

**ABSTRACT**

The mechanics of physical education are based on mathematical and scientific principles. Older students often lose the motivation that had kept them active and fit. This lesson was developed to increase students' participation and motivation in setting fitness goals. If they understand the purpose of physical education activities and witness real changes, students may be more willing to incorporate fitness into their lifestyles.

**TIES TO CURRICULUM**

There is a trend in mathematics education to develop lessons that apply to real life. Physical education is a curricular area that allows for real-life math problems such as keeping score, dividing into teams, measuring distance, and timing. One physical education standard is for students to achieve and maintain a health-enhancing level of fitness. Physical activities should address each health-related physical fitness component, assess personal fitness within each component, interpret the results of physical fitness assessments and use this information to develop individualized physical fitness goals, and evaluate the effectiveness of exercise to obtain fitness goals. To reach these goals, students must use math to evaluate the effectiveness of a fitness program. Without such an evaluation, students may underestimate the value of a fitness unit.

**TIME REQUIREMENT**

This activity takes approximately 1½ hours. This is the first lesson of a fitness unit. Students can supplement the program with half-hour time blocks at home, and then repeat the activity once a month during the semester.

**LEARNING OBJECTIVES**

- Students will be able to
- ◆ calculate and graph their predicted and actual running speeds and determine their resting heart rates;
  - ◆ state the physical changes of their cardiovascular fitness levels based on pre-test and post-test assessments; and
  - ◆ apply mathematic and scientific concepts to real life situations.

**NUMBER OF LAPTOPS AND GROUP SIZE**

One laptop for every four students is ideal.

<b>Task</b>	<b>Time</b>	<b>Location</b>
Introduction	15 minutes	Running track or gymnasium
Preparation	10 minutes	Running track or gymnasium
Running	20 minutes	Running track or gymnasium
Cool-down and discussion	15 minutes	Running track or gymnasium
Exercise log	30 minutes	Running track or gymnasium

**MATERIALS**

- ◆ Laptop computers
- ◆ Printer
- ◆ Microsoft Excel software
- ◆ Stopwatch
- ◆ Trundlewheel or a measured distance of 1000 meters

**SUGGESTIONS**

- ◆ Some students may need to walk or run 500 m if there are medical concerns.
- ◆ Try to avoid competition. Instead, encourage students to increase their own gains rather than beating classmates.
- ◆ Emphasize enjoyable fitness activities so students will be motivated to achieve their exercise goals.

**LESSON DESCRIPTION****Introduction**

Discuss the definitions of heart rates, cardiovascular endurance, physical fitness, and how they apply to regular exercise. Depending on the level of the students, you may need to review computer spreadsheets. Ask students if they think they can change running and strength performance to become stronger and faster. Explain that in this activity, students estimate how far and how fast they can run, then use laptop computers to graph initial running results and set goals for future performance.

**Activity**

After the introduction, students should be relaxed and calm. Time one minute while students count their pulse to measure resting heart rate. Divide students into groups of four and give each group a laptop computer. Groups will use a spreadsheet to enter each student's name, number, and resting heart rate, and predict how long it will take each to run 1000 meters. Assign each student in each group a number from one to four.

All of the students with the number 1 run 1000 m while other students warm up and stretch. The teacher stands at the finish line to tell students their time. 1s return to their laptops to record their running time as 2s run, followed by 3s and 4s. Groups then cool down and stretch. Finally, teams discuss and problem-solve how to improve their times.

Ask students these key questions about fitness: Why do we want to increase our cardiovascular endurance and be physically fit? How do we change our fitness levels? As a class, discuss each group's problem-solving ideas on increasing fitness gains. Explain the components of a fitness program—intensity, frequency, duration and mode of exercise. Give four examples of exercise and the duration of each log (e.g., 10 minutes of tennis). Groups should determine which activities and times would be beneficial in their fitness programs,

and then complete an exercise log on the laptop. Logs should include intensity, frequency, and duration of each exercise performed. Rotate between groups to give feedback and assist students on their exercise logs. Review the printouts of predictions, time and logs.

Outside of class, students should maintain exercise logs and record when and how they exercise.

Students can analyze performance in their logs to determine if they are reaching their goals. In one month, students take another timed run and compare that run to the original. They also compare their current resting heart rate with their previous resting heart rate. Students record these numbers in the spreadsheet and state the physical changes in mathematical terms.

## ASSESSMENT

There are three main components of this activity. First, assess each student's cooperation and ability to work in a group. Second, evaluate data collection and analysis, which should include a neat and well-organized exercise log. Third, assess each student's fitness level and fulfillment of fitness goals.

## REFERENCES

### Books

Carpenter, J. and D. Tunnell.  
*Elementary P.E. Teacher's Survival Guide*. New York: Parker Publishing Co., 1994.

National Council of Teachers of Mathematics. *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: NCTM, 1989.

National Research Council.  
*National Science Education Standards*. Washington DC: National Academy Press, 1996.

### Web sites

National Association for Sport and Physical Education.  
National Standards for Physical Education  
<http://www.aahperd.org/naspe/publications-nationalstandards.html>