

The slide features a decorative arrangement of six circles. Three circles are solid light green, and three are hollow with a light green outline. They are arranged in two rows of three. The top row has a hollow circle on the left, a solid circle in the middle, and a solid circle on the right. The bottom row has a solid circle on the left, a solid circle in the middle, and a hollow circle on the right.

# Science Investigations

## The flight of the whirlybird

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# Purpose: what do scientists do?

- Brand testing
- Data scanning
- Knowledge building
- Problem solving
- Designing

*Performance testing*

*Baseline data collection*

*Understanding*

*Searching for solutions*

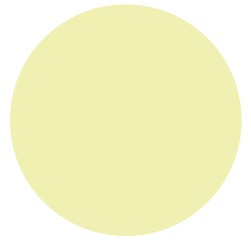
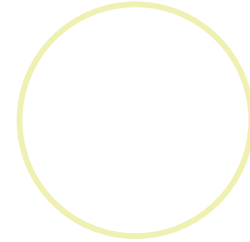
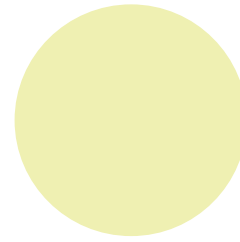
*Informing design*

# What do QM scientists do?



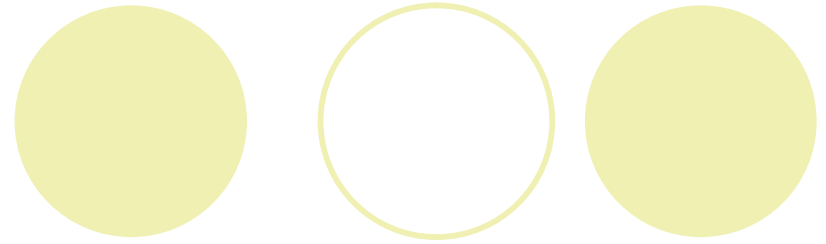
- Taxonomy
- Biodiversity scans
- Parasitology (disease) research
- Bio-product research
- Vertebrate ecology
- Vertebrate and invertebrate fossils
- Mineral and rocks collections

Agree or disagree?



- Science should be engaging not just fun.
- Science is concerned with building knowledge not searching for truth.
- Real scientists do not follow prescribed methods in research.
- Not all scientific investigations require an hypothesis.

# Agree or disagree?



- Working scientifically is a way of thinking based on evidence.
- Knowledge and understanding can be integrated into science investigations in schools by asking *why*.
- Science investigations conducted in schools are mostly “closed” rather than “open”.
- Open investigations can only be performed by older students.

# Science words

DON'T use

- Proof
- Proven
- Right
- Wrong
- Fun
- Magic
- Truth

DO use

- Supported by
- Suggests that
- Is consistent with
- Is not consistent
- Interesting
- Unexpected
- Knowledge



# Purpose

- What do you wish to find out?
- What is the BIG (research) question?

How can I make my whirlybird stay in the air longer?

What is the bio-health of this area?



Know

- What do you know about the topic?

What do I know about flight?

*Newton or Bernoulli?*

What do I know about the flight of whirlybirds?



# Observe

- Look closely at what happens.
- Does it make sense?

Explore the flight of whirlybirds until your observations are making some sense with what you know.

# Identify the variables



- The variables must be measurable.
- What are the factors that relate to the question?
- Which factor (variable) is most important to your question?

What are the factors (variables) that have an effect on the flight of a whirlybird?

What factor, that you are able to change, has the greatest effect on the flight of the whirlybird?



# Hypothesis

- What is the relationship to investigate?

The (time of flight) for a (whirlybird) depends on the (variable to change)

# Prediction



- What do you think will happen when your variable is changed?

If the wing size is larger the whirlybird should stay in the air longer.

# Fair Test



- What are the steps to follow?
  - How will you change the test variable while keeping all other variables constant?
  - What data is to be collected?
  - How many times will the test be repeated?
1. Change variable (wing size)
  2. Measure variable (time to drop)
  3. Variables not to change (all others including weight)
  4. Times to repeat (usually three trials)



Data

## Data Collection

- Do the tests then collate and present the data.

## Data interpretation

- Does the data match your prediction?
- How fair was the test?

# Conclusions

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- What have you learned that can help answer your BIG question?
- What other investigations should you carry out to find out more about your BIG question?

Do the test results support the hypothesis? If not, why not?

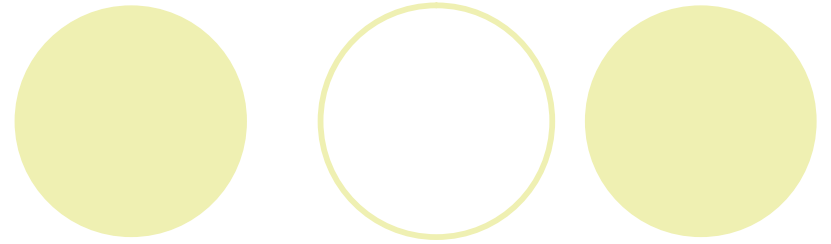
- Fair test?
- Modify Hypothesis?
- Modify knowledge?



# Evaluation

- What have you learned from your investigation?
  - How well did your whirlybird perform?
  - How did your whirlybird performance compare to others?
  - What other factors could be changed to improve your whirlybird's flight time?

# What's next



- More investigations

