



Lesson Plan: Mixed Strategy Nash Equilibrium Using Game of Thrones

Objectives:

1. Understand the concept of a Mixed Strategy Nash Equilibrium (MSNE) in game theory.
 2. Analyze strategic interactions where players randomize over strategies.
 3. Evaluate how MSNE applies to decision-making under uncertainty.
 4. Apply MSNE concepts to scenarios from *Game of Thrones*.
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Materials:

- Video: ["Game Theory in House of the Dragon: A Mixed Strategy for the Prince's Life"](#)
 - Whiteboard or presentation slides for game theory diagrams.
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Procedures:

Introduction (5 minutes):

1. Begin by discussing how uncertainty and strategy play a role in decision-making.
2. Introduce the concept of a Mixed Strategy Nash Equilibrium (MSNE) as a situation where players randomize their choices to make opponents indifferent to their strategies.

Instruction (30 minutes):

1. **Introduce why many games only have a MSNE:**
 - Explain how some games have a Nash equilibrium in pure strategies, like a prisoner's dilemma game, but other games do not have one.
 - Provide a simple example, such as rock-paper-scissors, where each player chooses their actions with equal probability.
2. **Video Analysis:**
 - Show the video ["Game Theory in House of the Dragon: A Mixed Strategy for the Prince's Life."](#)
 - Ask students to identify the strategic situation described in the video.

3. **Group Discussion:**

- Divide students into small groups to analyze:
 - What strategies were available to the Prince and his adversaries?
 - How does randomization ensure survival or success in this scenario?
 - Was the outcome influenced by information asymmetry or imperfect information?
- Have each group present their findings.

4. **Game Theory Diagrams:**

- Use the whiteboard or slides to map out the strategies and payoffs for each player.
 - Note, different groups could come up with different payoffs here. Some might use numbers and others might use “live/die”, for example. This is OK and gives a educators good opportunity to discuss how defining the payoffs is important (and not always easy).
- For those who provided numbers, calculate the MSNE, showing how each player’s choices influence the others.

Conclusion (10 minutes):

1. Recap the key concepts of MSNE, including the role of randomization in strategy.
2. Emphasize the practical applications of MSNE in competitive and uncertain environments.

Follow-Up Activity:

Assign students to find a real-world example where players use mixed strategies (e.g., business pricing strategies, sports tactics). Have them prepare a brief analysis of the strategies and potential equilibria to share in the next lesson.