Pathfinder: a modified collaborative game for learning and team development

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Abstract

Introduction: Games and other active learning techniques provide engaging, situation-based experiences that allow for immediate feedback and student empowerment. However, many games require significant time commitments and remain burdensome for faculty to integrate easily across other topics.

Description of Innovation: The authors modified a leadership activity to create a Pathfinder® game for recruitment and educational purposes. The highly cooperative and interactive maze design embeds a quiz to retrieve knowledge. Participants are tasked with finding their way out of a square maze on the floor, physically moving throughout the maze and answering quiz questions as they correctly navigate a pre-determined path known only by the gamemaster. Previous implementations of the Pathfinder® game include in-class learning, team-building, and prospective student recruitment. At the end of the game, one class of students were surveyed to gather feedback.

Findings: The descriptive survey gathered 36 student responses of which 75% agreed or strongly agreed that the game enhanced their learning experience, while 86% of students felt the game was fun and/or engaging. The game provides a low stakes mechanism for students to assess their knowledge and practice team building and communication. Importantly, Pathfinder® is highly adaptable to other disciplines/content areas and requires a relatively low amount of preparation time. However, adequate physical space is needed for successful implementation.

Summary: Pathfinder® is an interactive game that provides an opportunity for participants to work on communication and knowledge retention in an engaging and highly adaptable format that can be modified for virtually any topic or discipline.

Keywords: game-based learning, pathfinder, gamification, active-learning, pharmacy education

Description of the Problem

Pharmacy educators have a long history of integrating various game-based learning activities into classrooms to foster engagement, improve student learning outcomes, and meet accreditation standards.[1-9] Game-based learning also facilitates collaborative interactions among students to help build community and alleviates the passive nature of other traditional learning settings.[8,10] Popular examples of game-based learning include immersive simulations, quizzing software, scavenger hunts, Jeopardy®-style games, and escape rooms, to name a few.[11] Escape rooms, in particular, have gained popularity in recent years as a serious game format.[11] While escape rooms may boost knowledge and engagement, they require substantial time for creation and complex logistical details.[12-14] Additionally, escape rooms frequently highlight specific concepts in depth, which complicate their adaptation to other topics.

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Similar limitations are noted in the literature for other dynamic options like computer-generated simulations.[11,15] The lack of adaptability and significant logistical barriers make escape rooms and other options difficult to implement beyond their original scope and setting. Although simpler gaming options such as polling platforms and Jeopardy demand fewer hours of preparation, these often sacrifice many of the immersive elements present in more intricate options.[11]

In light of these challenges, our team created an easy-to-implement activity that modified a team-building activity with a series of quiz questions adaptable to any topic. The key objectives of this article are to: 1) describe a novel game called Pathfinder® that was designed for fast implementation and high adaptability to multiple disciplines in pharmacy education and 2) highlight the advantages and disadvantages of Pathfinder® when used in various settings.

Statement of the Innovation

Innovation

Pathfinder® is a collaborative and highly adaptable educational game featuring quiz questions within a maze design.

Rationale

Two of the authors (JHO and SJL) were tasked with developing an interactive activity for high school students attending a college of pharmacy recruitment event. Given the time

constraints (less than 72 hours), the authors recruited and brainstormed ideas with a pharmacy student at the time (RH). After reviewing several options and recognizing the barriers of other educational games, the authors created a new activity called Pathfinder® that requires minimal logistical preparation and readily adapts to any topic or theme.

Materials & Procedures

Pathfinder® uniquely embeds quiz questions into a maze activity, incorporating recursive teaching methods and knowledge scaffolding. An established team-building activity served as the inspiration for the maze portion of our modified version we named Pathfinder®. This original leadership activity was located at leadershipinspirations.com (the full description is now restricted to paid accounts).[16] Depending on the desired time frame for the game, the authors recommend preparing 10 to 15 quiz questions for the activity, which could include true/false, fill-in-the-blank, or multiple choice with preferably only two or three answer choices.

Gamemasters

The Pathfinder® educational game requires at least one active gamemaster and preferably two to separate the responsibilities of tracking the maze progress and quiz responses. Additional personnel also help with tracking penalties and bonuses.

