6-8 years

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inquire
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Science Content:
Life and physical Sciences

Target Concepts/Skills:
Forces of push and pull, speed, distance, time, force of air resistance, pull of gravity

Target Age group:
6 - 8 years

Duration of activity:
2 – 3 lessons

Summary:
This activity includes inquiry activities which explore air resistance by investigating how different seed spinners move away from the parent plant by making a seed spinner. In the first inquiry activity children test how long a seed stays in the air, either by letting it drop from a certain height and timing how long it takes until it reaches the ground, or else by blowing different types of seeds and seeing how far the different seeds move. The second inquiry involves a challenge where children are given different materials and they are invited to design their own seed spinners.

Objective:
By the end of the activity children should be able to:

- Identify seeds and describe what they look like with regard to how they might fly;
- Describe how different seeds move in air and what helps them move;
- Design a seed spinner that maximizes the effect of air resistance to travel;
- Measure the speed of a seed by dividing the distance travelled by the time taken to reach the ground;
- Measure how long a seed stays in the air;
- Identify the different ways in which different seeds disperse.

Resources:

- Dandelion clocks or similar seed head e.g. thistle for starter;
- group sets of: dandelion seeds + other seeds + tray;
- drawing paper; pencils; rulers; cameras; stopwatches;
- photographs of wind dispersed seeds;
- hand lenses, tape measures, and stop watches;
- materials to make spinners: paper of various thicknesses (i.e. tissue paper, sugar paper, card), scissors, thin rope, glue, paper clips, tape measures,
- pictures to explain the difference between seed, flower, and fruit; seed and plant, and dissemination modes (for example by animal fur, air, bees, humans, etc.)

Seed spinners: Exploring air resistance

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This project Pri-Sci-Net has received funding from the European Union Seventh Framework Programme (FP7 2007 /13) under grant agreement No.266647

European Commission

CAPACITIES

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1. Engage (Forming hypotheses)

Decide which question to investigate (= the challenge)
What do children already know? What are their ideas? (make the question to investigate meaningful for the children)

Starter/ stimulus (10 minutes) to elicit children's prior knowledge
Have some dandelion seed heads (clocks) for children to blow (if dandelion seeds are not available, sycamore seeds or cirsium arvense can be used, or bulrush which is available all year round).

Observation of how the seeds move.
Children are invited to consider what the seeds look like and how they move. This can be done in groups or letting the seeds go around the class for children to observe; or as a whole-group circle activity.

Pose the questions: What happens to the seeds when you blow the dandelion clock? Where is the 'push' coming from?

Investigation 1: Explore and investigate how seed spinners move away from the parent plant (85 minutes: 15 minutes whole-class prep; 50 minutes for groups investigations; 20 for plenary)

Explain to the children that they are going to do group investigations into

- how seeds spinners move. They need to discuss together:
- which questions they would like to answer
- what they will do to try and answer these and in which order
- which materials they need/want to use
- how long they are going to take for each part of the investigation
- who will do what
- what they expect to see
- which findings are important to answer their question and how
- how they will record their findings
- how to present their ideas/findings to the whole class

The teacher shows all available materials and hands out seed trays to each group.

Possible options for questions to investigate:

- What does the dandelion seed look like?
- How does it move?
- What helps it to move?
- What about other seeds?
- Can you make a 'seed spinner'?

The teacher leads short session on:
How are you going to record what you find? What would be the best way(s) to record? I.e.

- Graphs
- Data tables
- Drawings
- Pictures
- Paragraphs/free writing
- Diary

Teacher selects what to discuss as appropriate for age group
Close observation including drawings of dandelion seeds and other wind dispersed seeds – discussion of structure (30 minutes)

Children investigate in groups how seeds travel:
Time for spinner to reach the ground, distance spinner travels from point of released, number of twirls spinner makes etc. Children drop the seed from a height and note how the seed falls. They make their observations in the worksheet provided;

Children decide (in groups) on how to record and describe – (drawings, photographs, graphs (counts), tables, paragraphs, a diary etc.)

An alternative approach involves that of using a straw to blow seeds and to note how far a seed moves and/or how many puffs are needed in order for the seeds to cross a specific distance.

Recording, measure and describe – observation and recording the distance and time the seeds take to fall to the ground when given different amounts of 'blow' (20 minutes)

Comparisons of what the seeds look like and what it means for the distance and time the seeds take to fall to the ground – record findings

Children discuss and describe their findings as a whole class (15 minutes in total)
Most important learning points are discussed and written down by children

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Challenge: Can you make a spinner that works like a seed? (2 hours 10 mins)
The teacher recaps previous lesson with class and sets the children the challenge (10 minutes). The children are provided with various objects from which they have to design their seed spinners.

- What have you found out about the shape of seeds and how they move? Refer to:
  - Shape
  - Weight
  - Counterweight – discuss what it is
- What makes them move?
- How can you use this to make a good seed spinner?
- Which materials would be best?

