Let the games begin!

Overview

Many of the sports we play on Earth have a lot to do with gravity. What would happen to a game if we tried to play an Earth game like football, baseball, tennis, or golf, in an environment with one sixth the gravity of Earth? The idea of this lesson is to explore how gravity affects games.

We recommend organizing students in groups of three. The work of the three students will be highly interconnected. We suggest the following names and roles for participants:

- Referee: Primarily focuses on the rules of the game and is the chairperson for the group.
- Groundskeeper: Focused primarily on the physical features of the place the game will be played.
- Equipment Manager: Leads design of game equipment, safety features, and uniforms.

The big idea of the project is for a team to work together to more fully understand the environment on the Moon by considering how the lunar environment may hinder some old games and make new games possible.

Engagement

Many of us tend to like games and sports. Sports depend upon the environment in which they are played. The game of baseball is played on a field where the dimensions have been carefully defined by the speed of the ball and abilities of the players. Golf courses are designed around how far a golf ball can be hit. The height and size of a basketball hoop has everything to do with players ability to shoot the ball and jump. Ask students to come up with several other games or sports where the game is defined or played based on limitations of the players or equipment used.

Exploration

What happens if you change acceleration due to gravity from 9.8 m/sec^2 to 1.625 m/sec^2? Not only are you and everything else ⅙ as heavy, but you also fall ⅙ as fast. You should be able to jump 6 times as high, you will return to the ground much more slowly than on Earth, and a falling ball may appear to be in slow motion. Pick a sport and consider how playing that sport will be impacted. Please choose a movement-oriented sport, not chess.

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Explanation

Prepare a presentation to explain how your sport is changed as a result of attempting to play it on the Moon. Consider using diagrams and graphs to illustrate the impact. Suggest modifications to the game to make it better suited for the ⅙ g lunar environment.

Extension

Create a new game to be played on the Moon. It can be designed for outside play using an EVA suit, or for inside a pressurized building. Please specify the object of the game, team size, special equipment required, how the game is played, and the general rules that govern the game.

Evaluation

A rubric has been prepared to assist the teacher in evaluating the project. We suggest that evaluation of each individual's learning resulting from this project is the result of an interview of each student by the teacher using the following rubric for guidance.

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Concept	9-10	7-8	5-6	3-4	1-2
Big idea behind the project	Adequate description of how the project is intended to build understanding of how the environment affects a game.		Describes moderate impact of the new environment without apparent full understanding.		Describes facts learned during the project.
Rules of the Game	Describes the rules and explains how the team arrived at the solution.		Describes the rules and significance.		Offers few details of design or significance of the rules.
Field of Play	Describes the field of play in detail related to the work of the team.		Describes the field of play in moderate detail.		Offers few details of the field of play.
Uniforms and Equipment	Describes the uniforms and equipment in detail related to the work of the team.		Describes the uniforms and equipment in moderate detail.		Offers few details of uniforms and equipment.
Teamwork	Offers evidence of effectively working as a team member to meet goals.		Describes inconsistent attempts at collaboration		Offers minimal evidence of teamwork.