2020) implemented an escape room simulation with nursing students and discovered that participants indicated that the experience was beneficial to the development of some soft skills, including communication and teamwork. Kinio et al. (2018) conducted an escape room study with surgical medical students. The researchers reported interesting results. Of the four teams of participants, two of the teams utilized a collaborative strategy, working as a team, and two of the groups implemented a more independent approach, solving puzzles individually. The collaborative teams were able to successfully escape the room, whereas only one of the independent teams was able to complete the game in the allotted time. The results may suggest the importance of working collaboratively in a complex patient situation. Ninety-two percent of the students reported in the debriefing session that they felt the escape room design was appropriate for testing their knowledge (Kinio et al.).

Another benefit in the use of escape rooms is the stress levels reported by students themselves. Reed and Ferdig (2021), fourteen students completed a pretest and posttest to demonstrate whether anxiety levels decreased after participating in an escape room to practice patient care scenarios compared to the traditional simulation style learning activity. The researchers found a significant decrease in anxiety levels in students on the posttest. Students also reported that they enjoyed the activity (Reed & Ferdig).

The studies discussed in this section demonstrate positive findings with the utilization of an escape room design to teach communication skills. The studies did not seek to embed healthcare specific communication lessons into their escape room design. The current study fills a gap, teaching communication skills using a didactic approach and then providing an opportunity to practice the newly learned skills in an escape room. The study findings will also report whether the approach of learning these skills in a didactic format and then applying them in an immersive game impacts students' attitudes about the importance of communication in nursing practice.

Summary

The research reviewed in this chapter shows the relevance of the current study's escape room exercise to the industry's central goal of improving patient safety. The fact that patient safety remains a key healthcare challenge despite improvements in technology was clearly visible in the research. Research showing the impact on patient safety of the lack of preparedness among new nurses entering the profession and the resulting problems with retention was also reviewed. The specifics of the leading causes of declining practice readiness among new nurses were identified as weak communication and teamwork skills. Research into several of the leading tools for teaching communication skills – including the SBAR and TeamSTEPPS programs was considered. Research into the particular learning characteristics of the newest generation of nursing students was examined and that generation's importance to the future of the profession was considered. Finally, the teaching methods of simulation, gamification, and escape rooms and accompanying research about their effectiveness were reviewed. Taken together, these studies suggest that there is an opportunity to improve the industry's

understanding of effective teaching methods through further experimentation with the use of escape room scenarios in nursing education. The current study attempts to fill that gap. The methodology of the study will be discussed in the following chapter.

CHAPTER III: METHODOLOGY

Introduction

As discussed in the literature review in Chapter II, a gap in student nurses' communication skills, and therefore readiness to enter the workforce, was identified in the research. One reason for this lack of readiness is that student nurses have had inadequate academic instruction and quality experiences to develop communication skills appropriate to the nursing profession. Administrators have stated that new graduate nurses have struggled to perform at the level of expectation of employers (Kavanagh & Szweda, 2017). Several opinions exist about what the students need to enter the nursing workforce prepared, such as being better able to prioritize patient care issues and analyze patient data (Mirza et al., 2019). Wright (2014) found that the ability to accept feedback was also a key component to a successful transition. Other researchers have argued that communication skills are critical for new graduate nurses (Armstrong, 2019; Carson et al., 2018). Communication skills, such as clearly articulating an idea through verbal or written means, are closely associated with collaboration skills needed to fulfill a role as an effective member of a diverse team (Communication and Collaboration, 2011).

The purpose of this case study was to explore associate degree program (ADN) nursing students' experiences at a Midwestern community college using the TeamSTEPPS communication training curriculum. The case study incorporated the TeamSTEPPS curriculum into a patient simulation designed as an escape room that

taught and reinforced nursing communication skills. The current study also reports the results of the TeamSTEPPS Teamwork Attitudes Questionnaire (T-TAQ, see Appendix A) before and after the interventions. This survey aids in triangulating the obtained data to explore students' perceptions of the importance of communication skills and may demonstrate a difference in those perceptions after the interventions.

Chapter III will describe the researcher's methodology concerning research design, participants, data collection, analytical methods, and limitations. The methodology and methods used by the researcher to answer the research questions is provided in this chapter.

Research Questions

As discussed in the literature review, escape rooms are a newer, effective method to learn and practice various nursing skills. Therefore, the current study explored how an escape room, combined with a didactic lesson would impact the perceptions of students regarding their communication knowledge. Students' perceptions were collected using a questionnaire to collect data about which style of learning was preferred and if the combination of the didactic approach and an immersive game enhanced the students' perceptions. Demographic data (i.e., age ranges) was collected from the participating students to aid in the generational analysis of the results. The current study is guided by the following research questions:

1. When TeamSTEPPS training is utilized in an escape room patient scenario, what impact does it have on nursing students' perception of their communication and its relevance to teamwork?

2. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students explain their perceived changes in attitudes towards communication as it relates to teamwork?

3. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students perceive didactic and immersive game approaches to their development of communication techniques?

Data collected for the research questions was analyzed using a qualitative approach, identifying major themes in student perceptions. This method of analysis is appropriate because the goals of the study were to ascertain whether students' perceptions of their communication skills and their attitudes towards communication skills would improve after the TeamSTEPPS curriculum and the escape room activity.

Research Design

Qualitative research is an appropriate design when the researcher seeks to empower individuals to share their stories and to minimize the power relationship that often exists between the researcher and the participants (Creswell & Poth, 2018). A qualitative approach to research is situated within the context of the participants and presents a holistic picture of the phenomenon being studied (Creswell & Poth). A qualitative research approach is the best approach when the research questions ask what, how, and why related to a phenomenon (Creswell & Poth; Yin, 2014).

A case study design is often used to clarify complex ideas and can be used to interpret a current, real-life problem for a group of participants (Yin, 2014). Data collected in this case study was used to explore nursing students' experiences using a didactic method of learning communication skills, followed by an immersive game to

further practice their communication skills. The case study method was an appropriate method for the current study because the researcher examined the real-life experiences of a group of participants, bound by the time and place (i.e., during a simulation course at a community college). In contrast to an ethnography, which examines the culture within a population, a case study seeks an in-depth understanding of a case, as it is happening, and can result in a specific illustration of the issue that the researcher(s) seeks to understand (Creswell & Poth, 2018). According to Creswell and Poth and Yin multiple forms of qualitative data analysis should be implemented in a case study. The current study utilized interviews, observations, audiovisual materials, and survey methods.

The focus group interview is appropriate in this situation since the participants are familiar with each other and it is possible that the participants would not be as responsive in a one-on-one interview setting (Creswell & Poth, 2018). The focus group allowed participants to share ideas and build on each other's responses. The focus groups were based on the same group that completed the escape room activity together, which helped students collaborate and share experiences that occurred during the escape room. Interviews can help to provide insight and personal views and attitudes of participants (Yin, 2018).

A quantitative survey, the TeamSTEPPS Teamwork Attitudes Questionnaire (T-TAQ, Appendix A) was completed by participants to collect the personal attitudes towards the importance of communication in healthcare. The survey includes six questions and is scored using a five-point Likert-like scale. Participants completed the survey at the beginning and end of the escape room exercise. Though the current study is a qualitative case study, this quantitative survey further supports the qualitative data

collected through interviews and observations. Specifically, once the qualitative interview response and observation data had been standardized and cross referenced with the participant profiles it was comparable to the quantitative data from the T-TAQ questionnaire results.

As Creswell and Poth (2018) suggest, observations assist the researcher in capturing activities and interactions among participants in a qualitative study. A case study design likely takes place in the real-world setting of the case, which provides an opportunity for direct observation (Yin, 2018). According to Yin, observations of the group in action can provide invaluable data which will complement the interviews. The researcher was a non-participant observer and recorded the escape room activity to identify communication methods and instances to discuss with participants during the debriefing period after the escape room, and during the final focus group interview.

Participants and Setting

The study took place at a satellite campus of a Midwestern community college. The college offers a four-semester ADN program. The ADN curriculum includes didactic nursing courses, nursing skills lab courses, as well as clinical experiences and simulation courses offered in the nursing laboratory. The participants in the current study were students in the third semester and enrolled in the Nursing Simulation course. The course comprises critical care concepts delivered to students through lectures and readings and current evidence-based practice guidelines. The students then participate in patient simulations to practice the newly acquired concepts in a realistic scenario. Students are assigned different roles throughout the course, including nurse, nurse's aide, and charge nurse. They are expected to work together to make decisions about patient care in real

time. The current study was conducted on campus in the nursing laboratory and simulation rooms.

The sample in the current study was a convenience sample of 11 nursing students in their third semester of the nursing program. All students were required to participate in the interventions as part of the course curriculum. However, individual data was excluded from the findings for any student who did not wish to be included in the study. Students were provided with an informed consent form through the online course portal. Students who were willing to contribute data to the study signed the consent and uploaded it to the portal. Those students who did not wish to contribute data did not sign the consent form. Students were advised in the consent form that they could withdraw their contribution to the study at any time without any repercussions. No student who either declined to contribute or withdrew from the study would experience any impact on their grade in the course or in their college standings, nor would their academic relationship with the teacher/researcher be affected. No student opted to be excluded from the results.

Seven of the 11 participants identified as being Gen Z, meaning that they were 26 years old or younger. The remaining four participants disclosed that they were older than 26 years. Ten of the 11 participants were female, and one was male. For the escape room exercise, the 11 participating students were randomly assigned into three teams. The demographic mix of each team is noted in order to put Chapter IV's findings in context. Pseudonyms have been used for all participants. Team 1 consisted of four students. All were female. Elizabeth and Karen identified as Gen Z. Patricia and Jennifer were not Gen Z. Team 2 consisted of three students. John identified as male and Gen Z. Linda

identified as female and Gen Z. Sarah identified as female but was not a member of Gen Z. Team 3 consisted of four female students. Mary, Barbara, and Jessica identified as Gen Z. Susan is not a member of Gen Z.

Procedures

The data collection process began on the day the TeamSTEPPS Training was delivered to the students. It continued during subsequent weeks as the raw material collected during training was standardized and organized. On the day of the exercise, student interview responses and researcher observations were collected through a combination of video (via an iPhone and Apple's Camera app) and researcher notes per the observation protocol (Appendix C).

