

## Unit 2C Winding up

### Focus – mechanisms/structures

#### ABOUT THE UNIT

This unit introduces the children to the concept of winding mechanisms, building on previous knowledge of wheels and axles. The children explore how to make winding mechanisms using construction kits, then, after discussion, make their own toy using a winding mechanism out of reclaimed materials. The unit uses the context of nursery rhymes and the rhyme chosen can be adapted for a particular class topic.

The unit could be adapted to have a broader focus for the designing and making assignment (design and make a story prop which includes a winding mechanism to make movement) or focus on an alternative context *eg machines or cranes*.

#### PRIOR LEARNING

It is helpful if the children have:

- used construction kits
- made strong and stable structures
- discussed their ideas

This unit builds on Units 1B 'Playgrounds' and 2A 'Vehicles' and other work with construction kits and reclaimed materials.

#### VOCABULARY

In this unit, children will use words and phrases relating to:

- designing *eg explore, investigate, choose, decide, brainstorm, fast, faster, fastest, slow, slower, slowest, quick, quicker, quickest*
- making *eg collecting, punching, connecting, fixing, straight, doweling, masking tape, hole punch, cotton reel*
- knowledge and understanding *eg axle, winding mechanism, stable, structure, handle, turning, free, fixed, second, minute, timer*

#### RESOURCES

- picture book showing 'Incy Wincy Spider'
- construction kits suitable for making winding mechanisms
- card, cardboard boxes, doweling, string, cotton reels, pegs, lolly sticks for handles
- masking tape, glue, pipe-cleaners, stapler
- materials for finishing *eg coloured papers and card, fabric, felt-tip pens, paint*
- scissors, snips, hole punch, bradawl, hacksaw, sawing jig

#### EXPECTATIONS

##### at the end of this unit

*most children will:*

have gained an understanding of simple winding mechanisms and made realistic suggestions as to how their ideas can be achieved; have constructed mechanisms using construction kits and reclaimed materials; have made the parts *eg spider, rain and sun* to represent the story in a moving toy; have been able to say what works well in their model

*some children will not have made so much progress and will:*

have made a winding mechanism from construction kits but will have needed support in making with reclaimed materials *eg the axle may not be parallel, they may not have understood about fixing the axle securely and may have found it hard to make a robust structure*; have suggested at least one improvement to their idea after prompting

*some children will have progressed further and will:*

have communicated their ideas clearly and made a model with two or more winding mechanisms; have taken the theme from another poem or story – maybe making one character chase another up and down; have connected one mechanism to another so that one turns the other so that it is driven; have made judgements about their product in relation to their design idea and suggested improvements to their design

**LEARNING OBJECTIVES**

**POSSIBLE TEACHING ACTIVITIES**

**LEARNING OUTCOMES**

**POINTS TO NOTE**

CHILDREN SHOULD LEARN

CHILDREN

**INVESTIGATIVE, DISASSEMBLY AND EVALUATIVE ACTIVITIES (IDEAs)**

- that a winding mechanism has an axle that turns and a handle
  - to observe carefully what happens when such a mechanism works
  - to make simple drawings to show how the mechanism works
- Show the children toys that have winding mechanisms and/or construct a simple winding mechanism using a construction kit. Discuss with the children what the winding mechanism does and how it works. *What might you need to wind up?*
  - Provide opportunities for children to explore making winding mechanisms in different ways using a selection of construction kits. *How did they construct the winding mechanism? How did they attach the axle so it moves? How can they turn the axle? Ask them to use the mechanism to wind up something.*
  - Ask the children to draw a toy and label the different parts of the mechanism.

- talk about how the winding mechanisms are made and how they work
- make labelled drawings that show how the mechanisms work

**Links to this unit**  
**Design and technology:** Units 3C 'Moving monsters', 4B 'Storybooks'  
**Science:** Units 1E 'Pushes and pulls', 2E 'Forces and movement', 4E 'Friction'  
**Information technology:** Unit 2D 'Routes: controlling a floor turtle'  
**Mathematics:** Measurement (distance)  
**Literacy:** Discuss and explore the term 'synonym' in relation to the different shades of meaning implied by the vocabulary in this unit eg 'connecting', 'fixing'. Teach the vocabulary of sequence (first, next, then) and different ways of organising a sequential account as part of the planning

