## Effectiveness of the Sloppy Mountain Medical Center Computer-Based Escape Room Game for Teaching Interprofessional Teamwork Concepts

Introduction

Use of games or gamification is often cited as an innovative and effective strategy for teaching millennial health professions students who have grown up with gaming technology (Lohrmann, D. K., 2011). Benefits of gamification to medical education include abstraction of complex tasks into digestible skills, progression through challenges, replication of "real life" scenarios, and increased student satisfaction with learning (Yunyongying, 2018). While interprofessional education strategies have included the use of role-play, simulation, interactive icebreakers, and other types of games, very few studies have examined use of computer-based gaming to teach interprofessional teamwork skills, knowledge, and attitudes (Joseph & Diack, 2014). This paper presents the use and evaluation of a computer-based escape room game for teaching teamwork skills to interprofessional health professions students.

Background

Developed by the Medical University of South Carolina (MUSC) in 2018 as a component of the institution's **Southern Association of Colleges and Schools Commission on Colleges (SACSOC)** accreditation Quality Enhancement Plan, the Sloppy Mountain Medical Center computer-based escape room game (hereafter referred to as "Sloppy Mountain") was designed to challenge interprofessional teams of learners with a set of tasks that demand effective communication, leadership skills, efficient collaboration, creative problem-solving and cooperation. The overall purpose of the game is to develop team-based communication skills and techniques not specific to any one health profession; therefore players in any health professions program or with any background can find value in the game.
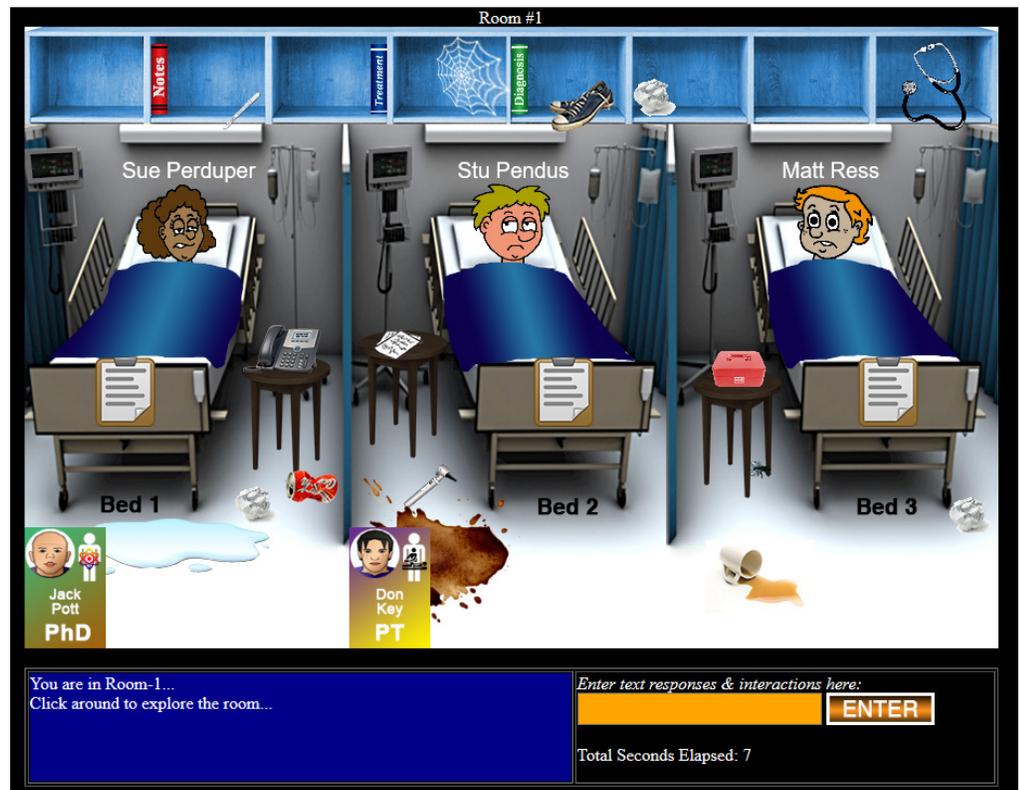
Figure 1. Each player on a three or four person team has access to only one room in the team's medical center. This image shows one player's room.

Working in interprofessional teams of three or four players, each with his/her own laptop computer, players work together to discharge patients from the team's medical center. Each player on the team functions as an imaginary healthcare super-provider with all of the rights, privileges and responsibilities associated with all aspects of patient care management, including treatment planning, medication ordering, specimen collection, lab ordering and interpretation, hospital discharging, and specialist consultation. Each player has access to only one of the rooms in the team's medical center. Most of the information and resources needed to discharge patients from each room are contained in the other team members' rooms. Students must work together, communicate clearly, collaborate effectively, and plan efficiently to discharge all of the patients quickly under time pressure.

