



Beyond Buttered Popcorn: A Project Using Movies to Teach Game Theory in Introductory Economics

Using short movie clips from popular films is an effective tool for teaching core game theory concepts including simultaneous games, the prisoners' dilemma, Nash equilibrium, and cooperative behavior. Assessing student understanding of the topics through a group project reinforces fundamental economic concepts. The generational bias of the current undergraduate population toward technology use and video consumption coincides with this educational technique, allowing students to better relate to the material and process educational concepts creatively and effectively.

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1. Introduction

Addressing the learning styles of the current college-age population begets some trepidation for college-level instructors who are acquainted with a more traditional learning format. Few would disagree that the presence of technology and technology related applications native to the undergraduate population has influenced the learning styles of these individuals. The current college-aged student is often categorized as “Generation Z,” those who will come of age from 2013 to 2020 (Schroer, 2016). According to a Sparks & Honey 2014 trend report, 41 percent of Gen Z spends more than three hours per day on their computers; they also have shorter attention spans and have never known a day without smart phones. This is a marked increase from a decade ago when less than a quarter of the same age students used their computers for anything approaching that length of time. Engaging and educating these learners is difficult and has resulted in research efforts by academicians to discover ways to connect to these learners and to leverage their technological ability.

2. Literature Review

Experimenting with various pedagogical tools in an attempt to promote engagement has resulted in many discoveries. Conaway and Clark (2015) investigate implementing prime time comedic TV programs as a source of inspiration to explicate economic concepts. Their results indicate that students’ attention levels increased, retention of the material was improved, and an upsurge in the level of acumen for the underlying concepts was achieved. Similarly, Lucasen and Thomas (2010) approach economics topics by using the popular TV show, *The Simpsons*. They state, “[m]any students start class with the impression that economics is difficult... [and] are often bored and even bewildered by lectures centered on abstract models with few practical examples” (Luccasen & Thomas, 2010, p.136). Becker and Watts (2001) concur, offering TV clip techniques as a means to depart from “chalk and talk” teaching methodologies. Ghent, Grant, and Lesica (2010), Gillis and Hall (2010), and Hall (2014) also demonstrate effective ways of implementing comedic television to simplify and illuminate core economic principles.

In a similar way, full-length movies or movie clips offer opportunities to reveal economic principles. Macy and Terry (2008) suggest a framework for using movies in an economics course to enhance critical thinking. They purport that the development of critical thinking skills is bound in ethical dilemmas and that “[m]ovies present an intriguing vehicle for engaging students and presenting ethical dilemmas with the necessary depth that students need” (Macy and Terry, 2008, p. 48). Leet and Houser (2003) design an entire introductory economics course around film, using full-length movies or clips of movies to underscore each economic principle and propose that the movie medium promotes economic understanding.

As we ponder Generation Z entering our classrooms, the need to deviate from “chalk and talk” methodologies is apparent. Becker and Watts (2001) advocate this progression as do Dixit (2005) and Suddath (2013). Mateer, O’Roark, and Holder (2016) conducted a survey among their academic peers to determine the most prevalent movies used to teach economic topics, believing that this modus operandi is beneficial to the current undergraduate population. *The Hunger Games* ranks sixth in their survey and they describe its usefulness for demonstrating many economics concepts including game theory. Willingham (2009) questions why students have the innate ability to recall details from a media experience but cannot recollect concepts exhibited in a lecture. His article suggests that media usage can facilitate information retention. Al-Bahrani, Holder, Patel, and Wooten (2016) study the effectiveness of using the arts to demonstrate principles and find that media, among other forms, can help students retain information as it increases the ways students process and manage information. We concur and

have witnessed the capture of student interest in economic theories that are explained through movie clips. While engaging and entertaining, this pedagogical technique need not sacrifice detail or rigor.

Introductory microeconomics courses often introduce the concept of game theory when discussing oligopolies and collusive behavior. We propose a group project that can be assigned to students to reinforce class discussions and assess student learning after these concepts have been introduced. We have found this project to be an especially effective tool to engage students and enrich their understanding of the material. Small groups of students are asked to find a clip from a popular movie or television show to demonstrate a simultaneous game.

