

Investigating Errors of Measurements by GPS Tracking Apps

Key Stage: 3

Mathematics Education

Strand: Measures, Shape and Space
(Learning Unit: Error in Measurement)

Technology Education

Knowledge contexts: Information and Communication Technology
(Module: Computer Systems)

Objectives:

- (i) To consolidate the concept of error in measurement
- (ii) To understand and apply ICT as a prime tool for learning and in our daily life

Prerequisite Knowledge:

- (i) Calculate different types of errors
- (ii) Use rate, ratio and proportion to solve real-life problems

Resources Required: Scaled floor plans of the school playground, trundle wheels, and tablet computers with GPS tracking apps installed



Description of the Activity:

1. The teacher introduces the activity to students and revises the concept of ratio and proportion.
2. The teacher gives each student a scaled floor plan of the school playground.
3. Students, working in groups, measure the dimensions of the playground on the floor plan and calculate the actual dimensions of the playground by consideration the scale ratio of the floor plan.
4. Students discuss how to verify the answer found in (3).
5. Students use trundle wheels and GPS tracking apps at the same time to measure the dimensions of the playground.
6. Students compare the results obtained in (3) and (5) and by taking the measurements by trundle wheels as reference, compare the errors of the results obtained from measuring the floor plan of the school playground and by GPS tracking apps..
7. Students discuss which method (scaled floor plan or GPS) is more reliable and how to reduce the errors in measurement.

Notes for Teachers:

1. It is desirable for students to work in small groups.
2. The teacher should allow ample opportunities for students to discuss and draw conclusion by themselves instead of giving them straightforward hints.
3. The teacher should prepare prior information about the dimensions of the school playground.
4. The teacher should install the GPS tracking apps in the tablets before the lessons.
5. The teacher could also conduct the activity in a standard athletic ground and asks students to measure the lengths of tracks for studying the errors of measurements by GPS tacking apps.
6. GPS function is widely used nowadays. Teachers could encourage students to find out the principle and usage of GPS from the Internet.

This example mainly involves the following generic skills:

1. Communication Skills

- Understand, analyse and respond to teacher's spoken instructions and instructions on worksheets
- Use appropriate language and mathematical expressions to present the methods and results of calculations
- Discuss and work with others to accomplish tasks, for example, determining the most appropriate way to take the measurement through discussion

2. Critical Thinking Skills

- Understand the restrictions of real measurement
- Evaluate the ways of finding the actual dimensions of the school playground
- Draw logical conclusions based on adequate data and evidence, for example, by comparing different methods and related errors in measuring to conclude the most appropriate method for taking measurements

3. Information Technology Skills

- Use the GPS tracking apps in the tablet to carry out the exploratory activities

4. Problem solving Skills

- Compare the results of different measurement methods and justify the method selected