Department of Primary & Childhood Education
Lesson Plan 2021/22

Edge Hill University

Date: Summer 2	Class: Year 5	Subject/topic: Science - Forces	Time: 1-2:30pm

Prior knowledge:

how does this lesson fit in with a sequence of lessons-what components have previously been taught?
Children will have experienced

- This is session 3 of 7 science lessons on forces. Covered action of gravity and friction.
- Y5 Summer 1- Space. Content here draws back on their understanding form this material.
- Range of real-life examples, experiences and science capital to draw upon in session to support and develop concepts
- Initial concept maps suggest GW, CB and RS have a strength in this area.

Outcomes:

what composite knowledge/ skills do you want children to achieve?
Children will plan and conduct a pattern seeking investigation and be able to explain the relationship between the size of parachute, air resistance and time taken to fall.

Assessment:

Pupils will record a statement addressing the relationship between surface area and air resistance in the form of a tweet to NASA.
Pupils will plan and conduct their pattern seeking investigations in small group – Teacher and teaching assistant will observe and question to assess understanding during this group work.

Learning objectives:

Substantive & disciplinary knowledge

1. To plan and conduct a pattern seeking investigation and draw conclusions.
2. To explain the effect of air resistance on the time taken for a parachute to fall
3. To identify which direction gravity and air resistance are acting on an object and the relative size of these forces

Key vocabulary:

Gravity, Air resistance, Surface area

Resources:

Concept cartoon, umbrellas, running parachutes, NASA email and design brief, materials for parachute making, rulers, scissors, stopwatches – alternatives as suggested by chn.

Predicted misconceptions:

- Misconception that heavier items fall more quickly.
  - Avoid investigations where material is changed – could reinforce misconception.
- Model language carefully to avoid confusion between terms air resistance and friction

Risk assessment:

Pupils will need to drop their parachutes from a height – ensure that a safe way of doing this is modelled within the classroom/ testing space.

SEQUENCE OF TEACHING & LEARNING				
Timing: *consider pace of lesson.*	**Role of the teacher & support staff:** *e.g. key questions, retrieval of prior learning, modelling and explanations, checking understanding, consider cognitive overload, effective use of additional adults, behaviour for learning.*	**Children's steps in learning:** *what will the children be doing? Learn, practise and apply component steps.*	**Adaptive teaching:** *consider adaptive strategies to support all pupils (including stretch and challenge & SEND), consider resources.*	**Checking what children know, understand and can do:** *Key questions inc. hinge and retrieval/recall, assessment of outcomes.*
Transition time	Do it now activity - Concept cartoon: Gravity – which object will hit the ground first? - Support children to express their ideas drawing on prior learning in Earth and space topic and previous lessons. - Allow children to share their ideas and model how this links with their previous learning.	- Commence activity on return form lunch - Think, pair share their ideas in response to the cartoon and questions. - Write response on a post-it.	- TA to scaffold discussion (PD, LM & FW) fade where possible. - Support with key terminology and retrieval of previous learning. - Additional challenge prompt on the board for all children to access as required	- Observe discussions, prompt where needed - Note who may need support to recall prior lesson and topic content.
10 Mins	Retrieval: Whole class - Question to check chn can recognise the forces acting on each object as they move. - Can chn identify gravity, thrust and friction in prompt questions. Can chn identify the direction of forces on the images of cars? - Model correct use of terminology when re-presenting the children's answers to the class. - Ask the Hinge question (labelling activity) to determine next steps.	<u>Retrieval activity:</u> - Children work independently with mini whiteboards to answer retrieval questions. - Children work in mixed ability pairs to apply this prior knowledge to a new context via think pair share. - Respond to hinge question individually	- Concrete resources available from previous session to refer to and provide a stimulus for retrieval. - Teaching assistant to focus on PD, LM and FW.	- Assess children's understanding through their response to key questions – target questions in response to feedback. - Use hinge question to decide if all children are ready to move on.
15 mins	LOtC – Outside if dry, hall booked as back up. Reiterate expectations to ensure behaviour for learning. - <u>Exploration</u>: Umbrellas and running parachutes. - Chn to explore the effect of these items. Support to observe and describe the differences.	- Chn to walk with open umbrellas held in front or behind them/ Run with and without running parachutes. - Describe when they feel and apply scientific vocabulary to explain.	- TA to work with CW to ensure physical mobility will not restrict access to the exploration. - Ask CW for permission to push his wheelchair whilst he holds the	- Ask questions to elicit their ideas and check their understanding. - Did you notice any differences? - What did you feel?