3. Sample Project: *The Hunger Games*

To introduce the project, we demonstrate examples of simultaneous moves games as presented in popular media films. We often choose the 2012 movie *The Hunger Games* as our example. We use this particular movie for two reasons. First, *The Hunger Games* was a part of both a popular film and literary series when the typical undergraduate student was in secondary or middle school, so many are familiar with the film. Second, the movie is rich with examples of games and collusion.

We first show the official theatrical trailer (approximately two minutes in length) to introduce the movie project (<https://www.youtube.com/watch?v=mfmrPu43DF8>). Although most students are familiar with the film, it is a quick reminder and helps create familiarity with the concept of showing movie clips in the classroom. We review the plot of the movie with the students. In *The Hunger Games*, the nation of Panem uses a lottery to select participants in a televised, controlled game of fight-to-the-death until there is a sole survivor. Katniss and Peeta are chosen to play in the brutal game. Midway through the game, the Game Maker changes the rules to allow two winners.

We then facilitate a class discussion about the many examples of simultaneous games that are presented in the movie. Students frequently note collusive behavior between Katniss and Peeta, Katniss and Rue, Gale and Katniss, and Cinna and Haymitch.

We then show the "Victors" scene from the movie (Scene 23: Victors, 2:06:49-2:08:56). At this point, Katniss and Peeta believe they have won the game until the Game Maker announces a rule change. The Game Maker will allow only one winner. Katniss and Peeta consider eating poisonous berries, resulting in simultaneous immediate death, to deny the Capitol any winners.

Next, we set up the game as shown in Figure 1, identifying the players. In this case, Katniss and Peeta team up to act as one player while the Game Maker is the second player. Katniss and Peeta have the choice to eat the berries or fight each other to finish the game. The Game Maker has the choice to allow one winner or two winners. We set up the game matrix by asking students to identify the results of each combination.

It is important to identify the assumption and the underlying priorities of each player. The Game Maker would clearly prefer one winner to two winners, but two winners is preferred to no winners. Katniss and Peeta, on the other hand, are motivated to beat the Game Maker. Their first choice would be to both live, but would prefer to both die rather than give the Game Maker the triumph of one winner. You can ask students to rank outcomes for each of the players in the payoff matrix with 1 being the best outcome and 4 being the worst outcome (see Figure 2).

Figure 1 – Game Matrix for Game between Katniss/Peeta and the Game Maker

		Game Maker	
		One Winner	Two Winners
K a t n i s s / P e e t a	Play to Kill	One Winner One Dies	One Winner One Dies
	Eat Berries	No Winners Both Die	Two Winners Both Live

Now we can review the results of the game. Katniss and Peeta have a dominate strategy to eat the berries. In contrast, the Game Maker does not have a dominate strategy. His optimal strategy is dependent of the choices of Katniss and Peeta. Given that Katniss and Peeta will choose to eat the berries, the Game Maker will choose to allow two winners. We find that there is a Nash equilibrium at (Eat the Berries/Two Winners). At this outcome, neither player has an incentive to change his or her strategy. The movies clip is consistent with the results of the game.

Figure 2 – Revised Game Matrix for Game between Katniss/Peeta and the Game Maker

		Game Maker	
		One Winner	Two Winners
K a t n i s s / P e e t a	Play to Kill	4 1	3 2
	Eat Berries	2 4	1 3

4. The Project

Divide the class into small groups. Ask each group to find a simultaneous moves game presented in a movie or television show and present their game to the class. Instructions to students should include the following:

1. Set up the game. Briefly introduce the characters, describe the plot and set up the scene. Do not assume that your audience is familiar with the movie/show.
2. Show a short clip that depicts the game. Download all clips prior to class and make sure that all clips are appropriate for the classroom (in other words, make sure that all clips are PG).
3. Construct the payoff matrix for the simultaneous game and present an analysis of the game. In your analysis consider the following:
 - a. What are your assumptions in defining the game?
 - b. What are each player's strategy options?
 - c. Does either player have a dominate strategy?
 - d. Does this game have a Nash equilibrium?
 - e. Is the movie/show consistent with the game?
 - f. How could the game be changed to create a dominant strategy or generate a Nash equilibrium (if it does not have one)?
4. The total presentation should be no longer than 10 minutes and must include each group member as a speaker.
5. A one-page summary of your game, analysis, and conclusions is due at the end of the presentation.