The first step of data collection was the administration of the T-TAQ questionnaire. As noted earlier, the questionnaire used in this study (Appendix A) was a subset of the original instrument developed by the AHRQ for the TeamSTEPPS program, which assessed the students' attitudes toward the importance of communication among the healthcare team members. The full questionnaire covers the following categories: Team Structure, Leadership, Situation Monitoring, Mutual Support, and Communication. Because this study focused on the communication module, students only completed the Communication section of the T-TAQ, which consists of six questions. Each question in the questionnaire asks the student to rate their agreement with a statement on a scale ranging from strong disagreement to strong agreement, similar to a Likert scale. The six-statement questionnaire was completed by all 11 students and collected by the researcher.

Next, an open ended, semi-structured interview was conducted involving all eleven participating students before the interventions. The interview questions (Appendix

B) were intended to explore how participants viewed communication skills and their importance to their practice as nurses. Participants were encouraged to answer the questions honestly, avoiding any reflexivity in their responses.

Next, the researcher delivered the content of the TeamSTEPPS communication material from the AHRQ website (Agency for Healthcare Research and Quality, 2019). This slide presentation was provided to students in a lecture format. No student responses were captured during this lecture.

After the lecture, each of the three teams entered the escape room in sequence and attempted to solve the four puzzles in the allotted time. The escape room concept has existed for several years in the entertainment sector, but the design entered the classroom in the 1990s (Nicholson, 2015). The concept involves a team of players locked in a themed room and the team must work together to solve puzzles and riddles using various clues they come across. The goal is to solve the final puzzle and *escape the room* within the allotted time. The escape room design, used in education, has gotten positive feedback from students, especially Gen Z students, who have been raised with technology and have also used gaming systems in education in different ways (Adams et al., 2018; Nicholson).

The escape room also supplies a time pressure that students may not normally feel when they are in nursing school but that they will experience when they are practicing in the nursing profession. Nurses must make decisions quickly, sometimes with minimal information, and this is a skill that nursing students do not get to practice regularly in school. Traditionally, patient simulations are used to help students critically think and make life or death decisions, but the escape room forces them to do it even faster.

Nursing students proclaim simulations to be anxiety causing, stating the activity to be terrifying and some even stated it was more stressful than a clinical experience (Reed & Ferdig, 2021). There are various reasons that students report feeling anxious, including the fear of making an error, the instructor watching them, and lack of consistency among faculty expectations. Creating an instructional tool incorporated into a game provides students with a way to learn or practice skills, but in an entertaining way. This design should foster more camaraderie and teamwork among the students and be a less anxiety-causing activity.

Participants were asked to limit their cell phone usage to scanning QR codes that provided prompts and clues for each puzzle. The students were oriented to the simulation room by the researcher. The researcher observed the groups through a one-way mirror as they proceeded through the game. The simulation control room offers the ability to hear the participants and communicate with them with a microphone. The microphone offered a way to provide clues, when requested by the teams. The timed game consisted of four puzzles and riddles to solve to escape the room within the allotted time, which was 30 minutes (Appendix D). The researcher made contemporaneous notes while observing each team's escape room exercise, following the protocol in Appendix C.

After escaping the room, each team completed the T-TAQ questionnaire a second time. Immediately afterward, each team was interviewed by the researcher and their responses were captured via the instructor's notes. After the team interviews were concluded, the entire class of 11 students engaged in discussion with the researcher about

the training and their impressions of its effectiveness. This discussion was filmed using an iPhone and Apple's Camera app. This step completed the data collection on the day of the exercise.

In subsequent days, the data collection process continued with the manual review and transcription of the video recordings. The transcripts were manually created in a Microsoft Word document. Also, the researcher's handwritten notes and observations were manually keyed into a Microsoft Word document. The students' T-TAQ questionnaire responses were manually keyed into a Microsoft Excel spreadsheet. Finally, each individual response and observation that had been transcribed into Microsoft Word was exported as distinct records to Microsoft Excel along with the demographic data for the student respondent. The result of this phase of the data collection process was a Microsoft Excel spreadsheet with 299 records containing individual student responses and researcher observations and notes. A separate Excel spreadsheet contained the T-TAQ responses. Finally, the researcher used standard Microsoft Excel graphing functions to visualize the T-TAQ questionnaire results.

The Researcher's Role

As the researcher in the current study, I designed and executed the exercise while drawing upon my 10 years of experience as a healthcare professional, first as a registered nurse and then as a board-certified nurse practitioner and associate professor of nursing. For the past six years I have been a faculty member in the nursing department at the Midwestern community college where this research took place. The test population consisted of a convenience sample of 11 of my third semester students in a simulation course. The facility that served as the research site is the classroom and simulation

laboratory on campus at the community college where my students and I regularly meet for class. The manikin and equipment that was used in the current study's simulation were familiar to the students and had been used before in their classwork. For the students, the only new element that was introduced in the current study was the escape room setting. The research was conducted mid-semester; therefore, the students and I were familiar with each other and did not suffer from hesitance or uncertainty in our interactions.

I do not believe I brought any conscious biases to this research beyond a commitment to my students' education and a professional stake in finding the best way to prepare them for entry into the profession. Prior to the current study, I had personal experience with game rooms only in a recreational capacity. My design of the escape room was based upon my personal experience and my research combined with my knowledge of the available equipment in my college's simulation laboratory. The data collection and analysis for the current study was entirely my own with some technical assistance from a third party regarding the Microsoft Excel graphing functions used in the visualization of the current study's data. My conclusions and recommendations for further research (detailed in Chapter V) are based upon my professional experience and the findings of the current study. No other factors influenced my work on this project.

Data Collection

According to Yin (2014), it is important to use more than one form of data collection to corroborate and triangulate qualitative data in a case study. The current study incorporated interviews, observations, documentation, as well as a quantitative survey to answer the research questions posed. The researcher assessed the authenticity

of all documents. Semi-structured interviews helped the researcher collect the perspective of the participants (Creswell & Poth, 2018). The use of observation and recording of the escape room activity helped the researcher collect the data in real time to analyze later for theme development. As suggested by Creswell and Poth, an observation protocol was utilized (Appendix C) to keep notes and develop a chronology of events during the escape room. The utilization of multiple methods of data collection provided a strong foundation to support research findings.

Participants completed the TeamSTEPPS Teamwork Attitudes Questionnaire (T-TAQ) at the beginning of the intervention and again at the end. The T-TAQ was developed as part of the TeamSTEPPS program to assess attitudes towards the core components of teamwork in healthcare. Participants were interviewed at the beginning and end of the study, to collect their individual opinions and attitudes towards communication skills and the nursing team. Participants completed the TeamSTEPPS Fundamentals Communication module and then participated in an escape room patient simulation to practice the learned skills. The researcher recorded observations of communication skills being utilized during the activity.

Data Analysis

A debriefing session was held following the escape room where participants discussed the activity and completed their second interview and T-TAQ. After participants were debriefed, results from the T-TAQ (both before and after the interventions) were tallied to determine whether the participants' communication attitude scores improved after their experience. Additionally, interview responses were analyzed to capture participants' perceptions of communication skills and how the interventions

influenced those perceptions. Finally, researcher observations were analyzed to discuss participant utilization of communication skills during the escape room activity.

Data from the current study was analyzed using qualitative and quantitative research methods. Themes were identified based on semi-structured interview questions and observations by the researcher during the escape room. Descriptive statistics were incorporated to compare the results of the TeamSTEPPS TAQ, a quantitative method, taken at the beginning and end of the study. These statistics were intended to triangulate the qualitative data collected.

To glean meaning from the free form responses and observation data, the researcher engaged in a multi-phase coding process. The first cycle coding of the data was implemented manually, using an initial (open) coding technique to identify commonalities among the various modes of data collection. Saldana (2016) states that initial (open) coding allows the researcher to reflect on the data and to identify areas for further exploration. All transcript data was keyed into Microsoft Word and then exported to Microsoft Excel for coding and data visualization. Microsoft Access was used to analyze the coded data. Initial codes were identified by transcribing all data, highlighting key words and phrases, and assigning a descriptive code to the data.

The researcher then collected the codes across the various data collection sources (surveys, observations, focus group interviews) and noted codes that overlapped among the different tools. The first cycle of coding identified 44 codes that overlapped throughout the data from the various sources. After the codes were established during the first cycle coding process, the codes were then coded manually to combine individual codes into broader themes and concepts. According to Saldana (2016), this approach,

which summarizes codes into a smaller number of categories is called Pattern Coding and is appropriate for a qualitative study where the researcher is attempting to identify major themes from the data. During the second cycle coding the researcher recoded the data to develop overarching themes for the data. This process of second cycle coding resulted in reducing 44 codes to 24 descriptive codes.

A third and final cycle of coding was implemented with the final 24 codes. The researcher sought to further broaden the codes into main concepts or themes. By cross-referencing the original comment/observation and code with the identity of the participant, the researcher identified six themes that emerged from this final step in the coding process. The table of codes and themes is attached in Appendix F. The six main themes are introduced and discussed in the next section.

Engaging in the analysis of the collected data within the context of the research questions was the focus of the remainder of the study. The first research question, which sought to explore how a didactic lesson and an immersive game may impact a nursing student's attitude regarding communication skills, was addressed by examining the participant responses to the semi-structured interview questions from before and after the interventions. Participants were asked to reflect on their experience and share any preferences that they may have had as it relates to teaching methods utilized.

The second research question sought to explore how participants explained any changes in their attitudes towards communication skills and their importance. This question was answered by comparing the TeamSTEPPS TAQ results from before and after the intervention and then encouraging participants to explore any differences in their results. Additionally, focus group interviews also captured participant explanations about

differences in their perceptions about communication skills after the communication module presentation and the escape room.

The third research question was answered by the semi-structured focus group interview that occurred at the end of the study. This question sought to explore whether students preferred a traditional teaching modality, the didactic lecture, or the immersive game. The goal was to gauge whether immersive games are more enjoyable and effective than traditional teaching methods.

