



Play games and score points with students

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Editor's note: The use of games for learning has a rich history; children learn through play, which is not only instructive but is also fun. This toolbox looks at games in the context of health professional education, describing games as immersive learning strategies incorporating competitive activities. The authors draw on their experience as creators and facilitators of games and gamification, highlighting the ability of games to foster creativity and innovation.¹ Gamification refers to the application of elements of games, and their principles, in contexts outside their traditional use to foster engagement and learning. Context-appropriate games may promote problem solving and critical thinking, which are key elements of clinical practice. The toolbox includes sections on how to design successful games, motivating students to participate, and implementation and its evaluation. The authors provide useful tables of game formats, with hints on preparation and the resources needed.

INTRODUCTION

Games are immersive active learning strategies, which encourage student interaction and increase the time spent 'on task'.^{1,2} Although games vary in format and setting, an educational game can be defined as 'an instructional method that requires the learner to participate in a competitive activity with preset rules'.³ In addition to interaction and time spent 'on

task', games also provide a 'safe to fail' environment and immediate feedback to the learner.⁴⁻⁶ This immediate feedback encourages students to engage with the material in a different way and decreases the level of faculty member facilitation involved in the learning exercise.⁴ With immediate feedback, students perform at their individual maximum skill level. As games include multiple levels of difficulty, students can obtain

feedback from the game at their level of competency.^{4,7}

In addition to the advantages afforded to learners, we believe that games benefit faculty members by fostering creativity and innovation, core tenets of health care and health care education. There is an initial investment of time for design and refinement; however, this investment is paid back as the game can be repeated in multiple

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DESIGNING A SUCCESSFUL GAME

Gamification of content can take on a variety of formats and design to achieve learning outcomes, from recall of content (Table 1) to problem solving and critical thinking (Table 2). Multiple elements of game design have been discussed in the literature;⁹ however, we feel that there are four key fundamentals that each game should possess (Box 1).

classroom sessions, across courses and professions. The games described in Tables 1 and 2 have been successfully employed for both pharmacy and medical students and residents. Players have ranged from small groups of fewer than 10 participants of medical residents to over 100 pharmacy learners in a classroom setting. Audiences were active participants in the games, despite training in multiple disciplines and at different training levels. Team-based games are also excellent alternatives from traditional interprofessional education (IPE).

The cooperative peer learning and collaborative problem solving in games support interprofessional core competencies of teamwork and communication.⁸

Despite these benefits, deviating from traditional content can feel risky when faculty members have a tried and true method. As creators and facilitators of games in the classroom, we have written this toolbox article with the objective of giving guidance to faculty members who are interested in the inclusion of games but who may be nervous about taking the plunge.

First, the game should provide extrinsic motivation through competition or winning, with the long-term goal of creating intrinsic motivation. Second, the game should allow for productive failure and result in an increase of student knowledge or understanding of the material, regardless of whether they are winning. Third, there needs to be equal opportunity for engagement. All students need to have the opportunity to be involved at all times during the game, not just when it is

Table 1. Examples of game formats that practise recall of knowledge

Game format	Description of game	Preparation	Supplies
Artistic/visual 4–8 players Minimum time: 5 minutes	Inspired by the game Pictionary® or Cranium® A player draws from a card deck and then must draw the subject of the card. Teammates have 30–60 seconds to guess what is being drawn. Number of rounds is determined by amount of time available.	Writing and printing of subject cards	Drawing surface (paper, white or chalk board, computer, tablet) Markers Timer
Verbalisation 4–8 players Minimum time: 5 minutes	Inspired by the game Catchphrase® and Heads Up!® During a set period of time, determined by the faculty member, teammates will take turns drawing from a deck of flashcards and describing what is written. The group with the most correctly guessed terms when the time runs out wins.	Writing and printing of terms on flashcards	Timer Flashcards
Board game 3–6 players Minimum time: 15 minutes	Inspired by the game Chutes & Ladders® or Snakes and Ladders® A player is read a question from a deck of cards. If they answer correctly, they get to roll the dice and move that number of spaces. First player to advance to the end of the board wins.	Writing and printing of questions and answers (30–50 cards) Creation and printing of board game templates	Question cards with answers (multiple choice or short answer) Dice Player tokens Board game printout

The game concept should be straightforward

Table 2. Examples of game formats that practise problem solving or critical thinking skills

