



# Curriculum Materials

## Learning Journey

### Air resistance



The CEYS project has been funded with support from the European Commission under the Erasmus+ programme (2014-1-EL01-KA201-001644).



# Developing the Foundations of Air Resistance

Stella Reynolds

Essendine Primary School



# DEVELOPING THE FOUNDATIONS OF AIR RESISTANCE

## Focus:

The focus of this project was developing children's problem solving skills through *play and exploration*. It provided the children with opportunities to *make connections, offer explanations* and *make cross curricular links* with other subjects.

## Rationale:

For a smooth transition from EYFS to KS1 there needed to be a focus on practical lessons with *play and exploration* at the centre. The learning that took place needed to provide children with free flow activities that they could access independently and which would *foster their creativity and questioning*.

## Implications:

The implications of my planning and teaching were to foster *problem solving and agency*. The children would be given a *range of opportunities to begin to develop their ideas about air resistance*. I needed to find *appropriate* opportunities in the children's *play and exploration* to introduce the idea of air and air resistance and consider my role in scaffolding the children's learning to support them in *making connections and offering explanations*.

## Links to the National Curriculum:

- Asking simple questions and recognising they can be answered in different ways
- Observing closely using simple equipment
- Performing simple tests
- Using their ideas and observations to suggest answers to questions

Age: 5-6

**Learning activities:** Making connections, communicating explanations

**Synergies:**  
Problem solving and agency, play and exploration, teacher scaffolding and involvement

**Creative Dispositions**  
Ability to make connections, ability to work together, curiosity

**Background School Setting:**  
A large multi-cultural school in Central London with over 90% of the pupils with EAL. In KS1/2 we operate a cross curricular curriculum. To ensure a smooth transition from EYFS, free flow is incorporated everyday in Year 1.

# Overview of the sequence of PROBLEM SOLVING activities

Topic Links: Flying, Space, Transport, DT curriculum

## 1. Paper Airplanes: Make a paper airplane that can fly the furthest.

**Teacher's Role:** Introduce new vocabulary, **ask questions**, encourage children to talk about chosen material, scaffold predictions, encourage children to change design, to help with **making comparisons and offering explanations**.

**Resources:** Different types of paper for example: tracing paper, white paper, card, squared paper

\*Working individually

## 2. Parachutes: Make a parachute that will fall down the slowest.

**Teacher's role:** Use vocabulary, ask questions, encourage children to **make connections** and **explain choices**, scaffold predictions, support carrying out a fair test, encourage to **explain findings and reflect**.

**Resources:** Different types of materials for example: bag for life, thinner plastic bag, tin foil, cloth, dish cloth, string, paper cup, hole punch

\*Working in pairs

## 3. Kites: Make a kite that will fly for 10 seconds.

**Teacher's role:** Use vocabulary, ask questions, encourage children to **make connections** and **explain choices**, scaffold predictions, support carrying out a fair test, encourage children to **explain findings and reflect**.

**Resources:** Card, sellotape, bamboo sticks, hole punch, decorations such as tissue paper streamers

\*Working in groups

# Starting point

**Activity 1:** Make a paper airplane that can fly the furthest.

Children had the opportunity to *play and explore* the type of paper **airplane** they wanted, how to fly them, how best to hold them and if they wanted to make any changes to the design. Children were **encouraged to carry out a fair test**.



**Rationale:** It allowed children opportunities for play and exploration and to problem solve in developing their design. I would be able to encourage children to *explain their choices of materials*. **This activity would create a hook to engage the children and an opportunity for them to build on previous knowledge of materials and experience of objects moving in air.**

## Children's comments:

"The winning plane is thin so it is light to fly"

"If the paper is thick, it will go slowly"

"My plane is straight so it will go far"



Children needed encouragement to talk about the choices they made and scaffolding **to use sentence starters and noticing patterns**. They *made connections* to their **existing** knowledge of materials and **shapes**. Through observing closely they were able to begin **to offer explanations** but they were **mainly focused on materials** rather than how the air affected the movement of the plane.

**Questions:** What do you know about airplanes? What materials have you chosen? Why? Why have you made your plane like that? Why don't planes fly forever?

**Introducing key vocabulary:** air resistance, bendy, thin, thick, light, stiff, the names of the different types of materials

The next activity needed to present opportunities for children to see the effects of air and make it more 'visible' to them. **I needed to support children in making observations about the effects of the air and to ask questions to encourage children to offer explanations for their predictions and observations.**

## Activity 2

**Activity:** Make a parachute that will fall slowest. The children were given a variety of materials and **objects to make parachutes**. The children were given opportunities to explore how to drop their parachutes. They were asked to consider where to drop them from and to make predictions on how long they **would take to fall through the air**. Each child was given a different role for the fair test (timer, scribe, parachute holder).

**Rationale:** This activity had greater potential for the children to visually see the effects of air resistance on movement. Through **play and exploration** the children would begin to experience the effects of air on a falling object. I would be able **to scaffold children's thinking by asking why questions** to help them **find explanations for predictions and observations**.

“Air went into the plastic bag and pushed it up to make it go slower”



“The tin foil parachute is small so will fall slowly”



“The bag for life is thick and heavy so it will be the slowest.”



“The dish cloth will fall the slowest because it has holes in it.”



“The fabric will fall the slowest because it is thin.”



“The plastic bag is light so it will fall slowly.”