Ethical Considerations

The current study presented several ethical issues that had to be addressed in order to preserve the integrity of the work. First, the confidentiality of the data collected had to be considered. To address confidentiality issues, participants were assigned pseudonyms and they were not asked for any personal identifying information other than their name and age range. Survey and interview responses, as well as video recordings of the escape room, have been stored on a computer that is password protected to further ensure participant confidentiality. The participants were made aware of the purpose of the study to ensure no deception takes place.

In the current study, as in all educational settings, there existed the possibility that students may forego the expression of honest opinions in favor of answering questions in the way they assume the researcher wants to hear. To address this risk the researcher encouraged the students to be honest in their responses and assured them that the research had no impact on their grade for the course. The researcher reminded the students that the course grade is derived almost entirely from objective test scores.

A competitive game exercise like the escape room in the current study carries a risk of inducing stress or anxiety in the participants. To alleviate this risk, the researcher reminded the participating students that healthcare communication takes practice and skills can always be improved. The researcher also noted that the game simulation mimicked a real-life scenario in which nurses must make decisions under the constraint of time. The students were reminded that simulated experiences are important places to learn critical thinking skills, while under time pressure, which prepares nursing students for their future career as a nurse.

Finally, it was important to consider the escape room game security. There was potential for participants to share some of the details of the puzzles with others, which would make the experience less effective for those participants. To mitigate the risk in the current study, the student teams were isolated from each other after completing the escape room.

Summary

This chapter identified the process and components of the study conducted. Participants were described and the data collection process was explained. Both qualitative and quantitative data collection methods were discussed. Chapter IV will address the findings and interpret the results.

CHAPTER IV: FINDINGS

Introduction

The purpose of this qualitative case study was to ascertain whether nursing students would perceive improvements in their communication techniques after the TeamSTEPPS communication curriculum was introduced and applied in an escape room patient simulation. As part of the study's data collection effort, the participants were asked to explain whether the escape room patient simulation further enhanced their perceptions of communication techniques. The study took place at a Midwestern community college, with 11 third semester associate degree nursing students. All 11 participants had prior experience with patient simulations, but in the current study participated in a patient simulation designed as a team-oriented escape room.

A qualitative design was chosen for the current study since the researcher sought to determine whether an escape room would enhance students' perceptions of communication. McCusker and Gunaydin (2015) stated that a qualitative design will facilitate understanding the experiences of healthcare workers because the design allows individuals to describe issues. A qualitative design is often used in the nursing profession because it allows participants to provide a detailed description of an issue without any interpretation (Squires & Dorsen, 2018). The design helped to bring an understandable description of the participants' perceptions of communication within a healthcare team.

Research Questions

The guiding research questions for the current study consist of the following:

1. When TeamSTEPPS training is utilized in an escape room patient scenario, what impact does it have on nursing students' perception of their communication and its relevance to teamwork?
2. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students explain their perceived changes in attitudes towards communication as it relates to teamwork?
3. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students perceive didactic and immersive game approaches to their development of communication techniques?

The researcher was guided by several factors from the literature review detailed in Chapter II to analyze the study's results through the prism of the generational makeup of the participants. First, research has established that Gen Z students will dominate new student enrollment in healthcare education in the coming decade (Plochocki, 2019). Second, Gen Z students have demonstrated a unique learning profile, including a greater comfort with technology, a shorter attention span, less developed social skills, and a preference for immersive, hands-on learning methods (Chicca, 2018; Plochocki; Shatto & Erwin, 2016). Third, research has shown that as each generation enters college, the generational differences, including how the members experience the world and workplace, should be considered when designing study and work environments (Serafin et al., 2020). Finally, additional research suggests that it is essential to update the educational framework to meet each generation's unique learning style and preferences

(Shorey et al., 2021). Together, these factors led the researcher to include a generational analysis of the data when exploring the current study's research questions.

Results

Main Themes

After careful analysis of all the data collected, six main themes emerged to assist the researcher in answering the research questions. The overarching themes include:

a. The participating nursing students perceived that the combination of formal TeamSTEPPS training and the escape room exercise raised their awareness of the importance of communication to a health care team.

b. Gen Z students perceived that the TeamSTEPPS training and exercise had a greater impact on their awareness of communication as a critical factor in team performance.

c. The participating students explained that the opportunity to apply the TeamSTEPPS strategies in a hands-on team competition emphasized to them that the team's communication effectiveness directly impacted the team performance.

d. The participating students explained that the communication mistakes that they made during the escape room exercise cemented their awareness of the direct link between communication and team performance.

e. The participating students perceived immersive game approaches as a valuable training tool in developing their communication skills.

f. Gen Z students demonstrated a greater affinity for immersive game training relative to other students.

In the following section the researcher will discuss how these themes relate to each of the three research questions.

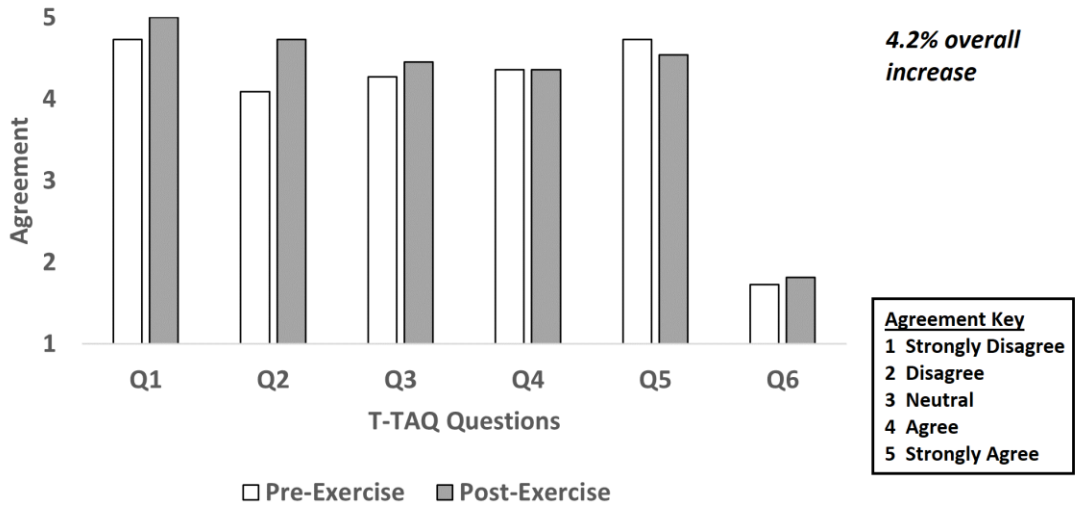
Research Question 1

When TeamSTEPPS training is utilized in an escape room patient scenario, what impact does it have on nursing students' perception of their communication and its relevance to teamwork?

The impact of the TeamSTEPPS training positively impacted students' perception of their communication and its relevance to teamwork. Students demonstrated this change in perception in their T-TAQ scores. As shown in Figure 1, students scored a 4.2% increase in the Likert-like rating scale of the T-TAQ statements after the training exercise relative to before the exercise.

Figure 1.

T-TAQ Scores Before and After Training



The fact that the T-TAQ scores increased after the exercise was a positive outcome. Even though the increase was small, at 4.2%, it is worth noting since the nursing students have had some foundational education in the importance of communication on the health care team. This exercise brought the concept back to the forefront of the learning goals for the exercise.

Students demonstrated the impact of the TeamSTEPPS training on their perception of their communication and its relevance to teamwork in their performance in the escape room. They were observed to apply TeamSTEPPS communication strategies during their attempts to solve the room's puzzles. Researcher observations documented during the escape room support this interpretation. During Team 1's attempt at the escape room, the researcher observed that *all four students were talking and confirming what had been checked*. Another of the researcher's observations highlighted the key communication strategy of active listening. The researcher noted that *all students were actively listening at this point and were close together*. The researcher went on to observe the respectful team dynamics of Team 1 by stating that *everyone was communicating well and that there was no one talking over each other*. Similarly, the researcher noted Team 1's *cooperative tone* and use of *healthcare terminology*. The researcher concluded that *the team discussed almost every decision and came to a consensus*.

Team 2 and 3 had a higher proportion of Gen Z students and showed a similar practical grasp of the value of the TeamSTEPPS communication principles in their escape room exercises, particularly the use of the *call out* principle. The researcher observed that *Sarah verbalized the math to calculate the infusion rate, but the question asked for number of units to be delivered, not the rate of milliliters per hour. Linda and John both corrected her*. Another example of effective verbal communication was evident when the researcher observed that *all are gathered close together, reading, but Barbara reads it out loud*. The researcher noted an uneven use of the white board among the three teams but did observe that Team 3 relied upon the white board most heavily and was most effective in its use. The researcher observed that *Susan suggested writing down*

what they need to keep track of the answers. The researcher noted the respectful tones of Teams 2 and 3 when she commented that *all answers offered were considered. No one outwardly disregarded any answer*. Finally, the researcher commented on the leadership qualities of one member of Team 3 with the following observation: *Susan took on a leadership role and began to allocate tasks. She wrote information on the dry erase board and organized the answers for the group*.

Students demonstrated an increased perception of the importance of communication as it relates to teamwork in their post-exercise interview responses. Karen, a Gen Z student in Team 1, commented, "Yes. I knew communication was important, but seeing all the tools like TeamSTEPPS and IPASSTHEBATON and everything that have been created made me realize how important it is to nursing." Barbara, another Gen Z student, agreed when she said, "I was much higher the second time. I mean I agreed with the statements on the T-TAQ more." Two non-Gen Z students, Jennifer and Sarah, indicated that the training did not change their responses on the T-TAQ questionnaire, but it did add certainty to their understanding of the importance of communication to teamwork. As Jennifer noted, "I did not change my answers much the second time, but I had already ranked communication as being very important the first time. The videos in the slides showed how real nursing depends on good communication." Similarly, Sarah observed, "I don't think my answers changed much, but I definitely think the slides and the escape room showed how communication is necessary. The slides showed how much work has gone into creating ways of communicating in nursing and team things always depend on communication." Sarah went on to speculate about the mix of training methods. "I wonder if we could do more

things like this. I think the combination of the slides and the hands-on escape room back-to-back really works well." Mary, a Gen Z student, agreed that the combination of training tools was useful to the class when she said," I agree that today with the lecture and then the escape room was a good way to show how important communication is."