Game format	Description of game	Preparation	Supplies
Quizzes Any number of players Minimum time: 5 minutes	Kahoot®, Quizlet®, Quizalize®, and Socrative® are an online game-based audience response systems. Points are earned based on accuracy and speed. Question formats include multiple choice or ranking.	Writing and inputting questions into audience response system	Facilitator: projection of question to class Students: mobile device or laptop to answer
Quasi-simulation 2–6 players per group Minimum time: 20 minutes	Students are given a chief complaint and a brief history of presenting illness. Each team develops a list of questions to ask a facilitator (or simulated patient) who has the full history and physical. Using information extracted from the facilitator, teams must accurately identify the problem. More advanced versions can include the creation of an assessment and plan.	Creating and writing of multiple history and physicals dependent upon number of groups participating	Facilitators or simulated patients for each group Handout of chief complaint and brief history
Card game 2–4 players Minimum time: 10 minutes	Inspired by gin rummy Faculty member to identify three interrelated categories about a subject. Examples include: <ul style="list-style-type: none"> • Infectious diseases: pathogen, antimicrobial, site of infection • Cardiology: EKG, arrhythmia, treatment • Oncology: tumour, chemotherapy, toxicity • Statistics: independent variable, dependent variable, statistical test Faculty member must then make cards for each variable to produce a card deck. Players are dealt 10 cards. The objective of this game is for students to create three melds or sets of three cards. In turn, players draw from the deck or discard pile and then discard, always keeping 10 cards in their hand. Players win by laying down three melds and one discard. Other players evaluate each meld for accuracy.	Identification of three categories Creating lists of examples in each category (15–30 each) Creating, printing, and laminating cards	Card stock Lamination (optional)

their turn. And finally, the game needs to have a known objective. Is the game largely entertainment and being used to break up the monotony of a lecture, or to assess understanding on presented content, or to promote critical thinking? When reviewing

content, the game concept should be straightforward and able to be understood by students after a brief introduction, with or without modelling. Games with the goal of promoting critical thinking or problem-solving skills typically are more

complex in their development, and require more coaching and demonstration from faculty members.

For novice game creators, we suggest experimenting with online audience response systems (ARSs). Examples of online ARSs with gaming capabilities include Kahoot®, Quizzizz®, Quizlet®, Quizalize® and Socrative®. These ARSs are free or have free versions that allow faculty members to input multiple-choice questions. Instead of clickers, students can compete independently or in groups using mobile devices or laptops. These ARSs are user friendly and require the

Box 1. Fundamentals of successful educational games

- Provides extrinsic motivation
- Productive failure (knowledge is gained even when students are not winning)
- Equal opportunity for engagement
- Known objective (entertainment, repetition, or critical thinking and/or problem solving)

Discussing the objective, rationale, and benefits of play will increase student buy-in

lowest time commitment from faculty members prior to deploying them. The use of ARSs in the classroom has been shown to increase assessment scores and student engagement in comparison with classrooms without ARSs.¹⁰

Faculty members who are new to gamification can also overlay their content onto an existing game concept. Catchphrase® and Heads Up!® are two word-guessing games that can be added to any lecture to reinforce key concepts or terminology. The preparation for deploying a word-guessing game is to create a list of terms on flashcards. The two game formats are based on either a student describing the term on the flashcard to the group, and the group guessing the term, or a student holding the flashcard so that only the group can see it, with the group describing the flashcard to the student, who then guesses. More gameplay details can be found in Table 1. Word-guessing games can be initiated quickly and be played for any amount of time, making it a versatile teaching tool. Faculty members can increase the level of difficulty for students by requiring the students to only use medical jargon or lay terminology to describe the flashcard contents.

MOTIVATING STUDENTS TO PARTICIPATE IN A GAME

With the competitive nature of students in the health professions, they are likely to respond positively when given the opportunity to interact with lecture material in a new way and compete with peers. Studies of health professions students have evaluated the perceived enjoyment of games compared with more passive approaches. For example, when compared with a traditional instructional method, in a randomised controlled trial 145 medical students

showed improved performance on a cognitive assessment and reported having more fun while becoming more secure with their level of knowledge on the topic.¹¹ Their attitudes towards the game were significantly more positive towards the video-game based method than towards the traditional approach ($p < 0.001$).¹¹ In a study of the use of board game and television show-based games with 128 pharmacy students, 100% of the students felt that the games increased their knowledge base beyond the lecture, and 80% felt that the games increased their interest in the lecture topic.⁷ Students also commented that the games increased the participation in the class from students who typically did not engage.⁷

When faculty members begin to design a game, often one of the first games to be incorporated into the curriculum is based on a game show, commonly Jeopardy®, where participants are given clues in the form of answers, and must provide a suitable question in response. Unfortunately, the game-show format does not exhibit many of the fundamentals of a successful game (Box 1). The first pitfall is that it is redundant. As many students have played game shows in the didactic environment, they do not see it as original or creative. This leads to disengagement and dissatisfaction with the game, and worse, dissatisfaction with the game material. A second disadvantage with game-show formats is that a small minority of the class is included in game play, and breaks the rule of there being an equal opportunity to engage for all participating students. Finally, because of the individual questions and the number of questions involved, the game is often lengthy and students commonly disengage. The games outlined in Tables 1 and 2 are examples of fast-paced inclusive games.

