

EduTrend Contents

W4C · SCIENCE & ENGINEERING · MIDDLE SCHOOL

Spinning Seeds

Investigate what makes a paper rotor fall slowly

Ages 11–14	Level: Advanced	60 minutes	Teams of 3	Activity 04

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 04 · AT A GLANCE

Spinning Seeds

Maple and sycamore seeds spin as they fall, which slows them down and helps the wind carry them away from the parent tree. Students build a paper rotor that works the same way, then run a full investigation: they change one variable, time repeated drops, calculate means and draw a graph to find the best blade length.

Learning outcomes

By the end of the session students can:

- identify independent, dependent and control variables in an investigation;
- explain the fall of the rotor using weight and air resistance;
- take repeat readings, calculate a mean and spot anomalous results;
- plot a line graph and write a conclusion supported by the data.

KEY WORDS

weight · air resistance · terminal velocity · variable · repeat reading · mean · anomaly · uncertainty · rotor

CURRICULUM LINKS

Physics: forces and motion, air resistance. Working scientifically: planning, measuring, analysing data. Maths: means and line graphs. Engineering design (NGSS MS-ETS1).

1	2	3	4	5	6
OBSERVE	**QUESTION**	**PREDICT**	**MEASURE**	**ANALYSE**	**CONCLUDE**
How do seeds fall?	Choose a variable	Write a hypothesis	Time 3 drops	Mean and graph	Explain the pattern

Materials (per team)

- Rotor template printed on 80 gsm paper (strip 4 cm wide, 20 cm long)
- Scissors and a ruler
- 1 metal paperclip (all the same size)
- Stopwatch or phone timer
- Metre rule or tape measure
- Worksheets 1, 2 and 3
- For the class: a safe drop point at 2 m and a few real maple or sycamore seeds if in season

Before the session

- Make one rotor and test it from 2 m: it should spin within the first 30 cm.
- Mark a drop height of 2 m on a wall or door frame.
- Decide whether students drop from a stable step or from arm height with a lower drop mark.
- Print one template sheet and one set of worksheets per team.

SAFETY

Students only stand on a stable, supervised step, never on chairs or tables. Keep the landing area clear. Take care with scissors.

ACTIVITY 04 · SESSION PLAN

Step by step

Timings are for a 60-minute lesson. Teams can share blade lengths across the class (each team tests two lengths) to save time.

Time	What happens	Say or ask
0–5 min **Hook**	Drop a real maple seed or a flat piece of paper and a folded rotor side by side from 2 m. The rotor spins and lands later.	*"What is different about the way they fall?"*
5–15 min **Build & plan**	Teams cut and fold a rotor with 8 cm blades and add one paperclip. They choose blade length as the independent variable and fill in Worksheet 1.	*"What will you change, what will you measure and what must stay the same?"*
15–40 min **Investigate**	Teams time three drops from 2 m for blade lengths of 3, 4, 5, 6, 7 and 8 cm, trimming the same rotor between tests. They record results on Worksheet 2.	*"Two of your times are close and one is far off. What should you do?"*
40–50 min **Analyse**	Teams calculate means and plot blade length against mean fall time.	*"Is it a straight line? Where does the pattern change?"*
50–60 min **Conclude**	Teams write a conclusion and evaluation on Worksheet 3 and share one finding.	*"How confident are you in your results? What limited their accuracy?"*

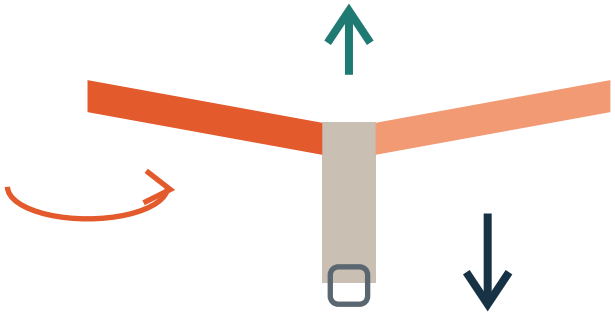
CHALLENGE CARD (print or copy onto the board)

Find the blade length that makes a paper rotor take the longest time to fall 2 m. Use fair tests, three repeats for each length and a graph to support your answer.

ACTIVITY 04 · FACILITATOR NOTES

The science in brief

Two forces act on the falling rotor: its weight pulls it down and air resistance pushes up. At first weight is larger, so the rotor speeds up. As it speeds up, air resistance grows until the two forces balance. The rotor then falls at a steady speed called its terminal velocity. Spinning blades sweep through a lot of air, which increases air resistance and lowers the terminal velocity.



Blades spin and sweep through the air *Air resistance acts upwards* *Weight (rotor and paperclip) acts downwards*

Longer blades usually increase the fall time, but only up to a point. Very long paper blades bend and flutter instead of spinning cleanly, and the pattern flattens or reverses. Hand timing also has limits: human reaction time is roughly 0.2 seconds, which is large compared with fall times of 1 to 3 seconds. Repeating drops and calculating a mean reduces the effect of these random errors.

