**Predicting the behaviour of a bouncing ball**

**Levels:** 3-4  
**NoS achievement aims:** Investigating in science   
**Contextual strands:** Material world, Physical world   
**Topic:** Sports Studies

**Rationale**

How and where a ball bounces is determined by: its elastic properties (how much it can be squashed, how readily it recovers); the effect of friction on spin; how it is thrown.

A well-constructed investigation can still produce unexpected results – these surprises need to be considered carefully and tested further. There may be more than one explanation for the results of an investigation. Open-mindedness is important in science.

**What you need**

* A range of balls of similar size and shape, some hard and some soft, for example:
  + table tennis ball
  + golf ball
  + squash ball
  + solid rubber ball
  + high-bouncing plastic ball.
* A table or desk (preferably rectangular) with a smooth under-surface.
* A hard (uncarpeted) floor surface on which to bounce the balls.
* Predicting Ball Bounce pdf - Diagram illustrating how to conduct the activity

**Focus**

* What types of materials are the balls made of?
* What kinds of materials would make the ball bounce easily? What sorts of materials are not very bouncy?
* How do different balls bounce, for example, a cricket ball compared to a tennis ball?
* When you bounce a ball, is it possible for you to predict where the ball will end up? What games do you play that depend on predicting where a ball will bounce?

**Exploration**

1. Choose two students (thrower and catcher) to stand at each end of the table/desk. (Alternatively, construct a target to place at the far end of the table.)
2. Have the thrower choose a ball, and prepare to bounce it between the legs of the table/desk (that is, aiming at a midpoint between the two nearest legs), so that it will then rebound off the undersurface of the desk.
3. Get the rest of the class to:
   * predict, with reasons, where the catcher will need to stand to receive the ball (or where, on the target, the ball will strike)
   * discuss and decide how to test and record the outcomes.
4. Have the thrower throw the ball.
5. Get the students to compare the result with their predictions.
6. Repeat the activity using:
   * the same ball, several times (to test consistency of results)
   * different balls
   * different throwing techniques.
7. Get the students to:
   * tabulate the results
   * consider ways to improve or change their testing/recording methods, for example, by marking the ball with chalk.
8. Explore further by getting students to search for explanations for their observations. Have them present and support their explanations to the class.

**Reflection**

* Did you get the results you expected?
* If not, what else did you do to help you find out what was happening?
* Which types of balls did or didn’t follow your predictions?
* What factors seem more important in predicting ball bounce – the ball size, shape or composition?
* Now that you’ve carried out these experiments, can you use what you’ve found out to test a different range of similar-sized/shaped balls (for example, tennis ball, billiard ball, wooden ball, petanque ball, cricket ball, baseball)?
* Based on your experience, predict how you think these different balls will behave. Is how the ball is used in the game related to the way it behaves?