To increase the likelihood of implementing a successful game, faculty members need to provide a clear understanding of the objective of the game and its instructions. With all games, the clarity of instructions is one of the most important aspects for successfully introducing a game.⁶ Although additional time is needed for these instructions, discussing the objective, rationale, and benefits of play will increase student buy-in. Other methods that we recommend to increase the clarity of game rules include faculty members demonstrating and playing the game with other faculty members or a small group of students prior to implanting the game in the classroom. In addition to adequate demonstration time during the class, students often appreciate the opportunity to play without scoring. This is particularly important if the game involves a significant amount of new technology. Students will disengage and stop playing if they encounter early obstacles.

IMPLEMENTING A NEW GAME IN THE CLASSROOM

In our experience, faculty members are often reticent to take a risk with their teaching methods. Above, we suggest employing ARS or word guessing games for a teacher's first educational game. If neither approach decreases apprehension about gamifying content, an additional approach is to use a game that is familiar to the teacher and or students, and replacing the game content with clinical content. For example, the party games Pictionary® or Cranium® could be used as the framework for any content that can be drawn or sculpted (Table 1). In doing so, both the drawing/sculpting student and the guessing student will be spending time with the content and thinking about it in new ways.

For more complex games, we suggest first hosting a pilot of

between two and four players of faculty peers or a small student volunteer group. A pilot is valuable for determining the time needed for explaining the concept and rules, the ideal duration of game play, and the clarification of rules, as well as any technical or logistical issues that had not yet been considered. Although the minimum time necessary for game examples in Tables 1 and 2 are listed, we generally recommend dedicating only 15 minutes when introducing a new game in the classroom, unless the pilot test was incredibly successful and faculty members are confident that a longer duration will be successful. By dedicating just 15 minutes of classroom time, faculty members can continue to use the majority of the classroom day as they typically would and still be able to assess student engagement, understanding, and comprehension in a larger and more diverse group.

ASSESSING SUCCESS OF A GAME

After exposing students to a game, we recommend that faculty members should survey students

about the experience (Box 2). The educational value of the game, strengths of the game, areas for improvement, and assistance in examination preparation are factors that can be evaluated after each game is played.² A successful game will show high scores for educational value, (typically greater than 7 out of 10 on a Likert scale), a majority of the class will recommend adding the game to the curriculum, a majority of students will advocate adding the game to their study habits (if practical), and the game will have increased their level of interest in the game content. Additionally, faculty members should see excitement and engagement in the classroom.

Pitfalls in evaluating the success of a game include an over-reliance of examination scores as an assessment of the success or efficacy of a game. Examination scores are commonly confounded by student depth of understanding, interest in the topic, and individual student preparation. We believe that other characteristics can better assess the success of a game, including the percentage of student buy-in after being provided with

instructions for playing the game and the duration of individual student game play. After the game, markers of success include student requests to play the game again, positive feedback in student evaluations, and students playing the game without external rewards. In addition to student feedback, we recommend seeking out feedback from faculty peers, especially those with expertise in the game content. Often a faculty member will have an idea for a game or modification to an existing game that can increase the educational success of a game, as well as inspire creativity and collaboration amongst peers.

CONCLUSION

Gamification increases engagement and motivation, leading indirectly to the acquisition of more knowledge and skills.⁹ Faculty members who are willing but nervous to incorporate games into their pedagogy skill set should start with the incorporation of online audience response systems, or word guessing games, for limited periods of classroom time. Faculty members willing to devote more preparation time as well as classroom time can use existing game rules and overlay their content, although the most ambitious faculty members may seek to create original games, keeping in mind the fundamentals of successful educational games. Through continual assessment that allows the expansion of successes and the elimination of failures, faculty members will hone their gamification skills and score points with students.

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A pilot is valuable for determining the time needed for explaining the concept and rules

Box 2. Evaluation questions for students after exposure to a new game

Summative

- On a scale of 1–10, how would you rate the educational value of _____?
(1, lowest value; 10, highest value)
- Would you recommend the addition of _____ to the curriculum?
(Yes/No)
- On a scale of 1–10, how likely are you to integrate _____ into your study habits?
(1, very unlikely; 10, highly likely)
- Does _____ increase your level of interest in _____ (game topic)?
(Yes/No)
- On a scale of 1–10, how well does _____ help you to prepare for the exam?
(1, not at all; 10, extremely well)

Formative

- How could _____ be improved? (free text)

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