Investigation and exploration of making a spinner: What makes a good spinner? Exploration of materials, structure, counterweight etc. (groups of 4-5)

Planning including identifying variables, prediction, questions (15 minutes)

- Size?
- Which material(s) would be best?
- What shapes work well to catch the wind/blow?
- How can you make it so that it stays in the air longer?
- What can you do to make them keep their balance?
- Discuss ideas and make predictions about how well they would work, how long they would stay in the air (compare ideas)

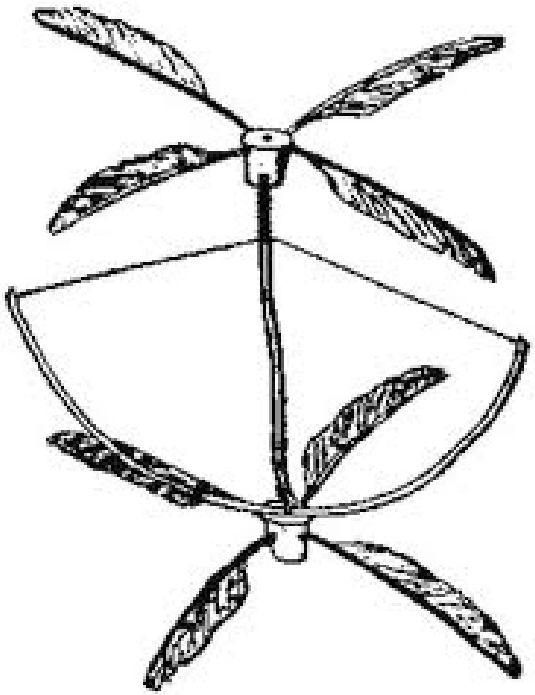
Children set up their investigation (1 hr 10 minutes)
Teacher goes round and helps out; questioning children about their spinner design. If more applicable for the age group, children could start with a 2D schema first, before moving on to a 3D model.

Recording, measure and describe –
Children record as they investigate what impact additions/changes to the design have on the distance and time the spinner takes to fall to the ground (tables, paragraphs, pictures, drawings, diary etc.)

At the end; children try out their spinners outside the classroom – small competition, which works best and why? (20 minutes)

Teacher makes sure individual children or as a group have noted what they have done

Children discuss and describe their findings as a whole class (15 minutes in total)
Most important learning points are discussed and written down by children



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Explanation of findings and evaluation

Activity 1. Plenary / whole class discussion of findings (15 minutes)
Group leaders present their findings to the whole class, which questions they asked and answers they got; their methods, their discoveries (surprises)? Next steps for investigation
Teacher encourages groups to comment on each other's methods and findings, to compare, give feedback – come up with a synthesis of the best practice. + a top 3 of most interesting findings
Teacher also facilitates in terms of what questions could be asked, helping children note things they don't out if their own accord

Activity 2. Design your own seed spinner discussion / plenary (15 minutes)
All seed spinners displayed

Children go round in groups to have a look at what other groups have done so that all work is acknowledged. They write down on post-it notes and stick next to each spinner:

- 2 things they found interesting;
- 1 thing they would suggest to the child/group who made the spinner about what might be improved next time

The teacher leads class discussion of:
1. The three most important things learnt about seed shapes and movements;
2. Which were the most successful spinner designs and why.

Optional extension
Extending thinking/creativity: What would happen if there was no wind? What would happen to the seeds and what would our natural environment look like? Would it be a problem? (15 minutes)
Teacher facilitates a philosophical enquiry with the whole class – eliciting arguments and counter-arguments; syntheses of both; new questions; conclusion for now (weather patterns, leisure activities, competition for plants to grow, overcrowding)
[This can be experimented with, i.e. the question can be asked before or after the investigation to measure the effect on the quality of the investigation and children's scientific enquiry based questions.

Materials in attachment: teacher notes and subject knowledge; worksheets

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Teacher Notes

Prior knowledge requirements of pupils: There are different sorts of plants; many plants have roots, a stem, leaves and flowers, plants make seeds which grow into new plants, objects fall towards the centre of the Earth due to gravity – this is usually observed in a 'downwards' direction

Common misconceptions:

- Seeds are dead; they only come alive when they have been planted and begin to grow (a seed is regarded as dormant however and becomes an active plant when favourable conditions are present)
- Seeds contain a baby plant

Notes/advice/things to think about

How large should the groups be? Mixed ability or not? Should roles be assigned?

- Possible health & safety hazards such as pollen allergies; children need to wash their hands well after the activity, not stick fingers into their mouths or eyes during the activity
- How much guidance do children need with each stage of the investigation
- Other adults needed
- Have questions ready to help children along
- Structured vs. open-ended: this is something to be considered. The worksheets are provided if teachers prefer a more guided lesson. If the teacher prefers to let the children decide about how to record their data, they can decide not to use the worksheets. Similarly, if teachers wish to focus more on the active part of the investigation than on writing, the worksheets can be skipped, or worksheets can be adapted to the age of the children or children with special needs.
- Another issue with the 'make your own seed spinner' activity is that this borders on physics content and the teacher may want to prepare for this or decide to avoid it.

Subject knowledge background

Seeds are produced by flowering plants as the mechanism for reproduction. Seeds are produced as a result of pollination and they need to be dispersed away from the parent plant to have the maximum chance of germinating. Seed structures are adapted in various ways for dispersal; wind, water and animals are common mechanism for dispersal. Insects, mammals and birds help flowering plants reproduce by transferring pollen from the male part of one plant to the female part of another plant. This activity can be developed to focus on biological aspects such as adaptation, dispersal mechanisms and the purpose of seeds or focus on more physical aspects such as forces and motion.

The further development of these ideas via inquiry could be in the context of falling objects. Many of these scientific ideas are counter intuitive and children consider that objects 'naturally' fall rather than as a result of the force of gravity and that the counter frictional force of air resistance will help to slow objects down. The larger the object the greater the air resistance and therefore the slower it will fall.

References

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			Picture or drawing
			How far does it travel when you blow it?
			How long does it take to fall to the ground?
			How does it move? (Write something about it) For example: it twirls
			What else did you see?

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	My own spinner (1st)	My own spinner (2nd)	My own spinner (3rd)
Picture or drawing			
How far does it travel when you blow it?			
How long does it take to fall to the ground?			
How does it move? (Write something about it) For example: it twirls			
What else did you see?			

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