

Misconceptions about Motion

Summarizes -- Driver, R., Squires, A.,
Rushworth, P., & Wood-Robinson, V. (1994).
Making sense of secondary science:
Research into children's ideas. London:
Routledge.

Complexity

- Students do not see motion as belonging to a number of different categories – at rest, constant velocity, speeding up, slowing down, changing direction, etc. Instead, they see motion as moving or not moving.

Stationary Objects

- Students think that if speed is increasing that acceleration is also increasing.
- Students regard objects at rest as being in a natural state in which no forces are acting on the object.
- Students who recognized a holding force, differentiated it from pushing or pulling forces.
- Students think air pressure, gravity, or an intervening object (like a table) is in the way keeps an object stationary.
- Students think that the downward force of gravity must be greater than an upward force for the book to be stationary.

Moving Objects

- Students think of actively moving objects (bowling ball) as having an impetus within them that keeps them moving in the same horizontal direction when they reach a cliff and passively moving objects (a tree trunk) as falling straight down when they reach a cliff.
- Most 15 year olds believe moving objects come to a stop even when there is no friction.

Force and Motion I

- If there is motion, there is a force acting.
- There cannot be a force without motion and if there is no motion, then there is no force acting. (for example, students see a downward force of a book acting on a table, but they do not see an upward force of the table acting on the book.)

Force and Motion II

- When an object is moving the force is acting in the direction of its motion.
- A moving object has a force within it which keeps it going (Buridan's impetus theory).
- A moving object stops when its force is used up.
- Motion is proportional to the force acting and a constant speed results from a constant force (students associate force with speed – not acceleration).

Friction

- Friction is a force
- Friction is the same thing as reaction
- Friction depends on movement
- Friction is associated with energy, especially heat
- Friction occurs only between solids
- Friction occurs with liquids but not with gases.
- Friction causes electricity
- Friction is thought of as an object