UK SPACE AGENCY

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MISSION X

TRAIN LIKE AN ASTRONAUT

GET ON YOUR SPACE CYCLE!

Team Leader Guide

MISSION OVERVIEW

Students will plan a route, and train with a bicycle to strengthen leg and abdominal muscles, and cardiovascular fitness.

FAST FACTS

Subject: Physical Education
Age: 8-12
Lesson Time: up to 30 min
Location: between students' home and school.

LEARNING OBJECTIVES:

- Build and improve strength, balance, and endurance.
- Practice basic multiplication and division.
- Make and record observations about improvements in bicycle riding.

Skills: coordination, strength, endurance.

INTRODUCTION

Cycling helps to strengthen heart vessels and lungs for endurance, as well as leg muscles. Cycle training will get your students used to long-distance cycling. They will also improve their coordination, balance and focus on the environment around them. A stronger heart and more muscular endurance will allow them to play and run for a much longer time. Finally, cycling is an ecologically friendly means of transportation.

Physical exercise is part of the daily routine of astronauts on the International Space Station (ISS). Muscle and bone carry less load in weightlessness and get weaker; about 2 hours of daily exercise slows down muscle loss and loads the bones in the skeleton. The ISS has an exercise cycle, called the Cycle Ergometer with Vibration Isolation and Stabilization (CEVIS), which helps strengthen leg bones and is used for endurance training. When the large muscles in the leg work, they need more blood. This causes the heart to pump more, and you have to breathe faster to take in more oxygen. Cycle training on the ISS is an important exercise to help astronauts maintain endurance and cardio-vascular fitness.

↑ ESA astronaut Thomas Pesquet riding the Space Station's exercise bicycle.

LET'S TRAIN LIKE AN ASTRONAUT!

MATERIALS

Team Leader

- No special equipment required for Team Leaders

Student

- Gym mat (1 per student)
- Bicycle
- Pencil, paper, and Mission Journal

PROCEDURE

Activity 1: Building core strength

1. Have students lie face up on a gym mat, arms by their sides, and legs raised to 90°.
2. Have students bend their right leg into their chest while keeping the left leg outstretched, then switch legs. This should resemble an upside-down pedalling motion.

Each student should repeat this pedalling motion 10 times.

Increase Difficulty:

- Have student raise their arms to the side or above their head
- Have students lift their head off the ground
- Have students lower their legs to 45°

Activity 2: Practicing balance

1. To improve balance while cycling, students can try the following adaptations:
    - Cycle forward, then roll with feet outstretched off the pedals.
    - Cycle forward, then stand and roll without pedalling.
    - Cycle forward, stand up off the seat while continuing to pedal (this is useful for climbing hills!).
    - Cycle forward, then release hands from the handlebar one at a time.

Activity 3: Go for a space cycle!

This exercise is a homework activity.

1. Ask students to bike to and from school for one day. If that's not possible, they can cycle 3 km in their free time and report the activity.
2. Have each student record the route, duration, and how they felt during the ride in their Mission Journal.

SET-UP

A successful bike ride begins with a route preparation. Before starting the bicycling activities, help students calculate the theoretical time it will take to complete a route of their choice.

Depending on the students' age, use the following average speed:

10 km/h for 6-8 years old
12 Km/h for 8-10 years old
15 km/h for 10-12 years old

To complete the calculation, use the following variables:

d= the distance to ride
v= theoretical speed
t= time to complete the ride

Time can be calculated by the following formula: $t = d \div v$

Example calculation:

How long will it take an 8-year-old to complete a 2km ride?

d = 2 km v = 10 km/h t = ?

$t = d \div v$
t = 2 km ÷ 10 km/h
t = 0. 2 hours

Now, convert this value to minutes: 0.2 h x 60 min/h= 12 minutes

If riding at 10 km/h, this 2 km ride should take 12 minutes to complete!

THINK SAFETY

- Avoid obstacles, hazards, and uneven surfaces.
- Appropriate attire for cycling such as a helmet and knee and elbow pads should be worn.
- Students should keep hydrated before, during, and after any physical activity.
- Students should be aware of the signs of overheating.
- A warm-up/stretching and cool-down period is always recommended.
- All cycle safety and traffic rules must be followed.
- Bicycle should be properly fitted to each student.

MISSION ADAPTATIONS

Increase Diffculty

- Invite students to ride their bicycle to school and back home for two or more days in one week.
- Challenge students to try a route which involves at least one small incline.
- Encourage students to cycle and explore their local area on a weekend

Increase Accessibility

- Incorporate the use of an adaptive cycle.

Decrease Difficulty

- Invite students to use bicycle training aids while practicing (e.g. training wheels, tricycle).
- Encourage students to practice cycling a short route without incline, such as around the block of their house.

This resource has been adapted from NASA's "Get on your space cycle!".
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