It was notable that Gen Z students perceived that the TeamSTEPPS training and exercise had a greater impact on their awareness of communication as a critical factor in team performance than with non-Gen Z students. This difference in perception was shown in the Gen Z T-TAQ scores. Gen Z scored a 7.3% increase in agreement with the T-TAQ statements after the exercise. Conversely, non-Gen Z students showed a minimal change in agreement. Figure 2 and Figure 3 show the contrast between the two student populations in terms of their T-TAQ scores.

Figure 2.

Gen Z T-TAQ Responses Before and After Training

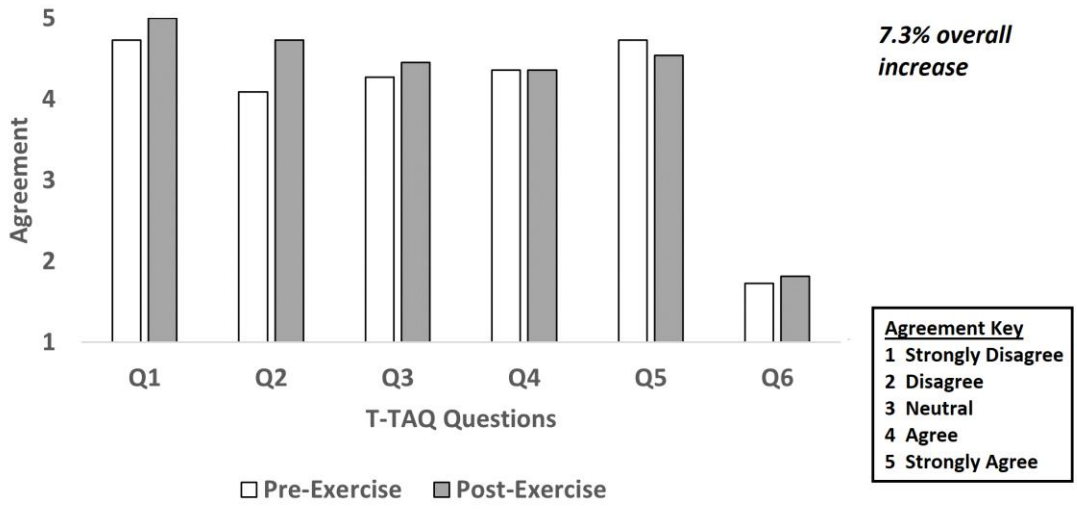
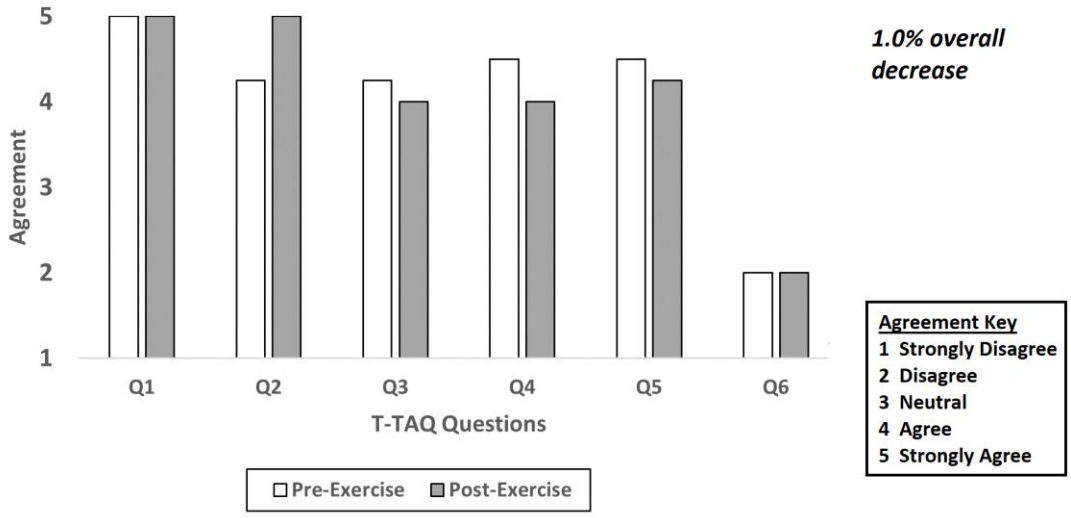


Figure 3.

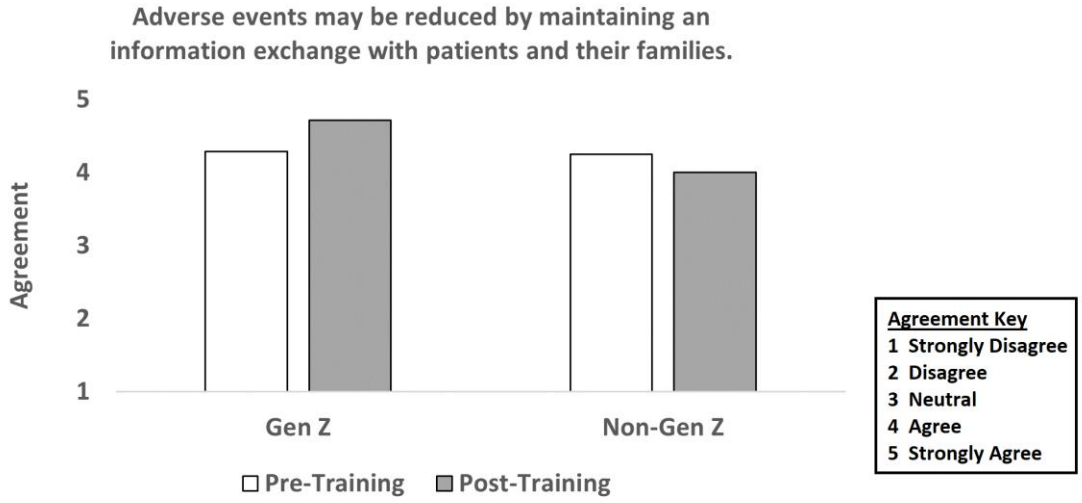
Non-Gen Z T-TAQ Responses Before and After Training



The distinct perceptions between the two student populations are more pronounced when focusing on individual T-TAQ questions. For example, the Gen Z student perceptions of the value of patient and family communication with the health care team were influenced differently by the TeamSTEPPS training and escape room exercise. Gen Z students demonstrated a 10.0% increase after the training while non-Gen Z students showed a 5.9% decrease. Figure 4 shows the generational contrast.

Figure 4.

T-TAQ Question 3 Responses Before and After Training



Research Question 2

After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students explain their perceived changes in attitudes towards communication as it relates to teamwork?

As noted in the Research Question 1 section, the training exercise raised the perception of the value of communication among the students. Results of the T-TAQ survey demonstrated a 4.2% increase in attitudes towards communication as shown in Figure 1. Students who scored higher on the T-TAQ were asked why they changed their scores. Their responses revealed an appreciation for the TeamSTEPPS principles. Jennifer linked communication principles with the goal of the exercise when she noted, “The escape room and the slides together made me think more about communicating well. It was the only way for us to win.” Linda, a Gen Z student, agreed by commenting, “Seeing the slides right before made us conscious of talking to each other in the room. We were trying to call back to each other.” Sarah concurred: “That's what I meant about

the slides. There were lots of good techniques in there and the escape room gave us a chance to use them." Mary, another Gen Z student, had a similar comment: "I liked how the slides pointed to actual examples of good communication and described them in different ways. Both in writing and in the videos. And then we turned around right away and had to call out and check back in the room." Finally, John and Karen both supported Mary's observation. John said, "We used the 'repeat back' technique in the room." Karen added, "We used 'call out' in the room."

The participating students explained that the opportunity to apply the TeamSTEPPS strategies in a hands-on team competition emphasized to them that the team's communication effectiveness directly impacted the team performance. Research conducted using immersive games rarely focuses on communication skills, and researchers have generally not explored using a standardized communication curriculum embedded into an immersive game. The current study combined modalities as well as focuses on communication skills.

The participating students explained that the communication mistakes that they made during the escape room exercise cemented their awareness of the direct link between communication and team performance. Specific mistakes that the students demonstrated in the escape room and mentioned in interviews afterward included information hoarding, physical proximity and discomfort, and overly deferential behavior. These in-game experiences were highlighted by several students during interviews. Elizabeth, a Gen Z student, spoke to the frustration that can result from poor communication when she observed, "[We] end up arguing with teammates because [of] incorrectly understanding communication or there was no communication." She went on

to highlight the particular value that the escape room provides in forcing the students to confront the frustration of their mistakes. She said, “When we were stuck in the escape room – like on that question about what's not important for communication and we didn't get ‘audible’ – it was so frustrating. It's not like just getting a question wrong on a test. I'll never get that wrong again.”

Several students observed how overly aggressive or deferential behavior can sabotage team dynamics and, ultimately, team success. John confessed, “I should have called for help sooner. I got stuck with the pump and couldn't help with the lock boxes.” Sarah agreed by saying, “We got stuck on the PT/INR lab twice. When we listen to other team members’ answers to a question we should apply our own knowledge to the question, just as a backup.” She went on to acknowledge that she struggled in the team environment. She said, “We had pretty good teamwork except when John just blurted out an answer and we just went with it. I'm not a speaker upper.” Elizabeth, another Gen Z student, made a similar remark. She confessed, “We got stuck on the last question with the PT/INR because one person felt sure about needing it and we all just went with it.” Sarah commented on the physical challenges presented by the escape room. Sarah said, “Being so close together made us uncomfortable and harder to communicate.” Linda concurred by observing, “I was the only one scanning the QR codes and maybe my team members needed to read the clues themselves to really understand.”

