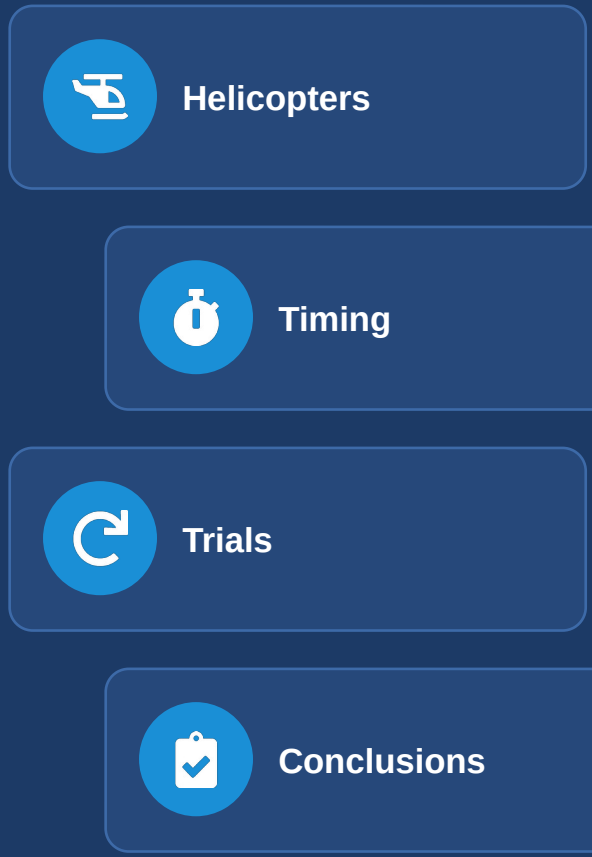
SNC1W Thinking Like a Scientist, Lesson 4

The Fair Test Lab

Paper helicopters



Today's goals

We are learning…

- To carry out a fair test safely.
- To write a lab report conclusion.

I can…

- Follow a procedure safely.
- Collect and record data for three trials.
- Calculate averages and graph my results.
- Write a conclusion that uses my data.

Today's plan

Time	What we're doing	You will…
0–10 min	**Hook**	Predict
10–20 min	**Plan**	Write
20–45 min	**Build and test**	Collect data
45–55 min	**Averages**	Average
55–70 min	**Graph and conclude**	Write
70–75 min	**Exit**	Answer

Predict

I'll drop two paper helicopters at the same time. One has short wings, one has long wings. Which lands first? Why?

Sentence starters

“I think the ___ one lands first because…”

“The wings might…”

How it works

- Predict alone: 1 minute.
- Watch the drop.
- Discuss: 2 minutes.

Big idea

A fair test lets the data speak. When we change one variable, control the rest and repeat our trials, we can say with confidence what caused the result.

Plan the test

On page 1:

1. Write a hypothesis: If…, then…, because…
2. Name the independent variable: wing length (4, 6, 8, 10 cm).
3. Name the dependent variable: fall time (s).
4. List the controlled variables.
5. Read the safety box.

Safety first

Do	Don't
Stay on the floor; the teacher handles the 2 m drop.	Stand on chairs, desks or stools.
Carry scissors pointing down.	Run with scissors or wave them.
Keep the landing zone clear.	Walk under a falling helicopter.
Pick up paper scraps.	Leave scraps on the floor (slipping).

Build and test

In groups of three:

1. Build four helicopters with 4, 6, 8 and 10 cm wings.
2. Assign roles: releaser, timer, recorder.
3. Release from the same 2 m height each time.
4. Time from release to landing; three trials each.
5. Record every time to two decimal places.

Sample data

Wing (cm)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Average (s)
4	1.38	1.45	1.43	?
6	1.70	1.75	1.68	?
8	1.98	1.91	1.96	?
10	2.15	2.08	2.13	?

Original sample data. Calculate the averages.

Model: averages

Task: Calculate the average fall time for each wing length.

4 cm: (1.38 + 1.45 + 1.43) ÷ 3 = 4.26 ÷ 3 = 1.42 s
6 cm: (1.70 + 1.75 + 1.68) ÷ 3 = 5.13 ÷ 3 = 1.71 s
8 cm: (1.98 + 1.91 + 1.96) ÷ 3 = 5.85 ÷ 3 = 1.95 s
10 cm: (2.15 + 2.08 + 2.13) ÷ 3 = 6.36 ÷ 3 = 2.12 s

Why it works

Same method every row.

Units on every answer.

Two decimal places, like the data.

Parts of a lab report

Question and hypothesis	What you tested and what you predicted, with a reason.
Procedure and safety	Numbered steps someone else could repeat.
Observations	Data tables with units, and a graph.
Analysis and conclusion	What the data show, with numbers; does it support the hypothesis?
Sources of error	What could have affected results, and how to improve.

Model: a conclusion

Task: Write a conclusion for the helicopter lab.

As wing length increased from 4 cm to 10 cm, the average fall time increased from 1.42 s to 2.12 s. Every increase in wing length gave a longer fall time. This supports my hypothesis. Longer wings push against more air, so there is more air resistance slowing the helicopter. One source of error was starting the timer late; counting down before each release would reduce this.

Why it works

- Describes the pattern.
- Uses numbers.
- Links to the hypothesis.
- Explains with science.
- Names an error and a fix.

Your turn

On page 2:

1. Graph your averages.
2. Write your conclusion with numbers from your data.
3. Name one source of error and how to reduce it.
4. Clean up: scraps in the recycling, scissors back.

Exit ticket

1. What was your independent variable?

2. Your result, in one sentence with numbers.

3. One way to make your test fairer next time.

Next class: Research Like a Scientist.

Teacher reveal

Helicopter lab: worked averages

4 cm: (1.38 + 1.45 + 1.43) ÷ 3 = 4.26 ÷ 3 = 1.42 s

6 cm: (1.70 + 1.75 + 1.68) ÷ 3 = 5.13 ÷ 3 = 1.71 s

8 cm: (1.98 + 1.91 + 1.96) ÷ 3 = 5.85 ÷ 3 = 1.95 s

10 cm: (2.15 + 2.08 + 2.13) ÷ 3 = 6.36 ÷ 3 = 2.12 s

Conclusion: As wing length increased from 4 cm to 10 cm, average fall time increased from 1.42 s to 2.12 s. This supports the hypothesis: longer wings catch more air, so there is more air resistance to slow the fall.