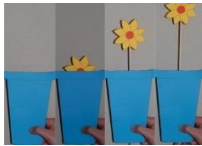


## Children's prior learning in this area

Sliders – Foundation.

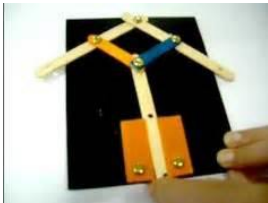
Levers & Sliders – Year 1.



Wheels & axles – Year 2.



Linkages & levers – Year 3.



Recall and retrieve levers, sliders, linkages.

## Cultural Capital Opportunities

### History of pneumatics.

Samuel Ingersoll invented the **pneumatic drill** in 1871.

## Key vocabulary and glossary

**Compressed** – something that is squashed, such as air in a tube.

**Input** – what goes into a system.

**Output** – what comes out of a system.

**Pivot** – a point about which a lever turns.

**Lever** – a beam which turns about a point.

**Pneumatic** – a system that works using gases (air).

**Hydraulic** – a system that works using liquids (water).

**Pressure** – the force used on an object or surface.

**Inflate** – fill something with air or a gas to make it swell up.

**Deflate** – remove the pressurised air to allow an object like a balloon to shrink.

**Syringe** – a tube with a nozzle and plunger for sucking and blowing air or liquids.

**System** – a set of related parts or components used to create an outcome. Systems have an input, process and an output. In a pneumatic system, the 'input movement' is where the user pushes or pulls a syringe or pump. The 'output movement' is where the object at the end of the tube moves.

**Enquiry Question- Who invented the first pneumatic device?**  
**Concept – Enquire**



**Children will know pneumatic devices and where they are found.**

What are pneumatic devices? - Pneumatic devices are various tools and instruments that generate and use compressed air. Pneumatics are everywhere in important inventions, however, they are relatively unknown to the general public.

[History of the Pneumatic Tubes \(thoughtco.com\)](http://thoughtco.com)

Discuss - Samuel Ingersoll invented the **pneumatic drill** in 1871.

**Practice** – Research what devices use a pneumatic mechanism? Pneumatics timeline.

[History of pneumatics: A timeline of evolution \(pneumatictips.com\)](http://pneumatictips.com)

**Apply** – Mind map pneumatic mechanisms through time.

**Deepen** – What impact have pneumatic devices had on our lives today?



**Enquiry Question – How does a pneumatic mechanism work?**  
**Concept – Design.**



**Children will know what components are needed to make a pneumatic mechanism work.**

Show the chn how a simple pneumatic mechanism works using air.

Squeeze the bottle (input movement) to inflate the balloon (output movement) and raise the toy.

Show the chn how a pneumatic mechanism works using a syringe.

**Using syringes**

**Design decisions**

- Children might use a squeezy bottle and a balloon in a container to raise or lower an object or a lever.
- They might choose to use three syringes connected by a T-connector so that two objects move backwards and forwards.
- Adding levers and linkages allows children to design and make more complex mechanical systems.



**Enquiry Question – What components are needed to make a pneumatic mechanism?**  
**Concept – Design**



**Children will know what components are needed in a design pneumatic product.**

**Practice** - Decide on a design criteria as a class or independently – use flip or chn can record in books – they will need to reference this during the designing phase.

**Apply** – Chn to design own pneumatic toy labelling components. Include materials and joining techniques used.

**Deepen** – Chn caption/explain use for each component.

THOUGHT	ACTION
What sort of moving toy shall I make and who will it be for?	Discussing ideas, drawing annotated sketches, generating design criteria.
How will it fit into the box? How will it move? Which parts will move?	
Which pneumatic system will work best?	
What materials will I need?	Modelling possible systems. Discussing and evaluating mock-ups and prototypes against the design criteria.
Who will I work with? How long will it take? What order will I work in? What tools and techniques will I use?	Discussing, exploring and trialling materials.
How will I finish it so that it looks attractive?	Negotiating, developing and agreeing a plan of action.
More thoughts ... appraising, reflecting, refining.	Discussing, exploring and trialling materials.
Will the finished toy meet the needs of the user?	More actions ... building, testing, modifying.
	Evaluating the toy with the intended user and against the design criteria.



Give chn the opportunity to experiment and investigate using the tools and creating their own working mehcnaism. Ask them to take notes/annotate pictures during this to support their design.

Investigate, analyse and evaluate familiar objects; What does it do? How has it been used in the design of these products? How can it be used in the design

**Record** - Photos, mind maps, annotated picrures.

**Enquiry Question -**

## Concept – make



**Children will follow their design step by step referring to tools, equipment, and materials.**

**Practise** - Chn to make their pneumatic mechanism following their design.

**Apply** - Following their design, chn to make their product – annotating changes on their plan/design.

**Deepening** – Chn should select from and use finishing techniques suitable for the product they are creating.

## Concept –Evaluate



**Children will evaluate their product by comparison and record their findings.**

**Practise** – Evaluate product – was it fit for purpose? What would you change? Why?

**Apply** – Evaluate product and record findings and evaluate use – include considered reasoning.

**Deepening** – Using the evaluation of existing products in order to inform their own, evaluate product and record findings and evaluate use – include considered reasoning.