

Watt powers your house?

Power output can be measured, predicted, and created therefore the following lesson will take the opportunity to provide students with a first-hand experience in measuring and simulating power. Using the Microcycles they will be measuring their own power output and illustrating their findings.

Grade: 3rd Grade

Lesson Length: 45 minutes

Standards

3-PS2-2: Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion.
 3-PS2-3: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
 W.3.7 Conduct short research projects that build knowledge about a topic.
 MP.2: reason abstractly and quantitatively and quantitatively.
 CCSS.Math.Content.3.MDA.1: Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

Objectives

- Students will be able to calculate how long it will take to produce 30 watts of power with 80% of accuracy.
- Students will be able to gather and interpret data with 80% accuracy.
- Students will be able to write time intervals and solve word problems with 80% accuracy.

Materials/Technology/Equipment

- ✓ One Green Microcycle
- ✓ Stop Watch
- ✓ Lined paper
- ✓ Writing material/colored pencils
- ✓ Illustration of a house: must include lights, cooking appliances, televisions, a washer, microwave, a fan, laptop, and a stereo.

Activity Structure

***The following lesson is created with the assumptions the students have already been introduced to energy and the way it is used to power objects.**

Opening Discussion/Introduction
minutes

5

Students will begin the lesson by being shown an enlarged illustration of a house. Next to the following items the teacher will ask the students how much energy do they think they use? (Numbers are estimates with wide variety depending on device)

1. Television (200W)
2. Refrigerator (500W)
3. Dishwasher (725W)
4. Microwave Oven(1000W)
5. Phone Charger (10W)
6. Portable Fan (40W)
7. Laptop (30W)
8. Stereo (100W)

The teacher will then ask how many students have these basic items in their homes. Then they will be shown that instead of using electricity to power them they are going to have to use the Microcycle.

They will be given the task to discover how long they have to pedal to be able to power their homes and the appliances listed above.

Lesson
minutes

30

To begin the lesson, the teacher will make a demonstration with the bicycle.

1. The teacher will ask for a volunteer to ride the microcycle, a second volunteer to hold a stop watch, and a third to count rotations.
2. The teacher will then review a few pieces of information:
 - The bikes have a generator that gets ignited by kinetic energy that is pushed through the pedals, sent to rotate the wheel, which is then powered by the individual.
 - The teacher will then put a sticker at one point and show the students that when the student pedals both feet that makes one full rotation. Only pushing one pedal makes half a rotation.
3. The teacher will then demonstrate each job for the students.
 - The student riding the bike will be counting out each rotation 1-2, 1-2, 1-2.
 - The student tracking rotations will make a tally mark for each 2 they hear.

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- The student with the stop watch will tell them to start and stop.
- 4. The teacher will then let the students know that they should attempt to pedal at a cadence where the meter says 30 Watts are being generated, and calculate how many revolutions per minute (RPM's) that would take. (since it may be hard for a child to maintain 30 watts for a minute, it's suggested to count rotations for 10 seconds, and multiply by 6. For example if it takes 15 rotations for a student to keep the meter at 30 watts for 10 seconds, then $15 \times 6 = 90$ RPM.
- 5. The students will then be divided in groups of 3.
- 6. They will each be given the questions:
 - How many rotations per minute do you need to power a house with the appliances listed above?
 - How many green microcycles, each outputting 30 watts, would it take to power a house with the appliances listed above?

The students will then each take their jobs and begin counting and marking their information. As the students work, the teacher will be circulating the classroom to ensure safety and be a support for the students.

Once the students have completed, they will all come back together as a whole group and discuss their findings. Each of their estimates will be written on the board and they will discuss their experiences.

Wrap-up **10**
minutes

Exit Ticket: Students will then be asked to write in their Science journals and answer the following prompt:

1. What did you learn about the appliances in your home?
2. Is there a way we can save energy?

After the Lesson

Homework

Students will go home and make a list of ten items they use that require energy and they will attempt to research the amount of Watts being used.

Extension Activities

Following the lesson, the students can begin to discuss the following topics:

- Renewable resources
- How the microcycles can be used to power homes and other facilities?
- Research the benefits of using the Microcycles for the planet.

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- Discuss the other different methods of energy and electricity.