This project has been assigned in more than 16 sections of Introductory Economics at the undergraduate level. The students are typically freshman and are generally a mix of liberal arts and business majors, although engineering and nursing majors occasionally take the class as well. Class size is usually 30 students, which allows the project presentations to be completed within two 50-minute class periods. The project works especially well in small classes where student interaction and peer learning are encouraged.

We believe that the project also lends itself to larger classroom settings as well as online courses where it would provide students with the opportunity to work with their peers. This could be accomplished through meeting/conference software such as Zoom or WebEx. For large classes or those whose class time does not allow for the group presentation aspect, project instructions could easily be altered to require only a written analysis of the game to be submitted directly to the instructor.

While the use of the project assignment is a more recent instructional development, the technique of using film clips to teach game theory concepts has been used to teach more than 1,000 students at both the graduate and undergraduate level. The graduate students are MBA students taking a core economics course, while the undergraduate students come from a wide variety of majors including criminal justice, business, psychology, and pre-pharmacy among

others. The technique has been used effectively at small- and medium-sized universities with selective admission standards as well as at a larger institution with an open admission policy. While this research focuses on the value of this exercise to the Generation Z population in particular, it also confirms prior research findings on the broad appeal of using movie clips as an instructional technique in today's economics' classrooms.

The student response to this assignment in the form of mid-semester formative evaluations and end of the semester teaching evaluations has been quite positive. Some examples of student projects include the ferry scene from *The Dark Knight*, the love triangle in *The Notebook*, and an immediate medical decision from the TV show *Grey's Anatomy*. Overwhelmingly, the resulting student presentations were lively and creative, with the added benefit of increased student participation and engagement during the class discussions following the project. Although some students assert that the effort to find a relevant clip can be time consuming, teaching evaluations, student exam performance on specified learning outcomes, and student feedback reinforce the success of the project.

5. Tips for Success

Using movie clips to teach game theory and strategic play comes with some challenges. However, extensive experience using these techniques enables us to provide suggestions for leveraging their use.

Students almost invariably ask to watch the whole movie. In other words, the entertainment aspect can sometimes overwhelm the mission of the exercise which is to facilitate an understanding of the game theoretic elements. Therefore, an explanation of how the movie clip and subsequent discussion fit within the context of the learning objectives for the topic or chapter is essential.

Organization both in the context of where this material fits in your course and how you design the particular class in which you use this exercise is essential. The technology in your classroom should be tested to avoid delays. Consider downloading the movie to avoid time lost to potentially unreliable internet connections. Further, it is a good idea to have a backup plan for the lecture in case classroom technology fails.

The age and maturity of the students must also be considered when choosing an appropriate clip. For example, some clips contain foul language and gun violence. While this may add to how entertaining students find the movie clip, this can represent a distraction and can make students uncomfortable. Stress the importance of classroom-appropriate clips when presenting the project.

The success of the student project is dependent on clear instructions, strict time limits, and small groups of students (three or four students is ideal). A clearly defined grading rubric makes grading the project easy and efficient. It should be noted, however, that a simple internet search will reveal many examples of the games in mainstream media such as movies and TV shows (Shor, 2006). Plagiarism can be an issue and should be considered.

The Copyright Act (1976) makes an allowance for some educational uses of copyrighted material. For instance, the limitations on exclusive rights section of the law gives instructors and students the ability to show copyrighted material "in the course of face-to-face teaching activities of a nonprofit educational institution" (17 U.S.C. § 110). Section 107 of the Copyright Act considers additional classroom uses that may not meet the requirements established under Section 110 on a case-to-case basis (17 U.S.C. § 107). Further, use of copyrighted materials may

be used during online instruction if it meets the criteria described under the TEACH Act (17 U.S.C. §§ 1301-1332). Many universities and colleges have established their own policies and procedures for use of copyrighted work based on the Copyright Act, so it is best to check with your educational institution about any legal issues before implementing this approach.

6. Conclusions

Today's undergraduates have grown up with technology and technology-related applications. They are comfortable with technology-based communication and often socialize in media formats. Additionally, technology has influenced their approach to learning in the classroom. Using movie clips is an effective approach to capturing the attention of students who are accustomed to being entertained. Similarly, this generation responds well to group work. This project encourages students to search for economics in the media formats that they prefer. Initial observational assessments show an improved level of understanding of core game theory concepts. Additional benefits include increased student participation in the classroom that extends beyond the length of the project and enthusiasm that could be an important link toward sparking an interest in the field of economics.

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