Context and Setting

Sufficient room is needed for the Pathfinder® game, including floor space of approximately 8 feet by 8 feet for the gameboard created by painter's tape and additional surrounding area for the gamemaster(s) and participants to view movement and maintain their place in line. This gameboard size and gameplay ideally accommodates 8 to 12 participants, although groups up to 25 have been accommodated. Larger groups exceeding 20 may find it more effective to divide into multiple Pathfinder® games running simultaneously, which will require additional space and gamemasters.

Tailoring and Modifications

The original iteration of Pathfinder®—designed for student recruitment—revolved around a theme of international travel and a series of infectious diseases encountered by the participants. Since that time, the Pathfinder® game has been implemented in a variety of classroom settings and at conferences across a multitude of themes and topics including pharmacogenomics and drug information (refer to Table 1). Throughout these iterations, five different people served in the gamemaster role.

Table 1. Versions of Pathfinder®

Version	Setting	Participants	Discipline/Theme
1	Recruitment event	High school students	Infectious diseases/ Nightmare study abroad trip
2	International conference	Research administrators	Escape from Alcatraz
3	Online (local teaching conference)	University educators	Nightmare study abroad trip
4	Elective course[17]	1st and 2nd Year Pharmacy students	Pharmacogenomics
5	National conference	Pharmacy educators	Educational theories/ Alice in Wonderland®
6	Hybrid (local teaching conference)	University educators	Educational theories/ Alice in Wonderland® [Encore presentation]
7	Required drug information course	1st Year Pharmacy students	Statistics and study design methodology

Evolution of the Game

Version 1 of the game (Table 1) was generally well received following a review of informal survey results from the recruitment event. In addition, pharmacy students provided high praise for the game through formal course evaluations of a new pharmacogenomics elective course that featured several other active learning activities (Version 4 in Table 1).[17] The creators also received positive feedback from conference evaluations and personal contact from a few attendees who successfully adapted and used the game at their workplace.

Based on these initial results, the authors pursued an opportunity to specifically evaluate the Pathfinder® game within a required drug information pharmacy course (Version 7) that included students (n = 38) in their first professional year of the Doctor of Pharmacy curriculum.

The game reviewed statistics and research methodology prior to a summative assessment. Students who participated in Pathfinder® completed a voluntary survey. Survey questions were designed to assess student engagement, attainment of learning objectives, and the overall learning experience. No

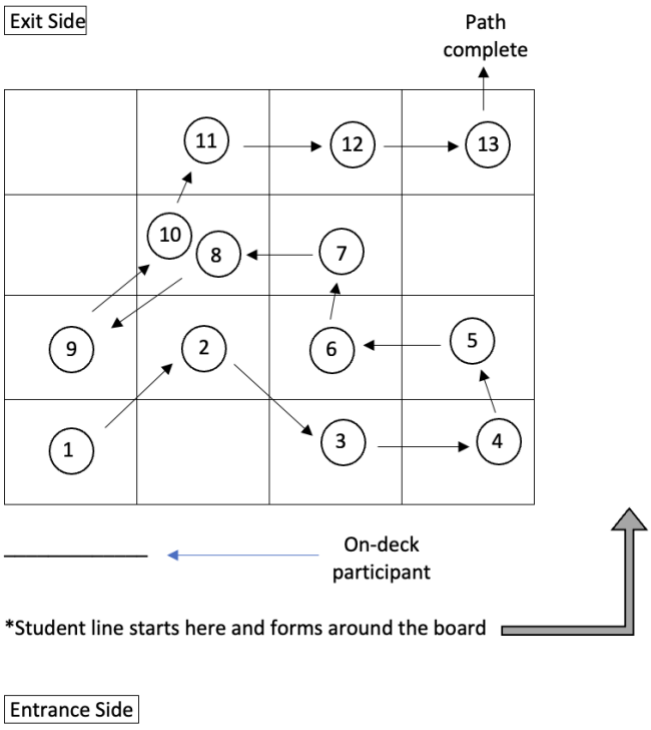
personal identifiers were collected, and the university's Institutional Review Board approved the project as exempt. Six questions measured student perceptions with a 5-point Likert scale ranging from "strongly agree" to "strongly disagree." Additionally, one open-ended question provided students the opportunity to share unrestricted comments. The authors modified questions used from course evaluations at the university that are used to gauge teaching effectiveness using the Danielson Framework, a reflective guideline for improving teaching and learning.[18] Collated results were analyzed using descriptive statistics.