	- Scaffold pupils to use the appropriate scientific terminology to describe the forces they are feeling. - Use children in freeze frame with force arrows to explain the terms thrust and air resistance.	- Answer questions / physically participate during the whole class forces input	umbrella to feel the forces that are acting.	- Why do you think you feel this? - What was happening while you were running with the parachute?
15 mins	Present challenge - Email from NASA – design a parachute for mars rover: - Show clip of the Mars Rover and it's intended parachute. - Chn to design the best parachute to slow the journey to the surface of mars whilst fitting NASA's design brief: to be made of a set material (share this with children) and be circular in shape. - Support children to identify what we mean by best in this scenario – The parachute which increases the time taken to fall by the most or reduces the speed of falling the most. - Set investigation question 'What diameter of parachute is the most effective at reducing the speed of fall?'	- Chn to discuss what we mean by best – 'slows the mars rover's fall the most' - Chn to work in mixed ability groups to plan a pattern seeking investigation. - Envoy – Half group to remain in place to justify their planned investigation, half 'quality assure' the planned investigation for another group.. - Improve own investigation as required.	- Children scaffolded by mixed ability groupings. - Challenge: Consider the variable being recorded – time taken to reach the floor (stopwatch) or speed (speed = distance/time) – opportunity to increase challenge if appropriate.	- TA and Teacher to observe during the planning process and scaffold discussions where appropriate. - Teacher and TA to take half of the class each to ensure each group has planned an appropriate pattern seeking investigation
20 mins	- Reiterate behaviour and health and safety expectations to ensure behaviour for learning during practical investigations.	- Children to work collaboratively to conduct their investigation and record their results on a table	- Teacher to scaffold recording using a table for XX if needed. - TA to support XX and XX ensure access to groupwork. Whole group to quiet area if required to ensure XX remains involved if appropriate. - Teacher to provide support for groups calculating speed of fall as appropriate.	- Teacher to observe pupils conducting the investigation and assess against LO. Intervene with support as necessary. Record who needed help to revisit later and next session. - TA to work with one group. Fade the scaffold for XX if the situation allows.
15 Mins	- Share findings from groups – what did they conclude? Can they explain why using scientific vocabulary? - Can children spot an unusual results/ anomalies or things they weren't expecting? How could they be explained – what would they do to explore this further	- Children to look for patterns in their results – can they describe the patterns shown by their results? - Children to use scientific language to explain their findings to a partner	- Support PD, LM and FW to explain their results using the scientific vocabulary - Stretch and challenge: Further thinking: Is one parachute enough? Can children suggest adaptations to the parachute	- Check that all children can explain the relationship between the size of the parachute, the amount of air resistance and the time take to fall? - Use tweet conclusion as assessment

	- Further thinking: Is there a limit to the size of the parachute? Why might this be?	- Children to write a tweet to NASA to explain their findings	system that would increase the likelihood of a safe landing? How might this effect the over all air resistance experienced? Could this overcome any of the identified issues in their results? – Can they update their tweet to suggest an improved strategy?	
5 mins	Image to support plenary discussion: - Ensure a secure understanding that – air resistance increases with the size of the parachute. Gravity remains constant and larger as the parachute remains to fall. - Show feather and bowling ball video clip – to demonstrate the impact of air resistance on the rate of falling. Link back to concept cartoon use at the start – can we explain our thinking? How would this be different on the moon - without air resistance?	- Answer questions using mini whiteboards, draw scaled arrows and label diagram - Discuss clip – explain what it shows in terms of gravity, air resistance, vacuum	- TA to focus on children identified earlier in the session and ensure they are now on track.	- Check to ensure children have grasped the important themes of the lesson. Make a note of any children who may remain unsure after additional explanation – target support in next session.

EVALUATION
Evaluation of pupils' learning: *PD. CM. FL confused the terms friction and air resistance – need support to reinforce the scientific vocabulary* **Next steps:** *e.g. how to address misconceptions, providing increased challenge or support, use of different resources or modelling techniques.* *TA to support to reinforce key vocab with identified pupils and build in to whole class retrieval activity in next session to check application of this.*
Evaluation of teaching: *Children were very excited about the practical investigation and largely participated well.* *A small number of pupils were off task during the practical – consider ways to maintain their focus whist conducting the investigation – could children be assigned specific roles within the group during investigation? Prompt questions on desks may help as both myself and the TA supported specific groups in response to their challenges and couldn't get to them as quickly as I had hoped.* **Next steps:** *e.g. subject knowledge, teaching strategies, behaviour management.* *Explore practical behaviour management strategies and ways to reward good team work and pupils who were on task. Explore allocated roles and plan resources to prompt with key questions either on the desks or main board to act as a prompt - increasing independence.*