The researcher also observed communication challenges playing out in the escape room. She noted that *Jennifer started reading the clue out loud, but not very clearly or loud enough. The other students got closer to her to hear*. The researcher went on to state that *Karen was trying to read over Elizabeth’s shoulder*. The researcher also observed the

overly deferential behavior of some of the students and the impact on team performance. She wrote that *Elizabeth repeated that intake and output is important. No one challenged her. John was very quick to answer questions and was often incorrect. Once the other participants saw this happen, they were more likely to question his answers*. Finally, the researcher observed a clear example of information hoarding that hampered the team's ability to escape the room. She noted that *John picked up the lock box and realized the other two were not lining up the numbers correctly on the box. He fixed the situation and tried some numbers and got the code. But they never verbalized that 'audible' was the answer. They were ultimately guessing*.

Research Question 3

After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students perceive didactic and immersive game approaches to their development of communication techniques?

The participating students perceived immersive game approaches as a valuable training tool in developing their communication skills. This perception is demonstrated in responses to post-exercise group interview questions. Elizabeth, a Gen Z student, focused on the unique requirements of the escape room when she commented, "The escape room makes us talk to each other to solve the puzzles." Karen agreed. Her observation about the teamwork inherent in the escape room suggests a possible distinction between the room and a typical simulation. Karen said, "The escape room was good because it was a team test. We were all going to get out together or we were going to fail together. We had to work together and communicate." Many other students commented on the value of the escape room. Jennifer was more explicit in her distinction between an escape room and a

traditional simulation. She began by noting the value of simulations "in general" but then contrasted them the escape room. She stated, "I think simulations in general are good for learning. It's different than just reading. I think we need to mix it up a little to learn. … We brainstormed to come up with answers and we don't do that in a simulation." Jennifer's perceived distinction between traditional simulations and escape rooms and the benefits of the latter for team dynamics was one of the highlights of the collective student feedback. The escape room format put several of the students at ease relative to traditional simulations. Sarah made this point explicitly when she said, "We didn't feel like sitting ducks. We just jumped in today." The distinction between traditional educational simulations and escape room training exercises will be noted in Chapter V's discussion of additional research opportunities.

The Gen Z students were especially vocal in their affinity for immersive game training relative to other students. This Gen Z affinity was evident in the more frequent positive interview responses regarding gamification in education. Although Gen Z students made up only 64% of the student population, they made 82% of the coded responses that affirmed immersive game training as a valuable educational tool. Karen's remark was typical of her peers. She commented that, "I liked the escape room. It was something different. It made us work in a different way." John pointed to the team aspect of the escape room when he noted that, "The escape room had multiple things going on at once and we had to work together to get it done." Linda expressed appreciation for the reduced stress of a team exercise. Her observation echoed Jennifer's endorsement of escape rooms as providing a more enjoyable educational experience. Linda said, "I liked the team part of it. Doing a simulation on your own is more stressful. Escape rooms are

fun, and it helps to work together." John and Elizabeth concurred. John stated, "I think it was less stressful because you are usually watching us, and we feel like we are being criticized." Elizabeth added, "Going in as a team was less stressful than being assigned as RN1, which has very specific expectations." Finally, Jessica and Barbara both expressed support for the unique format of the escape room as a learning environment. Jessica stated, "I think the different format from our usual class made the information more real. It's easy to get in a rut in class so that sometimes I don't focus on what's important." Barbara concluded, "That's true. It helps to switch things up in how we do things."

Summary

The purpose of this qualitative case study was to explore how third semester nursing students in the Midwest perceive the importance of communication in teamwork after experiencing a traditional instructional module from TeamSTEPPS and then participating in a team-based escape room patient simulation game. This chapter introduced the six main themes that emerged from the data and demonstrated an increased perception of the importance of communication by students. The answers to the three research questions were also discussed, highlighting quotes from participants as well as researcher observations. The following chapter will discuss the conclusions and implications of the current study.

CHAPTER V: CONCLUSIONS

Introduction

The purpose of this case study was to explore how a patient simulation designed as an escape room when combined with a traditional training curriculum would affect undergraduate nursing students' perceptions of communication. The student participants received a didactic lecture on communication techniques and then participated in the escape room. The lecture focused on communication techniques that are intended to be used when making patient care decisions under the pressure of time. The escape room provided students the opportunity to practice communication techniques while also experiencing a patient simulation activity where the participants must communicate and work together as a team to make patient care decisions and solve the embedded puzzles.

This final chapter will summarize the study's findings from the perspective of the identified research questions. Next, this chapter will discuss the findings within the context of the referenced literature and will consider the study's implications. Finally, this chapter will make note of the study's limitations and present recommendations for further research.

Summary of Findings

The study's research questions provide a structure for considering the research findings. The first question relates to the impact of the training exercise on student perceptions. Research Question 1. is repeated here:

When TeamSTEPPS training is utilized in an escape room patient scenario, what impact does it have on nursing students' perception of their communication and its relevance to teamwork?

Student perceptions of communication did change after the training. This shift can be seen in both the 4.2% increase in T-TAQ scores and in the students' performance in the escape room. Students were observed to apply TeamSTEPPS communication strategies during their attempts to solve the room's puzzles. The participants' change in perception was also evident in their interview responses. All students expressed appreciation for the escape room simulation as a learning tool. It is noteworthy that in both their T-TAQ scores and in their responses, the Gen Z students showed a greater increase in their perception of the value of communication than did the non-Gen Z students.

The study's second question focused on how the participants explained their change in perception. Research Question 2. is repeated here:

After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students explain their perceived changes in attitudes towards communication as it relates to teamwork?

In their interview responses, the students repeatedly pointed to the immediate opportunity to apply the learned communication techniques as the key to their changed perceptions. The students entered the escape room conscious of the need to communicate in order to win the game. They made frequent reference to the hands-on nature of the exercise as a useful element in their learning. The students also noted the learning

benefits of being *stuck* by one of the room's puzzles due to their own errors. This experience served as a visceral reminder of the practical value of the lesson material.

The third question related to the study participants' perceptions of the use of a game simulation in education. Research Question 3 is repeated here:

After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students perceive didactic and immersive game approaches to their development of communication techniques?

The participating students perceived immersive game approaches as a valuable training tool in developing their communication skills. They noted that teamwork was necessary to escape the room and commented on its value relative to lectures and traditional simulations. Several students commented that the escape room exercise put them at ease relative to other learning formats. The Gen Z students were especially vocal in their affinity for immersive game training relative to other students. Although Gen Z students made up only 64% of the student population, they made 82% of the coded responses that affirmed immersive game training as a valuable educational tool.

Discussion

The findings revealed that nursing student participants in the current study perceived an increase in the importance of communication skills to their performance on a health care team. Research has shown that the TeamSTEPPS curriculum has improved undergraduate students' perceptions of teamwork and communication (Baker & Durham, 2013; Brock et al., 2013; Liaw et al., 2014; Maguire et al., 2015). Therefore, it is not surprising that the students in the current study demonstrated similar improvements in their overall perceptions. Although similar in many respects, the current study included a

distinct element – the use of an escape room as a training tool – and yielded comparable results. An analysis of the findings of one of these studies (Maguire et al.) highlights both the similar and distinct findings of the current study.

Maguire et al. (2015) implemented TeamSTEPPS into a training exercise as part of an undergraduate nursing program. The study's focus was on teamwork, but the training exercise included all five subscales of the TeamSTEPPS curriculum, including communication. Maguire et al. provided the test population of students with a mix of traditional didactic lecture of TeamSTEPPS concepts and team exercises. Like the current study, Maguire et al. measured the training impact with the T-TAQ questionnaire. However, Maguire et al. did not include a game component. Maguire et al. showed an improvement in overall perceptions of teamwork when measured by T-TAQ scores but showed only minor impacts on perceptions of communication.

In comparison, the current study utilized simulation and TeamSTEPPS content with a focus on communication. The current study elevated the simulation-based training by adding a gaming element, with the use of the escape room design. As research has shown, Gen Z students prefer a gaming or immersive approach to learning (Schwieger & Ladwig, 2018). The addition of a competitive component to the standard simulation model made the activity more aligned with Gen Z student preferences. This conclusion is supported by a comparison of the Maguire et al. (2015) data with the data from the current study. Table 1 shows the T-TAQ communication mean scores from the two studies and highlights the impact of the training on Gen Z students in the current study. The table illustrates the commonalities between the current study's non-Gen Z participants with the Maguire et al. test subjects. For both groups, the training resulted in

minimal (< 1%) changes in perception of the value of communication. However, the table also shows the greater impact of the training exercise (7.3% increase in perception) on the current study's Gen Z participants.

Table 1.

Impact of TeamSTEPPS Communication Training

Study	Student Population	Sample Size	*T-TAQ* Median	Training Impact
Maguire et al.	Nursing without training	77	4.51	
	Nursing with training	108	4.50	-0.2%
Current Study	Gen Z before training	7	3.93	
	Gen Z after training	7	4.21	7.3%
Current Study	Non-Gen Z before training	4	4.08	
	Non-Gen Z after training	4	4.04	-1.0%

Independent of demographic factors, the current study supports previous research regarding the value of educational games. That support is evident in both student responses and in their professed stress reactions. As noted in previous chapters, employers and nurse educators are continuously trying to improve communication, teamwork, and critical thinking skills in nursing students and new graduate nurses. This current study, by utilizing a gaming approach, introduced a teamwork structure as well as encouraged communication among team members to escape the room in the allotted time.

A combination of styles in this current study was intended to appeal to all types of students. Some students prefer a traditional approach, such as lectures, and others prefer technology and immersive activities. The participants shared, through interview responses, that they preferred a combination of traditional, didactic delivery of new material, with an opportunity to apply the newly learned knowledge in a hands-on,

immersive style of activity. As such, this current study's findings support and extend previous research into the use of gamification and escape rooms in education. For example, a review of 128 empirical research papers on gamification and education concluded that a realistic simulation game resulted in a positive experience for students (Koivisto et al., 2017). Similarly, this current study's use of T-TAQ to demonstrate increases in student perceptions toward the value of communication reinforces research from a 2021 quantitative study of leadership students which recorded an improvement in self-reported communication skills (Egan et al., 2021).

Finally, this current study's documented student feedback on stress reduction in the escape room supports the conclusions of Reed and Ferdig (2021) that incorporating an escape room into an educational setting can reduce student anxiety and increase their enjoyment (Reed & Ferdig). This current study does not contradict the referenced previous research, but it reinforces it and extends its reach by bringing together the elements of a realistic simulation, a team-based competitive game, an escape room format, and nursing education curriculum into one qualitative study that produced similar findings.

