ScienceCube

Finding True North and Magnetic North

Using magnetic declination and geomagnetic sensors, you can identify and explain the difference between true north and magnetic north.

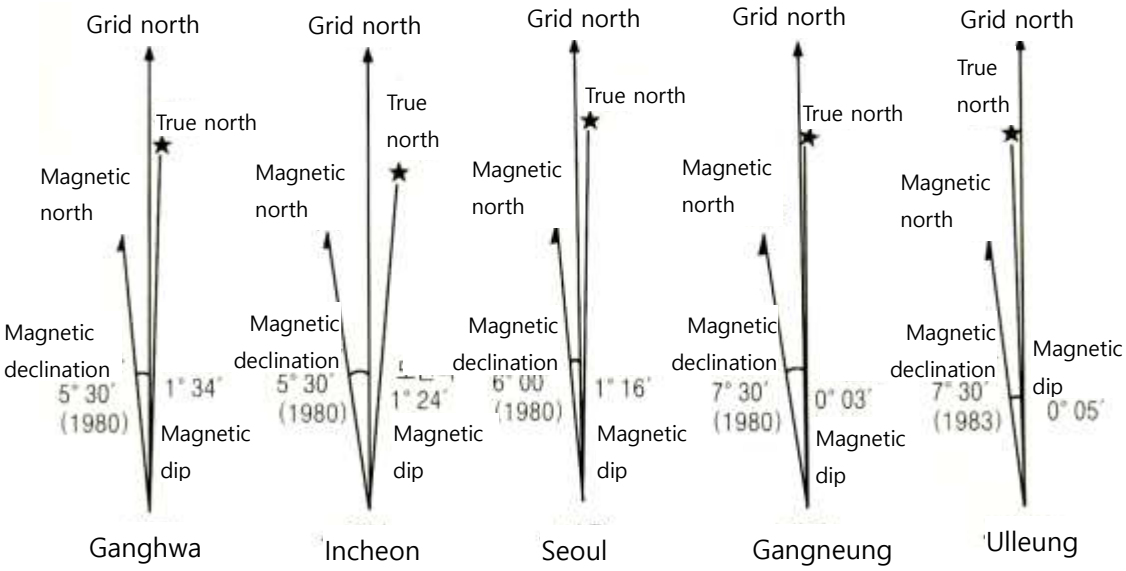
Fundamental Concept

1. Definitions of True North, Magnetic North, and Map North

- True North: The direction towards the geographic North Pole, which is the same as the direction of the North Star. True North is represented by a star symbol (★).
- Magnetic North: The direction indicated by the north end of a compass needle. It points to the magnetic north pole, located near Hudson Bay in northern Canada, which shifts slightly every year. The symbol for magnetic north is a half arrow (⇀).
- Map North: The direction towards the top of the map, aligned with the longitudinal lines. It is represented by an upward arrow (↑).

2. Magnetic Declination

The difference between true north and magnetic north is known as magnetic declination. In Seoul, for instance, the declination is about 6.5 degrees. This difference varies depending on the location and Earth's magnetic field..



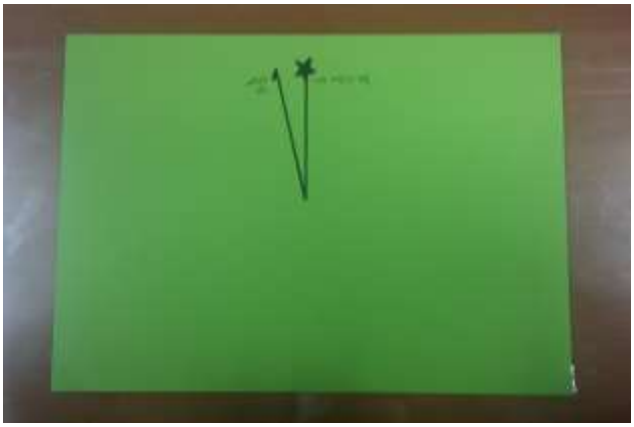
Experiment

Materials Needed

Smart sensor box, Science# program, A4 paper, Tape, Pens (two different colors)

