

GIFTS: Board Games as Tools for Professional Development of First-Year Engineering Students

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Abstract

Tinto's Theory of Student Departure focuses on both a student's academic and social integration as key components for student success. This Great Ideas for Teaching (and Talking With) Students (GIFTS) paper focuses on using tabletop board games to help first-year students develop useful academic traits such as critical thinking and teamwork, while also building social connections with fellow students, university faculty and staff, and local engineers. The paper provides examples of how board-game activities have been integrated into the first-year engineering experience to foster student persistence and skill development. The paper provides an overview of a formal 1-credit-hour honors seminar for first-year engineering students, taught by the authors, that focuses on board games. In this course, students examine connections between modern tabletop gaming and the engineering profession by actively playing commercially available board games and card games in community with classmates and others, supplemented with a combination of pre-class preparation materials and post-class reflection assignments. The paper also describes practical implementation details for how board games can be used in general STEM coursework, particularly in first-year engineering experiences, and outside of the classroom. The paper includes relevant examples from the literature for making games and playing games in the academic context for learning disciplinary content, developing professional skills, and fostering social connections.

Motivation

This Great Ideas for Teaching Students (GIFTS) paper seeks to explore and encourage board gaming as a means to promote the professional development and retention of first-year students. The paper starts with how board games fit within Tinto's Theory of Student Departure and then moves to the practical implementation of board gaming with first-year students. Board gaming is an activity that has seen increased popularity during and after the COVID-19 pandemic [1]. Codenames, a team party game, has sold over 16 million copies in the ten years since its creation in 2015, while UNO, a popular mass market card game, has sold 150 million copies [2, 3].

Tinto's Theory of Student Departure [4] is one of the major models of why students persist in or leave college. A key component of the model is students partaking in institutional experiences that lead to both social and academic integration. The model has an academic system made up of (1) a student's academic performance and (2) faculty/staff interactions, and a social system made up of (3) peer group interactions and (4) extracurricular activities [4]. We posit that playing board games in formal and informal first-year engineering academic experiences fits well within the model, promoting persistence. Our objectives are organized by these four areas of Tinto's Model.

Objectives

Academic Performance: Playing board games may help first-year students develop skills that aid their academic performance. Reference [5] states that, "Board games are spaces for mathematical learning and learning spaces that can enable the learning of various contents. Board games allow for various interactions that encourage players to engage in computational thinking, teamwork,

and creativity. ... Board games simplify complex issues and systems, which makes them appropriate to explore further learning and concepts such as motivation and computational thinking in formal and informal settings”. Other researchers have described board gaming positively for learning and improvements in academic performance [6-12].

The professional skills being developed may vary by game. While UNO has been shown to benefit the collaborative and mathematical skills of younger children [13], more complicated games may be better for first-year college students. Pandemic, a collaborative game simulating healthcare worker actions that was created a decade before the COVID-19 outbreak, may help students improve teamwork and decision-making and also think about epidemiology [14-19]. Math educators have written about how playing the game Set is beneficial for college students’ mathematical development [20-27], with the Set National Championship being a formal part of the Joint Mathematics Meeting annual meeting for professional societies in mathematics [28].

Board gaming can be a form of stress reduction [29-31] and can lead to better overall mental health [32-34], which is beneficial for academic performance. A study of 162 college students playing the game Saboteur found “short-term engagement in aggressive behaviors of the card game facilitated a reduction in negative emotions and an enhancement of positive emotions” [35]. Gaming helps students practice dealing with failure. In a competitive game, someone loses, and in a cooperative game, losing as a team is common. One can be attacked by friends during gameplay and feel a sense of loss if one’s plans do not come to fruition. Students may benefit from this low-stakes unpleasantness, which could build resilience for later life events [36-40].

Faculty/staff interactions: Board games can give faculty and staff opportunities to interact with students in casual group settings. Playing board games with students can foster more equal power dynamics and lead first-year students to see faculty and staff as more approachable.

Peer group interactions: Students may become disengaged, isolated, and uninterested in interacting with peers [41-43]. Facilitating interaction via board games fosters social interactions. In board gaming, students are forced to interact with each other in a unique and meaningful way. Playing board games with classmates may be especially important for people who are on the autism spectrum or have social anxiety, since board gaming can act as a social lubricant, providing structure to social interactions and reducing the pressure of conversation [44-49].