This current study also highlighted the differences in the Gen Z learner and their preferred learning style. Research has shown that many of the current college students prefer immersive games over traditional didactic approaches (Brull & Finlayson, 2016; Cain, 2019) and this aligns with how the students responded in the current study. Brull and Finlayson studied a medical facility that utilized three approaches to orient new nurse hires. They used a didactic approach for one group of nurses, an online module approach for a second group, and a game for the third group. There were 115 participants in the

study and a post research survey reported the highest test scores on clinical knowledge by the gaming group. Gen Z students prefer activities where they can be fully engaged, and they enjoy competition (Schwieger & Ladwig, 2018). The participants in this current study reported similar preferences to Schwieger and Ladwig's research finding, stating that they preferred a hands-on activity, especially to reinforce content taught by lecture or an assigned reading. Specifically, this current study's T-TAQ results for Gen Z (7.3% increase) and non-Gen Z students (minimal increase) and coded student comments (i.e., Gen Z students contributing 82% of positive responses) demonstrated the differences in perceptions between the student populations.

One participant in the current study stated that she enjoyed the escape room as something different, rather than the usual patient simulation exercise. In previous studies, Gen Z students more frequently referred to a *change of pace* as a necessary element of learning and retention. Research shows that Gen Z students prefer activities that allow them to collaborate and have student-led discussions, in addition to traditional teaching strategies. (Gilboy et al., 2015; Yew & Goh, 2016). Chicca and Shellenbarger (2018) found that the traditional methods of teaching which include: lecture, speakers, and slide presentations, will not be sufficient for the Gen Z learner. This current study supports the previous findings that demonstrate Gen Z students benefit from multiple modalities and opportunities for immersive activities. Furthermore, this current study suggested that escape rooms provide a particularly comfortable atmosphere for participants to communicate and interact relative to traditional simulations.

Implications

The results of the current study imply several concepts that nurse educators should consider when preparing course material and lesson plans for nursing students. Those implications are discussed in the following sections.

Limits of traditional teaching methods

The interview responses and escape room observations collected during the current study support the literature that suggests a broader range of teaching methods are needed to continue to improve nursing education. The students in the current study made repeated references to the value of combining the traditional lecture of TeamSTEPPS communication concepts with the non-traditional escape room exercise. One student's comment gets to the core of her generation's reaction to traditional lectures and tests as a means of education. She said, "When we were stuck in the escape room … it was so frustrating. It's not like just getting a question wrong on a test. I'll never get that wrong again." The escape room in the current study provoked an emotional response in this student that cemented the lesson content for her in a way that previous lectures did not. This observation is cause for reflection for nurse educators. Didactic lecture and traditional simulations have a proven track record of success in nursing education. However, their limits as teaching tools have been exposed by persistent industry problems with patient safety and new nurse retention. This current study lends credence to the industry's interest in alternate teaching methods as a supplement to traditional instruction.

Value of educational games

As noted in Chapter II, the literature reveals that the use of educational games in college programs is not a new concept. However, it is not yet widely adopted in U.S. nursing programs. This current study contributes to the belief that educational games are perceived by students as adding value to their educational experience. Games like the one used in the current study cater to the desire for a *change of pace* that is routinely expressed by the newest generation of students. The Gen Z students who participated in the current study were unanimous in their favorable comments about the stress reduction and team dynamics that were evident in the exercise. Comments like this one were typical of the student responses: "I liked the escape room. It was something different. It made us work in a different way." As technology continues to develop new modes of gamified interaction, researchers and educators will have more opportunities to explore immersive games as teaching tools. The current study has contributed to that effort by raising the salience of games in nursing education.

Utility of escape rooms

The fact that this researcher was able to design a viable educational escape room around a simulated medication (Heparin) protocol for nursing students speaks to the flexibility that escape rooms provide to educators. As noted in the literature, escape rooms were originally developed as recreational pastimes. They gained popularity in part because they could be tailored to almost any theme or subject. Previous research showed how educational game rooms were introduced for leadership programs. This current study's design of an escape geared toward building communication skills in a healthcare setting is emblematic of the utility that researchers and educators can derive from the

escape room format. Further research is needed to explore different formats and subject areas of escape rooms in education. For now, this current study points to the use of escape rooms as a flexible and engaging option for presenting challenging educational content.

The implications of this qualitative study may serve as inspiration for future research. However, researchers and educators should be aware of the limitations of this current study when drawing conclusions based upon its findings. Those limitations are discussed in the next section.

Delimitations and Limitations

This qualitative research study was designed for inclusion in an established academic program at a Midwestern community college. As such, there were constraints on the amount of time, number of students, and physical infrastructure that was available to the researcher. These limitations had an impact on the amount and nature of data collected. The most obvious limitation was the study's small sample size. The 11 participating students provided valuable feedback, but their small class size limited the impact of the perception measurements shown in Figures 1, 2, 3, and 4. Analyzing the results for a subset of students (such as Gen Z vs non-Gen Z) required development of conclusions based on an even smaller number of students. For this reason, the sample size represented the most serious limitation of this current study.

The course schedule required that the escape room exercise in the current study be conducted in one day and within a 4-hour time window. Within that time constraint, the researcher and student participants had to complete the T-TAQ questionnaire twice, engage in a lecture on the TeamSTEPPS communication protocol, participate in three 30-

minute escape room exercises, and conduct multiple rounds of interviews. Group interviews were conducted to save time, since most of the time was allocated to the escape room activity. A limitation of the group interview in the current study was that some participants did not adequately respond to all the questions. Another limitation is that participants would occasionally reiterate what had already been said by another participant. There would be more unique data if each participant was interviewed individually, and then every participant would have answered each of the questions.

Finally, the single physical laboratory that was available at the campus acted as a limitation on the amount of data available. More students and more data could have been processed if the teams had been able to engage in the escape room concurrently in multiple test labs rather than sequentially in one. The time and space factor of simulation experiences have long been seen as a hurdle (Cant & Cooper, 2014). Despite these limitations, the study benefitted from an engaged set of students and enabled the researcher to collect a considerable amount of data and insight into the students' perceptions.

This current study's combination of a traditional lecture (using the TeamSTEPPS slides), a hands-on simulation (with a manikin), a competitive team-based game, and an escape room that forced collaboration and communication was designed to address the multi-modal learning preferences of Gen Z students. That being said, the limitations and structure of the current study along with the student perceptions about the value of *something different* in education settings suggest opportunities for additional research and are discussed in the next section.

Recommendations for Future Research

The six main themes that emerged from the current study's data analysis and described in Chapter IV's Findings suggest possibilities for additional research into the use of gamification in nursing education. Four of those themes highlighted the student participant's overall change in perception of the use of gamification in education. Those specific themes were:

- The participating nursing students perceived that the combination of formal TeamSTEPPS training and the escape room exercise raised their awareness of the importance of communication to a health care team.
- The participating students explained that the opportunity to apply the TeamSTEPPS strategies in a hands-on team competition emphasized to them that the team's communication effectiveness directly impacted the team performance.
- The participating students explained that the communication mistakes that they made during the escape room exercise cemented their awareness of the direct link between communication and team performance.
- The participating students perceived immersive game approaches as a valuable training tool in developing their communication skills.

Two of the themes highlighted the impact of student demographics (specifically, age) on the perceived value of gamification. Those two themes were:

- Gen Z students perceived that the TeamSTEPPS training and exercise had a greater impact on their awareness of communication as a critical factor in team performance.

- Gen Z students demonstrated a greater affinity for immersive game training relative to other (non-Gen Z) students.

A deeper consideration of these themes would require studies that isolate specific elements of Gen Z student learning profiles that consider other possible demographic factors, which explore gamification options beyond the escape room, and that investigate the link between student perceptions and their actual performance.

Exploring the Unique Learning Characteristics of Gen Z Students

As noted in previous chapters of the current study, Gen Z students exhibit unique attributes that impact their learning profile. Those attributes include a relatively shorter attention span, an aptitude for technology, a preference for hands-on, immersive activities, and an affinity for team activities. This current study included elements that tapped into all of those characteristics. It would be worthwhile to know which of those characteristics are most relevant to the development of future educational programs. For example, a study could tailor an escape room toward fewer, longer form puzzles rather than the four quick puzzles included in the current study to determine the significance of Gen Z attention spans on learning. Similarly, a future study could orient an escape room around low-tech elements rather than the manikin simulation and smart phone usage that were incorporated into the current study. Future studies could also incorporate escape room games that rely less upon teamwork. For example, an escape room that presents individual challenges to each team member rather than collective challenges to all could determine whether Gen Z's preference for team activities is especially meaningful.

These ideas for future research would provide deeper insight into the specific aspects of Gen Z student behavior that educators should consider in their program

planning. In the coming decade Gen Z members will increasingly dominate enrollment in nursing education programs and entry into the profession (Plochocki, 2019). As such, they provide a rich opportunity for additional research in order to maximize their successful transition from student to professional nurse.

Exploring the Educational Impact of Additional Demographic Factors

Gen Z members are identifiable by age and that demographic factor was the one that was highlighted in the current study. However, there are other aspects of demography that were not explored here, and which could have a meaningful impact on nursing education. For example, the current study included students from a Midwestern U.S. community college in a major metropolitan area. Differences in geography were not considered. A future study that incorporated students from different geographic regions including urban, suburban, and rural communities could reveal whether those factors impact student perceptions. Similarly, the inclusion of international students in a future study could reveal whether gamification in education is more or less relevant for an American population of students. The students in this current study were overwhelmingly female. A future escape room study with a more diverse set of student participants might reveal whether identified gender impacts learning preferences.

The findings in the current study support previous research into the risks of a *one size fits all* approach to educational program design. Gen Z students will remain a focus of educators because of their sheer numbers if for no other reason. However, focusing future research on student demographic factors other than age could provide insights that educators can use to provide a richer learning environment for all students.