Common ideas to listen for

- "Heavier things always fall faster." In air, shape and area matter; a crumpled sheet and a flat sheet of the same mass fall differently.
- "The rotor floats because it is spinning." Spinning increases air resistance; it does not remove the weight.
- "A mean fixes everything." A mean reduces random error but cannot correct a systematic error such as a wrong drop height.

Adapting the activity

Support

Test only three blade lengths (4, 6 and 8 cm) and provide a partly drawn results table and graph axes.

Stretch

Add a second variable, such as the number of paperclips, and plan how to investigate it fairly. Estimate the uncertainty of each mean from the range of repeat readings.

WORKSHEET 1

Plan the investigation

Name: _____ Class: _____ Date: _____

Before you drop anything, plan a fair test.

Variables

Type of variable	In our investigation
Independent (what we change)	
Dependent (what we measure)	
Control 1 (kept the same)	
Control 2 (kept the same)	
Control 3 (kept the same)	

Hypothesis

As the blade length increases, the fall time will… because…

How we will make our results reliable

WORKSHEET 2

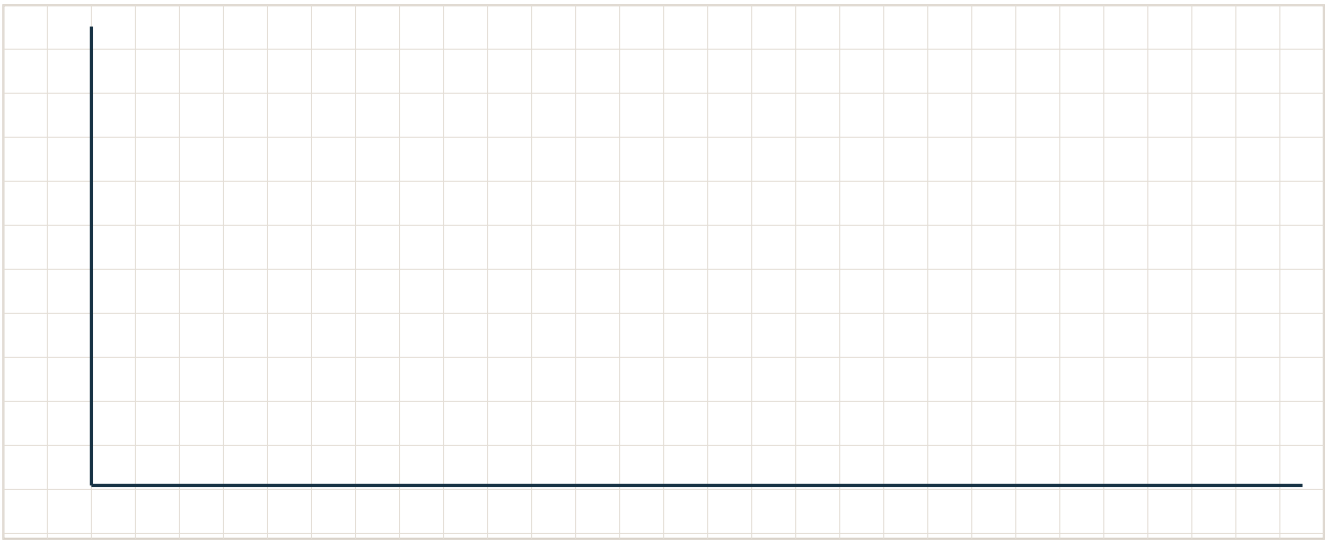
Results and graph

Drop from 2 m each time. Circle any result that looks anomalous and repeat it.

Results table

Blade length (cm)	Time 1 (s)	Time 2 (s)	Time 3 (s)	Mean (s)
3				
4				
5				
6				
7				
8				

Graph



y-axis: mean fall time (s)

x-axis: blade length (cm)

WORKSHEET 3

Conclusion and evaluation

Use your graph to answer.

Conclusion

Describe the pattern in your results and explain it using weight and air resistance.

Evaluation

Which results were least reliable? What limited the accuracy of your timing, and how would you improve it?

Self-assessment

I can…	Not yet	Partly	Confidently
name the three types of variable			
calculate a mean and spot an anomaly			
plot a line graph correctly			
explain terminal velocity			

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Plans a fair test	Processes and graphs data	Explains using forces

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Spinning Seeds is a sample activity from the EduTrend Contents W4C Science & Engineering programme (middle school, level: advanced). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.

© 2026 EduTrend Contents. This activity may be printed and copied for use with students in your own school, club or home. It may not be resold or published elsewhere. Photos: Esther Heidsiek-Schmitten / Unsplash.