Extracurricular activities: Board games can give students the chance to interact with others outside of class. This could be in a formal board game class, playing with a student organization, or casual gameplay between friends. The hobby of board gaming offers opportunities for people who might not be interested in or able to participate in other extracurricular activities, such as intramural sports or the arts.

Practical Implementation and Assessment

The University at Buffalo’s honors first-year engineering students are required to take a 1-credit honors seminar, with topics proposed by honors college faculty. All the honors seminars have a standard set of required course learning outcomes: (1) acquire the skills, knowledge, ethical judgement and personal responsibility for lifelong learning while creating a sense of community among Honors Scholar cohort, (2) attain and apply critical thinking skills to define and solve

problems, and (3) understand the value of an interdisciplinary approach to thought and discovery. The authors created an honors seminar on board games by designing class sessions and assessments that aligned with the required course learning outcomes. The following italicized text is from the course description: *This course examines connections between modern tabletop gaming and the engineering profession. Topics include problem solving, critical thinking, teamwork, strategic planning, resource management, ethics, design, rules and standards, collegiality, technical communication, and lifelong learning. The course centers on the experience of actively playing board games in community with classmates and others, supplemented with a combination of lectures, discussion, assignments, and other activities. Students analyze how lessons learned from board games translate to the contexts of engineering problems and the development of professional skills.* In our implementation, the course functioned like a flipped classroom. The allotted 50-minute lecture time was mainly spent on learning and playing games with classmates. Faculty and guests (staff, graduate students, and community members) helped with the rules and strategy during the gameplay. After each class, students read a short document written by the instructor about the game(s) played in class and wrote a brief reflection essay (one page or less) in response to the provided prompts. They were asked to prepare for the next class period by watching or reading about how to play the upcoming game(s) or about its genre or history. Appendix A lists the games played in the course.

The first offering of the course was a success, but there is room for improvement. The students enjoyed the course, made and strengthened friendships, developed new skills, and improved their adeptness at learning new and more complicated games. The formal university evaluations for the course rated it 4.9 out of 5, with a 55% response rate. The professor observed students' professional growth, consistent with the literature. However, it is hard to determine how much is due to board gaming and how much to general maturation over the course of a semester. A sample of student quotes about the course is in Appendix B, suggesting that students believe the course met its objectives. For course grades, attendance and completion of the weekly reflections were augmented by a gamified scoring system based on experience points for various gaming related tasks like logging plays, teaching others, and playing different genres of games.

The course was indirectly inspired by Games of Strategy: Contract Bridge, an honors add-on course for calculus at another large public university [50]. The honors seminar seems to be the most common place where one could incorporate board gaming into the formal curriculum, with several schools reporting teaching a games-related honors course [51-54]. Board courses have also been used to teach leadership development and history, and as a general freshmen seminar [55, 56]. While the authors believe that such a class is beneficial for students, it is unlikely that all students can access it through required courses. There is a trend to trim overall credit hours, and the incentive is not there for enough faculty to teach this type of course for the entire engineering student body [57]. It is, however, still possible and beneficial to do board game activities outside of the classroom or to embed games within traditional engineering courses.

The authors have hosted board game nights for students from the research lab, department, and various student organizations. The largest had 100 plus students, faculty, and staff at an engineering living learning community in partnership with a gaming club [58]. Hosting a board game event for a technical society is a fairly common practice to foster group interactions and as a recruitment method. First-year students may feel more comfortable attending an initial meeting of a professional society if the event is a board game night rather than a lecture or a regular

business meeting. First-year students may perceive the board game event as more fun and lower stakes than other types of meetings. Engineering Summer Bridge programs are an ideal place to include board games as they typically provide coursework during the day and activities during the night. Several programs listed board game events as part of their Summer Bridge schedules [59-62]. Board gaming events would also fit nicely in the schedule for orientation or the first week of classes, as a way to get new students to know each other better.

Hosting a board game night does not need to be expensive. Most commercial board games in the “party genre” like Dixit or Codenames cost under \$35. It is a great return on investment when you consider the number of people and the hours that you can play the game. Plenty of games like Pictionary require no equipment or minimal equipment, like scratch paper or a deck of cards. The same goals of connecting with others can perhaps also be achieved by digital games like Jackbox Games, which are meant to be played using phones as controllers, playing in real time with people whom you are talking to [63]. This could be a great substitute for an in-person game night if the group you are working with is not centrally located. During the COVID-19 pandemic, many student groups utilized online board gaming to stay connected [64, 65].