**FOCUSED PRACTICAL TASKS (FPTs)**

- techniques for making winding mechanisms
  - to use tools accurately and safely
  - to investigate and evaluate ways of making characters for the toy
- Remind the children of techniques for holding axles to enable them to turn *eg punching holes in the side of a box, using clothes pegs or triangular pieces of card with holes punched*. Demonstrate the techniques and discuss possible difficulties *eg what happens when the axles are not parallel*.
  - Show the children how to cut, fix and use appropriate amounts of masking tape, or plastic tubing, to secure the cotton reels on the axle if there is a loose fit.
  - Remind the children of the correct use of tools and, if necessary, demonstrate and give children the opportunity to practise using specific tools and equipment *eg how to use a hacksaw and sawing jig to cut doweling*.
  - Ask the children to investigate ways of making the spider, sun and rain.
  - Discuss the importance of the size of the drum on a 'winder'. The bigger the drum the faster it winds up for a given winding speed. Explore using different drum sizes.

- understand techniques for making winding mechanisms from construction materials
- use tools accurately and safely
- talk about strengths and weaknesses of different ways of making characters

**Content**

- The work in this unit is designed to build on previous experience of wheels and axles. The focused practical tasks may need to be developed further if children have not had this experience.
- One of the techniques described here uses a cotton reel, fixed tightly to a length of doweling or a paper stick. If the doweling is too thin then plastic tubing could be used to make it thicker or masking tape could be used to fix the cotton reel on to the doweling.
- Some children will be able to devise their own techniques for constructing a winding mechanism drawing from their experience of using the construction kits.
- Some children may need extra support with making the axle parallel.
- Some teachers may wish to use 'Incy Wincy Spider' as an example and then let children decide on a different idea or story *eg Jack and Jill*.
- Teachers may want to give a set of design criteria *eg 'Design and make a set of "winders" that will raise and lower the characters in the story, be easy to use and will not wear out or break easily.' or 'Design the characters for our story so that they look good, can be seen across the room and are easy to attach to the "winders".'*

**DESIGN AND MAKE ASSIGNMENT (DMA)**

**Design and make a winding up toy based on a chosen rhyme eg 'Incy Wincy Spider'**

- to identify criteria for their design
  - to select tools and materials and use correct vocabulary to name and describe them
  - to assemble, join and combine materials to make a winding mechanism
  - to understand the need for a stable structure to support a mechanism
  - to evaluate against design criteria
- ★ Read the rhyme *eg 'Incy Wincy Spider'*.
  - ★ Ask the children to think carefully about their ideas. *Which winding mechanisms would be most suitable for your toy? How will you construct the spider? How will you make the sun and rain work? How will you make it strong enough for people to use?* Discuss other design criteria.
  - ★ Ask the children to collect their materials and list the tools that they think they will use.
  - ★ Encourage the children to make well-constructed structures. *How is it going to move? How will you join the pieces so that it can move? How could you make it stronger? Where are the weak points? How could you reinforce them? Are there different ways of making this? Which would give the best results?*
  - ★ Discuss what they have done and evaluate how well the toy works in relation to their design criteria.

- apply what they have learnt through IDEAs and FPTs in their designing and making
- talk about what their design has to do to work well
- select appropriate tools and materials and name them
- construct a winding mechanism that works and has a straight axle
- talk about their finished products in relation to their design criteria

**Class management**  
 Children might work individually or in pairs to design and make their winding mechanism. Other related activities might include:

- describing how a winding mechanism works, or drawing it
- identifying the steps of making the model – either through written instructions or in numbered diagrams
- measuring how far the mechanism winds, how many turns, thinking about size and number of turns
- making a glossary of new vocabulary

When storing unfinished models, show children how to use masking tape and/or paper clips to secure loose components to their model so that they do not get lost.

**Health and safety**  
 When carrying out a risk assessment for this activity, teachers will need to consider the materials, tools and equipment being used. In addition, the following point should be noted:

- activities using saws could be organised at a workstation so that they can be more easily supervised

**Out-of-school activities and homework**  
 There are opportunities for children to find out about where winding mechanisms are used. Some children might make further models using construction kits or reclaimed materials.

- essential activities
- ★ assignment stages (all are essential)
- optional activities