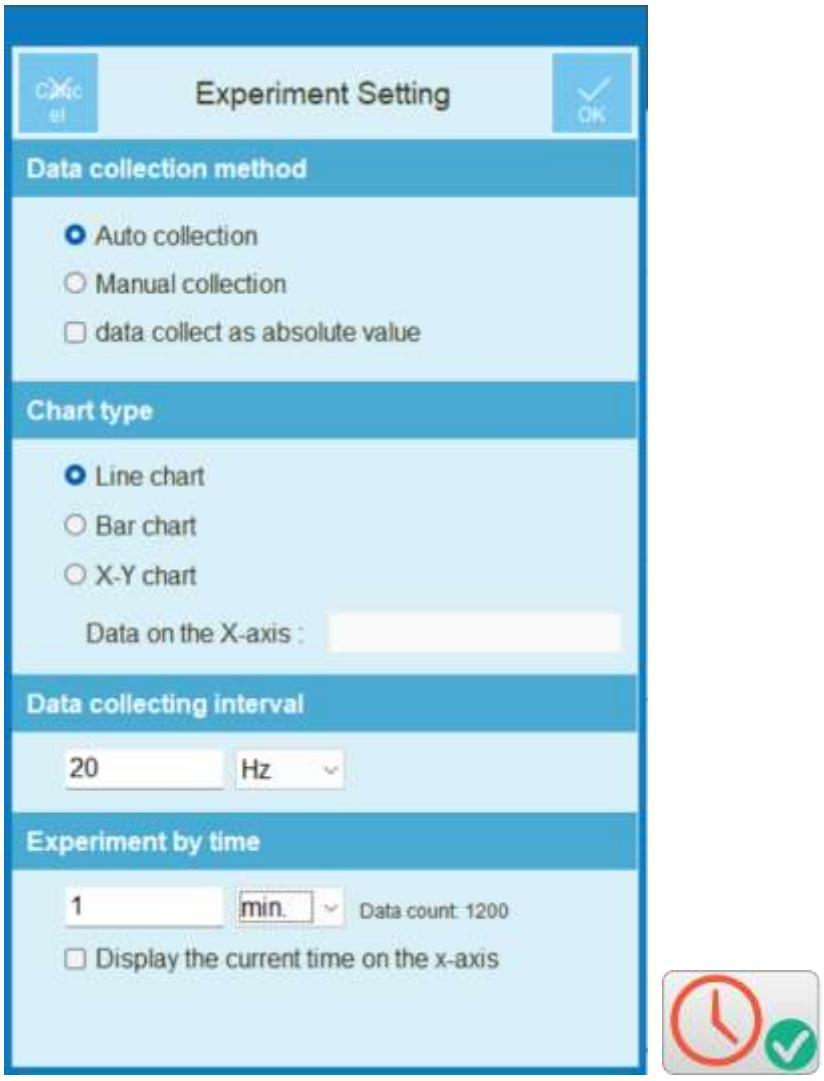
Experimental Setup

1. Tape the A4 paper to a desk and mark the center point as a reference.
2. Draw arrows indicating your estimated directions of magnetic north (1) and true north (★).
3. Research and record the magnetic declination for your location.



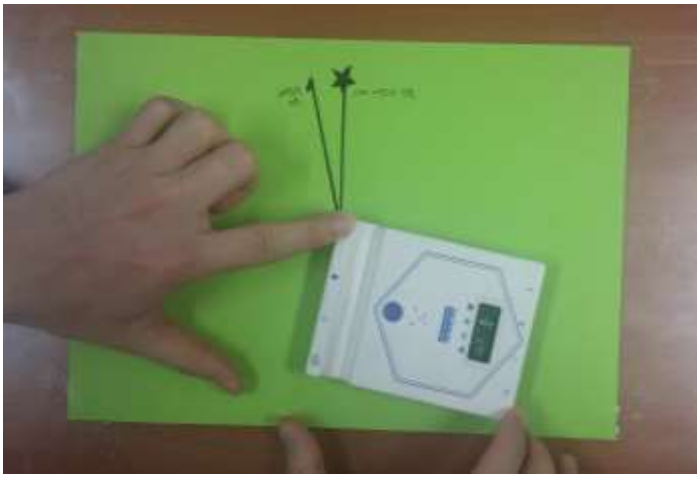
Interface Setup

1. Run the Science# program.
2. Press and select "Geomagnetic."
3. Press to set up the experimental environment or press for automatic setup.



Data Collection

1. Place the smart sensor box with the icon over the reference point.
2. Press to start data collection.
3. Rotate the smart sensor box around the reference point using both hands.



4. When the measurement is complete, press  to stop data collection.
5. When the angle is 0.0°, the direction indicated by the darker icon  shows magnetic north. Mark this on the A4 paper.
6. Adjust the direction by the magnetic declination to find true north and mark this on the A4 paper..

[Magnetic North] 

[True North] 

7. Take a photo of the A4 paper showing your drawn directions for true north and magnetic north using a camera.

Data Analysis

Recording Data

1. Research and record the magnetic declination for your location..

Location	Magnetic Declination (°)

2. Draw graphs of the changing 3-axis magnetic field values and angles as the smart sensor box is rotated.

3. Draw and photograph the estimated and measured directions of magnetic north and true north on the A4 paper..

Data Application

1. Describe how the 3-axis magnetic field values and angles changed as you rotated the smart sensor box.

2. Did your estimated directions of magnetic north and true north match the measured directions? If not, what was the degree of difference? Explain why you chose the initial directions for magnetic north and true north, and share your findings with others..