In addition to hosting board game events, universities can designate physical spaces for board gaming and support student groups for board game players. For example, Princeton University’s Engineering Library and the University of Tennessee’s Library each have over 50 games that students can check out [66, 67]. MIT’s Strategic Games Society has a large, dedicated gaming room on campus, with a library of over 850 games [68]. The University at Buffalo has a board game lounge in its student union, plus a supply of board games in the honors student lounge [69]. The Players Association of the University at Buffalo hosts a small board game convention each semester on campus, in addition to regular meetings [70].

Gameplay can also be included in traditional engineering courses. The corresponding author, when introducing chemical processes in the opening week of the first course for the chemical engineering major, uses a short game inspired by the game Scattergories. Students form teams and are tasked with brainstorming as many chemical processes as they can in three minutes. Teams are awarded points for unique processes not identified by other teams. Students get really into this even without any formal grade being recorded. Every group is called on to involve all the students. Typically, more than 50 processes from everyday life and engineering applications are identified. The game has students reflect on the course content and socialize with their peers.

Many other faculty members incorporate board gaming into the classroom and have published about their efforts. These works can be primarily divided into studies on (1) college STEM classes playing board games to teach specific content via mass-market games [25, 71-75] or custom educational games [76-91] and (2) classes that have their students create board games to think about design, cement course content learning, and to do K-12 outreach [92-100]. Other work focusing on game design outside of a STEM context has clear applications to engineering design and related professional skills: “creative collaboration, problem solving, design iteration, understanding systems, and communicating ideas” [101]. While this paper focuses on tabletop board gaming, others have explored related topics via digital gaming [102-104], escape rooms [105-111], role playing games [112-117], and the gamification of a course [118-126] to create a more engaging classroom experience.

Appendix A

Games played in the course Honors Seminar: Board Games

1. Human Bingo
2. Codenames
3. Pandemic: Hot Zone – North America
4. Students played 2 of the following games: Apples to Apples, Dixit, Charty Party, Wavelength
5. Spades
6. Students played either The Crew or Wizard one week and played the other game the next week
- 7 Koala Rescue Club
8. Saboteur
9. Set
10. Ticket to Ride for students who were in town for the class period before Thanksgiving
11. The final 2 weeks were devoted to open gaming, and they could bring friends and their own games. Students played their choices of some of the games listed above and other games, including Azul, UNO, Settlers of Catan, Diamonds, Paku Paku, and Exploding Kittens.

The main factor influencing the game selection was the 50-minute class period set by the Honors College. The class focused on mass-market board games, as these are the ones students are more likely to play in the future with friends and family.

Appendix B

Student quotes from the final survey of the course Honors Seminar: Board Games, shared with the University at Buffalo IRB approval of Study 00010047. Seven of the 22 students from the Fall 2025 cohort signed consent for their deidentified comments to be included in the study after the class concluded. A selection of their comments is included here.

Strengths

- “The class helped me build community and learn through play rather than lectures. I gained teamwork habits. Playing and analyzing games strengthened my critical thinking because every game required strategy, and decision-making. I saw how games connect to psychology, communication, and engineering, which showed the value of interdisciplinary learning.”
- “I enjoyed learning new games, the relaxed environment, and how the XP system made participation fun.”
- “cooperative games like The Crew improved communication, trust, and reading teammates’ intentions.”
- “games forced planning, predicting outcomes, and adjusting strategies mid play.”
- “I met people I would not have interacted with in another course.”
- “This class was refreshing, and surprisingly meaningful. I’d recommend keeping it.”
- “This class definitely made me reflect on how interactions and logic from board games can apply to other disciplines. Especially in regards to ethics.”
- “Thank you for a great semester, this class was the levity I needed this semester.”
- “I really connected with students like ----, -----, and ---- because of HON 214.”
- “My favorite aspect of this class was learning and experiencing new board games. I didn’t really play board games before I took this class but now I can see how fun it is, and the type of friendships you can create through them.”
- “I think I did make social connections in this class better than I could have done in other HON 214 classes because a big part of this class was talking to other students while playing games.”

Suggestions for Improvements

- “short discussion on how games are produced”
- “A small project where students design a simple game or revise rules”
- “The only thing I could think of is having the class be a little longer. Maybe not as a requirement, but for those who wish to stay for longer they can do so.”
- “1.5 hours would allow both play and reflection. As we meet once a week.”

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