

Strategic Adjustment Activity

(30 minutes)

Materials you will need

- “adjustment_game_1.xlsm” and “adjustment_game_2.xlsm” excel files
- “adjustment_activity.pdf” slides

Instructions

1. Ask for 12 volunteers. Break them up into 3 groups of 4. Break each group up further into 2 teams of 2 each. The two teams in a group will face one another in the game. So you will fact be running three versions of the game in parallel. (Or, if you teach multiple sections, you can run one game in each section and have competition, as described below, across sections.)

2. For each group, make one team the Defender and the other team the Attacker. (They will switch roles for the second version of the game later.)

3. [Slide 1] Say,

“In this first version of our game, each Defender is protecting 4 targets. The Defender teams each have 100 units to allocate to defending their 4 targets. If a Defender allocates x_i units to defending a target, then if that target is attacked, the attack succeeds with probability $\frac{100-x_i}{100}$.

So, for instance, suppose you devote 20 units to target 1, 40 to target 2, 30 to target 3, and 10 to target 4. What is the probability an attack against target 2 succeeds? (60%) What is the probability an attack against target 1 succeeds (80%)

After the Defenders allocate their resources, the Attacker sees those allocations and then chooses exactly 1 target to attack.

You will play 5 rounds of this version of the game.”

4. [Project Slide 2] Once you are sure they understand the order of play, go on to explain the scoring rules for the first version of the game. Say,

“Scoring works as follows.

The Defender values the targets differentially. Target 1 is worth 1 point, target 2 is worth 2 points, target 3 is worth 3 points, and target 4 is worth 4 points. A successful attack against a target destroys its value. So the Defender’s score for a round is the sum of the points associated with all targets that have not been successfully attacked.

The Attacker simply gets 10 points if it successfully destroys any target and 0 otherwise.

Whether the attacked target is destroyed will be determined with a computer program that accurately implements the probabilities of success and failure just described.

[THE FOLLOWING IS VERY IMPORTANT. THE GAME WILL NOT WORK IF YOU DON'T DO THIS PART.]

Very importantly, for this game, you are not competing against the team you are facing. Rather, the 3 Attacker teams are competing against one another and the 3 Defender teams are competing against one another. The winners will be the two teams (one of each type) with the highest point total.”

5. [Project adjustment_game_1.xlsm. You will need to enable macros for the program to work.] Have the Defenders take 1 minute to decide how to allocate their resources and write it down. Have them read out their allocation to you and type their allocations into the relevant spots in the spreadsheet for round 1. These must sum to 100 or the program won't work. (You have 3 tabs for the 3 groups.)

Now have each Attacker team tell you which target they want to attack, given how their Defender team allocated its resources. Type the number into “Site Attacked” in round 1

Once you've done this the Random Number column will display a number between 0 and 100. If the number is larger than the amount allocated to the attacked target, then a 1 will appear in the “Successful Attack” column. Otherwise a 0 will appear. The spread sheet will then calculate the points for the Defender and the Attacker.

Repeat 5 times and note the TOTAL for each team.

6. Talk with the teams a bit about how they made their allocation decisions and what factors they were thinking about.
7. [Project Slide 3] Now tell the teams they are switching roles. The Attackers become Defenders and the Defenders become Attackers. Say,

“We are going to play the same game, but with different scoring. Now the Defenders value each target equally. Each is worth 2.5 points. Again, a successful attack destroys the value of a target and the Defender's score in a round is the sum of the value of all the non-destroyed targets.

The Attackers now value the targets differentially. The value of a successful attack on target 1 is 4 points, the value of a successful attack on target 2 is 8 points, the value of a successful attack on target 3 is 12 points, and the value of a successful attack on target 4 is 16. If the Attackers successfully destroy a target, they get the points associated with that target. Otherwise, they get 0. “

8. [Project adjustment_game_2.xlsm] Again play 5 times, this time recording in adjustment_game_2.xlsm.
9. Again debrief. What was different about the considerations in this game? Was optimal play the same or different? Why?
10. Report the winning teams (the two teams with the highest Total Points across the two games) .