

Teachers' Guide

Objectives of the lesson

- Students realize the wrist is a lever and that each shoot requires the proper force
- Students recognize the three parts of a lever in the wrist
- Students are able to score using the lever
- Development of fine mobility skills
- Students cooperate with each other
- Students develop their creativity and critical thinking skills to solve a problem they are given

Introduction to the activity

The activity refers to basketball. Even from the initial discussion, students are encouraged to understand that shooting in basketball is not left out to chance. It is a result of technique, that players work during training. Shooting techniques are the result of the research on how it can be more effective. Bioengineering is the discipline that studies the engineering of the human body and tries to improve the performances and reduce injuries in all sports. If you have students that play basketball, let them talk about their training.

We end up that the athlete's hand that shoots the ball is a lever, where the fulcrum is on the elbow, the force is ahead and the load is the ball that the athletes hold in their palm.

Simple Machine

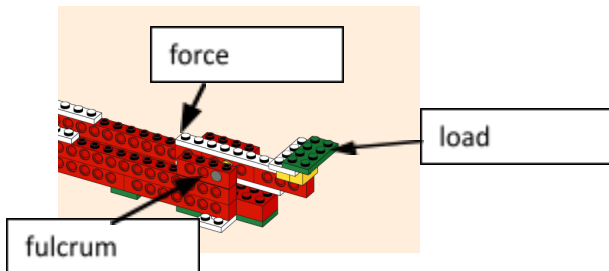
The simple machine you use in this activity is the lever. Remind your students about the fulcrum, the force and the load, the three parts a lever consists of, and the three classes of levers (as for the last one, students would most probably not remember about them. Refer to them, but don't insist). You will meet the lever twice in the activity, once during the presentation, where the hand of an athlete is a lever while he shoots the ball to the basket, and once during the building, where you build a catapult that throws the ball to the basket. During the activity students realize that simple machines are in our body as well.

Building

Follow the guidelines, the building has no difficulty. At Step 21 you can emphasize to your students to take notice how they can use the connectors to increase the height of their building.

Answers to the worksheet

1. In the basket we built the lever replaces the athlete's hand. The fulcrum the force and the load are noted in the picture below.



The lever is 1st class.

Beware! The athlete that shoots the ball is a 3rd class lever.

2. One problem that students might face is that the ball cannot reach the basket or goes beyond it. They can overcome it by adjusting the distance between the fulcrum and the load. Another problem might be that the "ball" cannot pass through the basket, so they enlarge the basket or shorten the ball. In general, all challenges they need to overcome are constructive. Ask your students to deal with them creatively.
3. The distance for a free throw is nearer the basketball than a 3-point shoot. So, in the latter you need a bigger force, so the ball can reach the basket. Apart from the force applied, the ball needs to get to the appropriate height to travel till the basket. This is an application of throwing at an angle in physics textbooks, but students of that age have nothing to do with that!) Just stay to the qualitative part!