Exploring Additional Modes of Gamification

This current study incorporated one form of gamification – a short-duration, team escape room – into an educational setting. The student participants reacted positively to this format relative to traditional simulations, using words like *fun* to convey their comfort in the setting. Further research could attempt to isolate what aspect of escape rooms led to this response. For example, the relative informality of the escape room – with no pre-assigned roles and limited instructions on how to proceed – might have played a part in the students' perceptions. Those elements could apply to other forms of educational games and could provide researchers with similar avenues to explore. For example, traditional board games (like Clue) and role-playing games (like Charades) could be modified to incorporate nursing education material and could reveal to researchers whether students' professed affinity for *a change of pace* could extend to low tech game options. Educational video games provide another mode of gamification for researchers to investigate. Video games hold promise for nursing students, but scholarly research is needed to determine the potential of this form of alternate learning. The immense popularity of video games makes this a particularly noteworthy avenue of research.

Continuing technical advances in virtual reality (VR) equipment could disrupt many traditional elements of education and require additional research to gauge their effectiveness. VR headsets would enable students to collaborate over vast distances on a variety of educational games and challenges. VR could provide the flexibility to design and use educational games at low cost and in short time frames. They could empower students to repeat gaming challenges to more fully engage with the material. A research

study that combined VR gamification with traditional modes of instruction could test students' professed interest in multiple learning channels. The potential of VR technology in nursing education makes this an especially attractive field of study for researchers.

Exploring the Relationship Between Student Perceptions and Actual Performance

This qualitative study explored the impact of gamification on student perceptions of different aspects of education. However, the possible link between changes in perceptions and actual educational and professional performance would require more extensive research. Since the goal of all nursing education is to prepare students to successfully enter the profession, an investigation of game-based education on nursing performance is especially relevant. An obvious example of this area of research would be to measure whether the use of an educational escape room correlated with student performance metrics such as test scores. Since gamification is not in widespread use in nursing education, it would be relatively easy for researchers to establish a control group to compare with students who participated in an escape room educational exercise.

Quantitative research of this kind would supplement the insights provided by qualitative studies such as this one. Another research effort might track nursing students with and without a game-enhanced educational background over time as they entered the profession. Growing concerns about attrition among first year nurses were noted earlier in the current study as a primary driver for the search for better teaching methods. If gamification can be demonstrated to improve student preparation for the rigors of a professional career and reduce first year attrition, then it would suggest far more investment in alternate teaching strategies.

The varieties of gamification and the potential benefits of improved nursing student performance provide both the opportunities and incentives for additional research. Pairing quantitative studies with qualitative studies such as this one would provide researchers with deeper insights into a changing student population.

Summary

The current study addressed three research questions pertaining to the incorporation of gamification tools (specifically, an escape room) into traditional nursing education curriculum on communication and teamwork. Those three questions were:

1. When TeamSTEPPS training is utilized in an escape room patient scenario, what impact does it have on nursing students' perception of their communication and its relevance to teamwork?
2. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students explain their perceived changes in attitudes towards communication as it relates to teamwork?
3. After receiving TeamSTEPPS training and utilizing that training in an escape room patient scenario, how do nursing students perceive didactic and immersive game approaches to their development of communication techniques?

To establish the importance of these questions, the researcher explored industry literature that demonstrates the continued existence of a practice gap for new graduate nurses which can affect the transition from student to licensed nurse. Communication challenges represent the common denominator between reasons new nurses list for leaving the profession and reasons for medical errors. An emphasis on teaching

communication skills to student nurses may be the key to improving patient outcomes, lessening medical errors, and improving new nurse retention.

Nurse educators must continuously update content and delivery methods to prepare students for practice. The changing demographics of student nurse populations and the unique learning characteristics of Gen Z students in particular present a challenge to educators as their curriculum evolves. Gen Z students comprise the majority of nursing students and have demonstrated their preference for technology in the classroom as well as immersive and competitive activities in which to practice newly learned concepts. \

Combining traditional methods of teaching communication skills with immersive games and activities to apply the learned skills can improve students' understanding of the importance of communication on the healthcare team as well as be enjoyable and engaging for the students. The emergence of new technologies such as virtual reality provide researchers with opportunities for continued study of the link between innovative teaching techniques and student performance.

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Appendix A: Teamwork Attitudes Questionnaire–Communication Module Only

Teamwork Attitudes Questionnaire (T-TAQ)

Instructions: Please respond to the questions below by placing a check mark (✓) in the box that corresponds to your level of agreement from Strongly Agree to Strongly Disagree. Please select only one response for each question.

Communication	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Teams that do not communicate effectively significantly increase their risk of committing errors.					
2. Poor communication is the most common cause of reported errors.					
3. Adverse events may be reduced by maintaining an information exchange with patients and their families.					
4. I prefer to work with team members who ask questions about the information I provide.					
5. It is important to have a standardized method for sharing information when handing off patients.					
6. It is nearly impossible to train individuals how to be better communicators.					

Appendix B: Interview Questions

Questions asked before communication didactic lecture and escape room:

1. What do you do when you feel you are communicating well with members of the healthcare team?
2. What happens when you feel you are communicating poorly with members of the healthcare team?
3. Do you prefer to learn from reading and lecture or by hands-on activities? Please explain why.

Questions asked during the debriefing focus group:

1. What happened during the escape room experience that reflected good communication?
2. What happened during the escape room experience that reflected poor communication?
3. What is one thing from the TeamSTEPPS communication module you hope to always remember? Why?
4. What is one thing from the escape room activity that you hope to always remember about communication? Why?
5. What skills did you apply in the escape room activity, that you learned in the TeamSTEPPS module?
6. How did the escape room patient simulation differ from the previous patient simulations you completed during this course?
7. Reflect on how your TeamSTEPPS Teamwork Attitude Questionnaire score changed.
8. After the TeamSTEPPS communication module and the escape room activity, what aspects of communication do you do well? How do you know?
9. After the TeamSTEPPS communication module and the escape room activity, what aspects of communication do you need to develop more? How do you know?

Appendix C: Observation Protocol

Date: Observational Purpose:	
Descriptive Checklist Notes	Reflective Notes
Description of Communication between escape room participants	
Language Used: Tone Healthcare terminology	
Nonverbal Communication Body language Other nonverbal	
Decisions made based on consensus Did the team discuss options or did one person take the lead?	
Moments of Leadership When Who Situation Response	

Appendix D: Escape Room Flowsheet

Introduction:

The “Nursing Students Use Communication as the Key to Their Escape” Escape Room is intended for use for third semester students in the nursing program at Moraine Valley Community College. It is designed to gauge the students’ ability to communicate effectively in a team setting and to build on the core concepts of the program curriculum.

Objectives:

1. Students will explore the scenario and setting of the escape room.
2. Students will communicate with each other and work as a team to identify and explore appropriate interventions of care within the scope of nursing practice during the escape room.
3. Students will demonstrate an ability to effectively communicate and work cooperatively and professionally as part of a care team.

Instructions:

Nursing students at this Midwestern community college receive a diverse course of instruction covering all aspects of patient care as part of the two-year associate nursing degree program. For the escape room exercise, students will be randomly assigned to a team of three participants. Each team will have 30 minutes to decipher the clues and escape the room.

The researcher will be remotely monitoring the room from the control center. There is a one-way mirror so that the researcher can observe the students and their interactions in the escape room. The researcher will keep the official time of the exercise and will provide additional clues to the team when requested. The clues will be labeled and must be solved in sequence as described in the escape room flow (below). Each team will begin the exercise with 50 points. If a team cannot escape the room in the allotted time, then all 50 points will be lost, and the team score will be 0. For teams that solve the room, points will be deducted from the team total in two ways:

1. One point will be deducted for each minute that elapses before the team solves all puzzles and escapes the room.
2. A team can request additional clues during the exercise at a cost of two points each.

The team with the highest score at the end of the exercise is the winner.

Each team will be briefed on the escape room scenario, rules, and scoring for the exercise before entering the room. Teams will also receive their first clue during the briefing session. The exercise will begin once each team member has entered the room and the door has been closed.

Cell phones are allowed in the escape room and, in fact, are necessary to solve some of the puzzles because of the QR codes involved. The door will remain closed but not locked during the exercise. Students will be allowed to leave the room at any time, but the 30-minute game clock will not stop under any circumstances. The researcher will observe the team in the escape room from the control center. The activity will be recorded so that the researcher may review the activity in a later stage of the study. Students will work together to find clues and solve puzzles to escape the room before the 30-minute game clock expires.

Educational Correlation:

The Escape Room's areas of focus correspond to Module 3 of the TeamSTEPPS 2.0 Fundamentals Course produced by the Agency for Healthcare Research and Quality. The TeamSTEPPS system was developed to improve institutional collaboration and communication related to patient safety. The Escape Room also incorporates concepts from the Simulation course core curriculum.

Escape Room Directions and Report:

Welcome to the Escape Room. The rules are listed below.

- The duration of the exercise is 30 minutes at most. The moderator will end the exercise after 30 minutes if you have not escaped by then.
- You may leave the room at any time, but the game clock will not stop for any reason after it starts.
- Cell phones are allowed in the Escape Room. However, only to use QR codes.
- Your objective is to escape by solving all puzzles in numbered sequence and to achieve the highest possible team score. Your team score at the beginning of the exercise is 50. One point will be deducted from your score for each minute that it takes your team to escape the room.
- If you cannot escape the room in the allotted time, then your team will lose all your points and post a team score of 0.
- The moderator will act as official timekeeper and will calculate your score at the end of the exercise.
- Each puzzle's solution provides a clue to the next puzzle in the sequence. Do not deviate from the sequence indicated by the display cards on each puzzle.
- If you are stuck and need another clue, then the moderator will provide one upon the team's unanimous request. However, each additional clue will reduce the team's score by an additional two points.
- Everything you need to complete the exercise is in the room. A dry erase board and markers have been provided but you are not required to use them.
- A folder containing a variety of relevant forms and documents is located on the table.
- The puzzles consist of boxes with 4-digit combination locks. Please don't try to force open a box. The locks will open easily if you have the correct combination.

- Remember you are part of a team. Communicate with each other to solve clues together. Rely upon each other and have fun.

Your Escape Room contains one patient with the following relevant information:

RM is a 58-year-old male complaining of shortness of breath and heart palpitations.