Game Instructions

Pathfinder® features a maze-like activity comprised of a 4x4 grid containing 16 squares on the floor (Figure 1). Somewhat reminiscent of classic board games like Minesweeper® or Battleship®, the active participant chooses a concealed square that could entail either a review question, a loss of turn, a penalty, or a bonus. The primary goal of the game is to navigate the maze by physically entering one side of the maze and exiting on the opposite side. To reach the exit, participants must follow a specific path known exclusively to the gamemaster. Participants work collaboratively to unravel the path, by individually taking turns and correctly answering questions embedded along the correct path that are prepared in advance by the gamemaster. Each participant lines up for their entry into the game, physically stepping onto a square within the maze during each turn. If the participant chooses the correct square in the pre-defined map, then the gamemaster reads the first quiz question. Selecting an incorrect square, however, results in a penalty, bonus, or end of turn. Examples of penalties include: 1) solving a trivia question to continue the turn, 2) answering all previous questions correctly, 3) wearing a blindfold, and 4) losing the ability to speak or gesture. Bonus opportunities have included the following: 1) rearranging players in line (this is especially important if players received a blindfold penalty), 2) removing one or more penalties, or 3) allowing one or more players to pass freely through the maze.

With each incorrect answer, the participant's turn is over, and the next participant enters the playing field. A crucial element lies in the participants' ability to recall the correct path, established through previous actions. In addition to the active player in the maze, the game layout designates one 'on-deck' participant with speaking privileges, alongside remaining participants in line around the maze who are allowed to gesture but not vocalize assistance. This aids the active participant in answering questions or recalling the correct path.

Figure 1. Example of Pre-Determined Path for Pathfinder



The game unfolds as each active participant retraces the correct path, progressing until they reach a new square where they are presented with the next question. If the participant answers the question correctly, the gamemaster prompts the participant to choose another square until the participant either answers a question incorrectly or steps on an incorrect square. This pattern continues until all participants have successfully traversed the maze. Consequently, the game remains ongoing until all players complete the activity, necessitating their sustained engagement and attentiveness to the designated pathway to facilitate a collective team exit from the maze.

Findings

Of the first professional year students who participated in the drug information version of the game (n = 38), 36 completed the survey (95% response rate). Among these 36 respondents, 81% agreed or strongly agreed that the game engaged their interest and increased their understanding of the content. Moreover, 75% of respondents agreed or strongly agreed that the game enhanced their learning experience, and 74% agreed or strongly agreed that they achieved the goals of the activity. While the majority of respondents (86%) agreed or strongly agreed that the game was fun, over one third of respondents (36%) indicated a preference for a traditional lecture format instead.

Critical Analysis

The Pathfinder® game provides a positive learning experience with several advantages (Figure 2). It combines physical movement and a cooperative team approach like a well-

DOI: https://doi.org/10.24926/iip.v16i3.6187

executed scavenger hunt or escape room, fostering an engaging and immersive experience for participants.[12,19] Pathfinder® effectively utilizes recursive teaching principles, by employing penalties that require players to answer all previous questions correctly before advancing to the next square. Importantly, Pathfinder® stands out from some other games for its high adaptability, requiring minimal and consistent logistical preparation. Switching topics or concepts only necessitates the creation of new review questions in the game's simplest form. While originally designed as an infectious disease-themed game for prospective student recruitment during a pharmacy summer camp, Pathfinder® has been successfully adapted for conferences and classroom use in pharmacogenomics and biostatistics.[17] The estimated time to prepare Pathfinder® ranges from one to four hours depending on the extent of thematic elements and creativity employed, making it more time-efficient than many other serious games in pharmacy education. For instance, some escape rooms require up to 20-40 hours for initial implementation.[13,14] Unlike many other educational games such as simulations, video games, apps, and online polling platforms, Pathfinder's® original design does not depend on technology. This mitigates the risk of technical glitches and potentially alleviates stress for faculty and students frequently inundated with new technological features.[20] Finally, consistent with other cooperative educational games, Pathfinder® enhances communication and teamwork skills as students collaborate to navigate the maze. To foster this atmosphere, the authors recommend using the game as a low-stakes activity, which matches literature supporting an opportunity for students to practice more challenging questions prior to large summative assessments.[21]