Figure 1 is a screen capture image of a single player's room. At the outset of the game, each room is messy and disorganized, as evidenced by spills, crumpled papers, and cobwebs. Since each team member has limited access to the information and resources needed to discharge patients, players must collaborate with their team

members in other rooms to learn how to interact with the game elements, such as the telephone, lockbox, charts, or medical devices; discover clues hidden in the room; realize that clues and resources need to be shared with all team members; and ultimately figure out the process to discharge patients. The game includes a timer, and the fastest teams to discharge all patients win.

Methods

In January 2019, MUSC implemented Sloppy Mountain with 850 first-year interprofessional students during Interprofessional (IP) Day, a required event with a 14-year history of developing a culture of collaborative teamwork and improving patient care and safety. Participating students were enrolled in graduate programs in Biomedical Research, Dental Medicine, Dietetics and Nutrition, Health Administration, Medicine, Nurse Anesthesia, Nursing, Occupational Therapy, Pharmacy, Physician Assistant Studies, Physical Therapy, and Public Health. The 850 students were divided into 43 groups with 15-25 students in each group and were assigned separate meeting spaces on campus. During a 2.5-hour session, the groups participated in activities focused on teamwork communication, one of which included playing Sloppy Mountain. Fifty-five faculty facilitators were responsible for leading the day's activities and were provided a facilitators guide and all materials, handouts, and other necessary resources; they also attended a 2-hour orientation prior to IP Day that included time to practice playing Sloppy Mountain.

The IP Day session began with a welcome video from the President and CEO of the University focused on interprofessional teamwork. After the video, students participated in a short interactive icebreaker designed to get to know each other, and then they worked in teams as part of a 15-minute communication activity. Next, students played Sloppy Mountain in interprofessional groups of three or four for approximately 50 minutes, followed by a 10-minute debrief. During the debrief, facilitators asked students to reflect on the significance of time pressure on teamwork and active listening; the need to seek information from all available sources; strategies for eliciting information when

Playing the Sloppy Mountain Medical Center escape room game helped me:	Agreed/ Strongly Agreed*
Identify challenges and solutions associated with communicating complicated information in a clear and concise manner.	92%
Appreciate the challenge and importance of seeking information from all available sources.	93%
Appreciate the challenge and importance of working as a team to solve problems.	93%
Appreciate the value of listening and responding to the needs of other team members in order to solve problems collectively.	94%
Appreciate the importance of monitoring team progress as well as providing task-relevant support and assistance to the other team members.	90%

Table 1. Student reported effectiveness of the Sloppy Mountain Medical Center escape room game. *5-point scale: Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree

not readily available; the concept of mutual support; and the emergence of leaders during game play.

All student participants were emailed an anonymous web-based survey at the conclusion of the IP Day session. Students were instructed to respond on a five-point Likert scale (1=Strongly Disagree; 5 = Strongly Agree) to questions related to learning objectives and satisfaction with the IP Day activities.

Results

Table 1 presents IP Day evaluation results related to Sloppy Mountain learning objectives. From the 850 students surveyed, 501 responded, resulting in a response rate of 60%. For all items, 90% of respondents or more agreed or strongly agreed that learning objectives were achieved.

Discussion

A large majority of students agreed that Sloppy Mountain was an effective way to progress in their understanding of challenges with team communication, such as clarity of communication, the significance of time pressure on teamwork effectiveness, active listening, information seeking from all available sources, and monitoring team progress. Student narrative comments concurred with objective data, and students indicated that they were highly satisfied with the game itself but recommended changes to the video and icebreaker activities. In particular, students would like to spend more time learning about interprofessional roles and responsibilities as a component of the

icebreaker, rather than focusing entirely on getting to know personal information about each other. Since learning more about interprofessional roles and responsibilities is an important part of interprofessional teamwork, a brief activity on this topic will likely be added to future IP Day sessions.

There is a breadth of research pointing to the benefits of using games for learning that adds further dimension to our findings. In particular, educational games have been shown to motivate and encourage perseverance, develop enduring understanding of concepts, and when used with learning groups, offer opportunity for "small-group cognition," in which the group accomplishes intellectual outcomes as the result of social transactions and co-construction of meaning as they work toward a common goal (Gressick and Langston, 2017). Although the evaluation of IP Day did not specifically include measures to assess learner outcomes in relation to educational gaming, evaluation responses did suggest that the game taught important lessons about teamwork. This may be true because the game required students to apply key teamwork skills (e.g. active listening, information seeking, assertion, and mutual support) as they problem-solved together to work the game interface and successfully discharge their patients.

Conclusion

The Sloppy Mountain Medical Center escape room game can be an effective way to engage interprofessional healthcare students and develop appreciation for complex interprofessional teamwork. Next steps for research on Sloppy Mountain include adding

measures related to the benefits of gaming and implementing qualitative methodologies, such as observation, focus groups, or narratives to further examine students' learning. Other key measures to explore include how learner characteristics (i.e., profession, age, gender, gaming experience, etc.) may influence learning outcomes and successful game play. Additionally, given that this paper reports on only one curricular approach, other curricular or instructional approaches, including session design, facilitation, and debrief, could be examined to determine the effectiveness of the Sloppy Mountain escape room game for teaching interprofessional team communication.

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