DOB:	09/05/1963	
Height:	72.5 “	
Weight:	99.8 kg	
Medical History:	atrial fibrillation, hypertension, diabetes mellitus type 2, hyperlipidemia	
Vitals:	Temp	98.8 deg F
	P	112, irregular
	RR	17
	BP	138 / 80
	SpO2	94% on room air

The team will be given a sheet containing the Escape Room Directions and Report. The moderator will read through the rules and will verbally provide the scenario below and the first clue. After providing this information, the moderator will lead the team to the Escape Room and close the door. The exercise has begun.

Escape Room Set-Up:

The room contains a simulation mannequin in a hospital bed. The mannequin is dressed in a hospital gown and has a hospital ID band with the patient’s name and DOB. The room also contains a supply cabinet with a series of locked boxes that are labeled 1 through 5.

Escape Room Flow:

Scenario

The nurse whose shift is ending tells you that the patient has been prescribed Heparin IV and has already received the bolus, but now needs the maintenance medication. The nurse hands you the Heparin hospital protocol for weight-based dosing of the medication. The medication is in the medication cart, in box #

The outgoing nurse doesn't have time to start the medication, so he has endorsed that task to you. The outgoing nurse neglected to tell you that all the supply cabinet boxes are locked. You need a unique 4-digit code to unlock each box.

Clue #1

The moderator will verbally instruct the team as follows: "A critical piece of information somewhere in the room will let you figure out the code to the first locked box. You will find it in the place you look first, when delivering patient care."

Puzzle #1

The team is expected to check the patient's ID band first. In addition to the patient's information, the ID band contains this note: "Code #1 = YOB + calculated Heparin units to be delivered to the patient. That is, the access code for Puzzle #1 must be determined by the team by adding the calculated prescribed units of Heparin to the patient's year of birth (found on the hospital ID band).

The calculated initial maintenance dosage of Heparin is 15 units/kg. The patient's weight is 99.8 kg. So, the dosage is 15 * 99.8 = 1497 units, The code can be calculated as:

	1497	(units of heparin to be delivered to patient)
+	1963	(year of birth)
=	3460	(combination code for Puzzle #1)

After determining the code, the team is expected to open box #1 and find the IV Heparin and a sheet of paper containing clue #2. (See Appendix E)

Clue #2

Keep your eyes open while you're administering the Heparin and you will find the code for Puzzle #2. Hint you will have to look with more than just your eyes.

Puzzle #2

The team is expected to administer the Heparin via the IV pump. There will be a QR code posted to the IV pump. After starting the IV, the team is expected to scan the QR code with a cell phone which will launch a web browser and load a PDF with the following text:

Congratulations! You have found the key to determining Code #2. The answers to these four questions form a 4-digit code which will solve Puzzle #2. Read carefully and think them through as a team.

According to the TeamSTEPPS system, which of these factors does not represent a challenge to effective communication?

1. Distractions
2. Workload
3. Geographic location
4. Lack of information verification

Which of these factors is not a standard of effective communication?
1. Complete
2. Audible
3. Clear
4. Timely

Which of these statements about communication is true?
1. Effective communication skills are vital for patient safety.
2. Communication enables team members to effectively hoard information.
3. Communication is the mode by which one of the TeamSTEPPS strategies and tools is executed.
4. Effective communication is the responsibility of the team leader.

Which of these items is not an information exchange strategy in the TeamSTEPPS system?
1. Situation - Background - Assessment - Relaxation (SBAR)
2. Call-Out
3. Check-Back
4. Handoffs

The access code for Puzzle #2 is comprised of the four correct answers above. The correct answers are 3-2-1-1. The team is expected to enter that code into the lock for box #2 to reveal a lab report and sheet of paper containing Clue #3.

Clue #3

Six hours have passed since the original infusion of Heparin. A lab report containing the results of the patient's blood work is in the box. What change in treatment should you consider? How many additional units of heparin will the patient receive in the next hour? The number you find is the code to open box #3.

Puzzle #3

The team is expected to know that the Heparin dosage may need to be adjusted after 6 hours and that they should follow the heparin protocol provided and make changes based on the PTT value in the lab results. For this patient, the PTT value on the report is 55. The students are expected to know that a PTT value between 35 and 39 requires a bolus of 1000 units of heparin plus an increase in the units delivered per hour of an additional 100 units.

The team is expected to adjust the Heparin dosage appropriately and then use the code 1-1-0-0 to open box #3. Within that box, the team will find a piece of paper containing Clue #4.

Clue #4

The note reads:

Congratulations! You knew just what to do. Your patient is improving. Now, though, your shift is nearing an end. What does your replacement need to know? Some of the numbered items below are important for you to include in your shift report and some of them are not. Find the four most important and put them in the right order and you will have your code for accessing box #4. What's the "right" order, you ask? You all learned it in a song long ago. Sing it out loud together and two points will be added to your score.

1. Current diet order
2. Family is present at bedside
3. Time for next PTT draw
4. Current heparin dose being administered
5. Intake/output totals
6. Last vital signs
7. Next time PO medications are due
8. PT/INR
9. Cardiologist on consult
10. Cholesterol levels

Puzzle #4

The team is expected to know that the most important items to be included in their shift report are 3, 4, 6, and 9. The proper sequence for the code can be determined by alphabetizing the four items. This produces a code of 9-4-6-3. The team should enter that value in box #4 to open it. Doing so will release party streamers and a note reading "You've escaped! Congratulations!"

The escape room exercise is complete. The moderator will calculate the team's final score and congratulate the team on their success.

Appendix E: Heparin Protocol

Heparin Protocol (Based on drip concentration of 25,000units/250ml (100units/ml)

1. Weight in kg _____ (actual/stated) circle one
2. Labs:
    a. Baseline PTT, PT/INR, and CBC
    b. Hemagram with platelets every other day while on Heparin
3. Administer Heparin bolus IV Push
    a. Calculate 70 units/kg _____
        i. Maximum bolus 10,000 units (round to the nearest 100)
        ii. Example: 5880 units would be 5900 units
4. Initiate Heparin Maintenance IV infusion
    a. Calculate 15 units/kg/hour _____units/hr
        i. Maximum initial infusion1500 units/hr
    b. Calculate ml/hr _____
5. Check heparinized PTT 6 hours after Heparin started and 6 hours after any change in dose
6. With each PTT result, RN to adjust, write Heparin order and reorder PTT
7. When 2 consecutive PTTs are therapeutic, order daily heparinized PTT
8. Call Physician for evidence of bleed, run a PTT STAT and HOLD Heparin (Call MD)
9. Stop Low Molecular weight Heparin (i.e., Lovenox) or subcutaneous Heparin
10. No need to call MD with critical values unless there is evidence of bleeding

Heparin Dose Adjustments Based on PTT				
PTT (seconds)	Infusion Hold Time	Heparin Bolus IV Push	Infusion Rate Change	Order next PTT
<35	0	3,000 units	Increase by 300 units/hr (+3ml/hr)	6 hr
35-49	0	2,000 units	Increase by 200 units/hr (+2ml/hr)	6 hr
50-64	0	1,000 units	Increase by 100 units/hr (+1ml/hr)	6 hr
65-95	0	---	No Change	6 hr
96-104	0	---	Decrease by 50 units/hr (-0.5ml/hr)	6 hr
105-119	0	---	Decrease by 100 units/hr(-1ml/hr)	6 hr
120-140	0	---	Decrease by 150 units/hr (-1.5ml/hr)	6 hr
>140	Hold 1 hour	---	Decrease by 200 units/hr (-2ml/hr)	6 hr

Appendix F: Codes and Themes

Phase 1 Code	Phase 2 Code	Theme
Assertive behavior is necessary for leadership	Assertive behavior is necessary for leadership	Students perceived combination of training methods raised awareness
Lecture and escape room reinforced the importance of communication	Lecture and escape room reinforced the importance of communication	
Lecture emphasized importance of communication	Lecture emphasized importance of communication	
Preference for multiple learning methods	Preference for multiple learning methods	
The lecture provided communication strategies	The lecture provided communication strategies	
Escape room required teamwork	Escape room promotes teamwork	Gen Z perceived greater impact of escape room training
Escape room emphasized communication strategies	Escape room provided unique learning opportunity	Students believe hands-on team competition were effective learning experiences
Escape room emphasized importance of communication		
Escape room provided unique learning opportunity		
Escape room required communication		
Simulations provide unique learning opportunity		
Verbal communication requires confirmation		
Good communication requires confirmation	Good communication requires confirmation	
Good communication requires listening	Good communication requires listening	
Good communication requires respect	Good communication requires respect	
Good communication requires teamwork	Good communication requires teamwork	
Good decisions require consensus	Good decisions require consensus	

Phase 1 Code	Phase 2 Code	Theme
Attention to detail is necessary for good performance	Attention to detail is necessary for good performance	Students believe mistakes made in escape room were effective learning experiences
Communication barriers hinder performance	Communication barriers hinder performance	
Escape room increased stress		
Disorganized behavior is a barrier to communication		
Hoarding information can hinder performance		
Poor communication causes conflict		
Poor communication causes mistakes		
Proximity can be a communication barrier		
Asking for help when needed is essential to teamwork	Deferential behavior can hinder performance	
Deferential behavior can hinder performance		
Good communication requires confidence		
Shyness is a barrier to communication		
Defined roles are not realistic	Excessively strict roles can hinder performance	
Strict roles can hinder performance		
Inattention to detail can hinder performance	Inattention to detail can hinder performance	
Confirmation requires designated roles	Lack of defined roles can hinder performance	
Lack of defined roles hinder performance		
Traditional simulations require defined roles		
Poor communication causes frustration	Poor communication causes frustration	
Escape room decreased stress	Escape room decreased stress	Students perceived immersive game training as valuable
Escape room required clear roles	Escape room required clear roles	
Confirmation requires call out	Escape room promotes teamwork	
Confirmation requires check back		
Escape room required cooperation		
Made good use of communication tools	Made good use of communication tools	
Written communication provides lasting benefits		
Preference for experiential learning	Preference for experiential learning	Gen Z demonstrated greater affinity for game training