Pathfinder® also meets the Accreditation Council of Pharmacy Education (ACPE) expectations of active learning and communication skills described in the pharmacy accreditation standards.[1] And like other literature, our study suggests that students tend to prefer more engaging learning activities such as educational games for the development of these skills.[19] Practicing problem-solving skills and the ability to work effectively in a team-oriented environment can help equip pharmacy students with needed skills for the profession to ensure they are well-prepared for their future careers.

Key Issues

Despite its advantages, Pathfinder® has several limitations to consider. First, the game requires a substantial amount of floor space for a 4x4 square and room for ideally 5-12 participants. Larger groups of up to 20 to 25 students have been accommodated in the past but wait times to actively enter the game field substantially increased. For larger groups, the authors recommend two alternatives: dividing into multiple teams if a separate room and facilitator are available or displaying a 2-dimensional board on a projector screen, preferably with live annotation and an online survey response tool. Then, non-active students can still respond to the game review questions to follow along and test their own knowledge. Another limitation is the game's unpredictability, which places pressure on the gamemaster to monitor time and to adjust the rules as needed. Effective management of game progress is crucial unless unlimited time is available. Over several iterations, a gamemaster will gather experience to expedite or slow down the game, for example, by adding a time-intensive penalty or changing the correct path to remove a quiz question. A third limitation, common to many active learning ideas, is the potential for game fatigue and the challenges of reusing the same structure. However, it's worth noting that 20% of survey respondents in the drug information iteration had previously played the infectious disease-based version of Pathfinder® as prospective pharmacy students. Despite this repetition, engagement and other scores remained high, suggesting that reintroducing the game structure with an entirely different topic and purpose can still be successful. Finally, the lack of skill measurement before and after the game represents a key limitation of the study.

Other limitations relate to the style of questions and modality of interaction. In the original Pathfinder® game, facilitators verbally presented questions. For certain topics or questions, however, alternative delivery modalities may be more advantageous. For instance, in the biostatistics version, some students preferred questions displayed in written form for better comprehension. In response, facilitators provided math setups on a whiteboard.

Next Steps

Pathfinder® is a modified and collaborative educational game featuring quiz questions within a maze design. The game offers high adaptability to different curricular topics and requires less preparation and logistical support compared to some interactive games. Most surveyed students reported that Pathfinder® was engaging, fun, and effective in meeting learning objectives and enhancing their understanding. Although it is plausible that Pathfinder® could improve knowledge, teamwork, and communication skills, future study is necessary to evaluate this hypothesis. We also encourage further exploration of the virtual option of the game to optimize the experience for online learners and those with physical limitations.

The authors developed the new Pathfinder® game to facilitate collaborative gameplay for reviewing or introducing educational concepts. Pathfinder® includes elements of physical movement, communication, and teamwork, making it adaptable to numerous educational topics and game themes. Overall, Pathfinder® provides instructors an additional option for integrating a new educational game into their classes or events.

Conflicts of Interest: None.
Funding/Support: None.

Disclaimer: The statements, opinions, and data contained in all publications are those of the authors.
Human Subjects (IRB): IRB exemption granted

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Figure 2. Development Demands and Engagement Characteristics of Game-Based Learning Options.

	Development Time Required	Easy Adaptability	Physical Movement	Immersive Experience
Pathfinder	✓	✓	✓	✓
Escape Rooms	✗	✗	✓	✓
Computer Simulation Software	✗	✗	✗	✓
Jeopardy-style	✓	✓	✗	✗
Interactive Quiz Tools	✓	✓	✗	✗
Modified Board Game	✓	✓	✗	✗
Scavenger Hunt	✗	✗	✓	✓