



Earth Spins- Teacher's Notes

Earth Spins

Historical Background

Most people thought that Earth and mankind lay at the center of the stars, although earlier ancient Greek and Indian scientists had speculated that the Earth spun around its axis daily and orbited around the Sun annually. Evidence to support these ideas was difficult to produce. The fact that the much respected Greek philosopher Aristotle thought that the Sun orbited the Earth made it difficult for others to refute his belief up until medieval times. Newton suggested that if the Earth turned on its axis it would bulge at the equator and flatten at the poles. Later accurate surveying of the planet supported this idea.

By the early 1800s scientists tried dropping weights from particularly high towers and it was noted that the weights landing spots were displaced from under the spot from where they had been dropped suggesting that the planet had moved slightly while the weight was dropping.

The French scientist and mathematician Leon Foucault (1819-1868) finally produced an experiment that demonstrated that the Earth spins on its axis. He suspended a very heavy pendulum from a very long (67m) wire attached to the dome of the Parthenon in Paris. The pendulum was left free to swing in any direction it wished. A stylus on the base of the pendulum made marks in sand laid on the floor tracing any change of movement. The pendulum should just have swung back and forth BUT it actually rotated 11° clockwise per hour. Something had forced the pendulum to slowly change its direction of swing. The cause was the planet spinning on its axis under the experiment in the Parthenon that caused the change of direction of swing.

(Inertia causes any body to remain in its original position unless acted on by another force. This is easily demonstrated by sitting on an office chair



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with a full glass of water and swinging round. Yourself and the glass will spin round but the water lags behind because of inertia and a circular splash is made. It is easier however to ask a student to demonstrate this outside by spinning round quickly with an arm extended and holding a glass of water).

Teacher Demonstration

This is based on an activity by Janice Van Cleave in her book "Icy, freezing, frosty, cool and wild experiments"

Materials

- An office chair
- A short pendulum made from a piece of string and a weight
- A piece of paper with a large arrow drawn on it.





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Method

1. Sit on the chair with the paper on your knee. The arrow should be aligned along your upper leg.
2. Start the pendulum swinging along the direction indicated by the arrow.
3. Gently swing the chair clockwise.
4. Observe changes in the pendulum swing.

The pendulum swing change was caused by rotation about the axis of the chair. Similarly Foucault's pendulum swing changed because of rotation about the axis of the Earth.



Interesting fact

Pilots have to adjust their flight paths to account for the Earth turning under them. If they pointed their plane toward their final destination at the beginning of their flight it would no longer be in the same spot when they arrive.