The wind carrying the plastic bag created a wow moment - an opportunity to scaffold what the children were saying and to introduce the idea that air was making the bag fly but you couldn't see it. Children were encouraged to work together and share ideas.

**Questions:** Why did you chose that material? Why do you think yours will take the longest to fall? Who's parachute will fall the quickest? Why? What makes parachutes stay up in the air?

The majority of children again made comparisons between the different materials and references to shape in giving explanations for their predictions to begin with, rather than identifying that air would affect the way the parachute fell.

Once the children started to see the effects of air resistance they needed to be exposed to it in a different context and be encouraged to **make connections between their experiences**.

### Activity 3

**Activity:** Make a kite that will fly for 10 seconds.

The children were given a choice of paper and decorations. They were given opportunities to play with their kites, to decide where to fly them from and how best to hold them. They were allowed to make any changes to the design. The children carried out a fair test.

**Rationale:** This was an opportunity to observe the children exploring the effects of air with different materials and to **give them time** to discuss and **make connections** from the previous lessons.

“I want the thin paper because it is light so will stay up in the air”



“The wind is pushing the kite to make it go higher”



Fly kites on a windy day to make them go higher”

The children’s learning had progressed - they knew something was making the kite move and some it was best to wait until it was windy. The children’s **explanations of their observations** needed scaffolding and questioning was key to make them extend their ideas. However, now many of the children were giving **explanations** which drew on the movement of air.



**Questions:** Why did you choose that material? What will happen if you put more decorations on the kite? Why do you think your kite will fly the longest? What is keeping the kite up in the air?

The children now needed to be encouraged to **make further connections** between their experiences of air resistance in these three activities.

# Children's progress

## Child A

### Start of the sequence

Child A understood that air was something that you couldn't see but no evidence that he recognised the connections between air and the movement of objects.

### End of the sequence

'Air and wind are the same thing'. Child A was able to make connections in a greater range of contexts.

'You should fly kites on a windy day so that the kites can go high'. Child A's ability to make connections between the kite's ability to fly and the environment, shows he was able to make comparisons and reason..

## Child B

### Start of the sequence

Child B knew that air was invisible and all around us but did not make links between air and the movement of objects.

### End of the sequence

'My kite went the highest because it was light and the air was making it fly high'.

Child B was able to make connections between her previous knowledge of materials and link it to her learning about air resistance.

'When we made parachutes the dishcloth had holes so the air was going through it. If air goes through it, it will fly for longer'. Child B was able to make connections between observations to reason about why the dishcloth would make the best parachute.

## Child C

### Start of the sequence

'Air moves things like the trees'. Child C is able to make links in explaining his observations to everyday ideas.

### End of the sequence

'Airplanes use wind to fly and when we flew them wind came out of my hand'. Child C was able to make connections but still had misconceptions about what air was and connections with the wind.

'The wind is pushing the kite to make it go higher'. Child C was able to use his ability to make connections to begin to reason about what made the kite fly high.



## Children's progress:

- Children were able to build on knowledge of materials from previous topics **to offer explanations and give reasons for their predictions.**
- The children **began to make** connections between their experiences of parachutes and kites. They could visually see the effects of air and **seemed to understand** that something was making the parachutes and kites move.
- Through scaffolding from the teacher and practice the children were able to get better at explaining what they had observed closely. The children used **some** new vocabulary in their explanations, **often connected to the properties of materials.**
- The children were engaged and excited by their learning, as they continued their learning in free flow, **for example.**
- Children were able to use their imaginations to come up with something new in designing, making changes to their design and decorating it.
- Children began to develop** skills from **just** making predictions to testing to recording, reflecting and reasoning as they justified and explained their ideas.

### Next steps:

- Extending children's vocabulary around forces and air resistance so that explanations are more scientific
- Encourage children to make connections between their everyday experiences about objects moving in air and as they use ideas about air resistance to offer explanations in different contexts.

## Planning: NEXT STEPS AND Free flow opportunities

- Different types of paper planes diagrams for the children to make and test.
- A range of materials for the children to make parachutes and test in different environments, seasons and weather.
- A range of materials and decorations for the children to make kites and test the difference between few decoration to a lot of decorations.
- Using balloons to try to lift different objects off the floor like in the movie 'Up'.



These activities will encourage children to make connections between materials, shape, mass and air resistance and to give reasons. It will develop their curiosity about what will happen next and allow opportunities to work together, communicate and share ideas as they perform simple tests and find answers to their questions.

## REFLECTIONS: Teacher's Role:

- Forces are not currently part of the statutory Key Stage 1 curriculum but it is key for children to have experiences of forces throughout the Early Years and Key Stage 1 to enhance their learning for Key Stage 2 so that they can relate it to their own experiences.
- The children were given a range of problems to solve, linked to air resistance, allowing them opportunities to *make connections* between different activities. Each lesson was practical and **play and exploration were central**. The children's *curiosity* about what was going to happen next was key to developing the children's learning.
- Children were able to work individually and work together which gave **opportunities for dialogue** and sharing of ideas.
- Teacher scaffolding was key throughout. It was important to understand **when to let the children work independently** and when to step in and support the children's learning.
- The lesson on airplanes allowed the children the opportunity to **come up with something new** about how their planes were flying.
- The lesson on parachutes created an opportunity to introduce the foundations for air resistance. It was the beginnings of the children starting to **make connections** from the lesson on airplanes and what they thought air was.
- **Questioning** was key to understand the children's ideas about what they thought air was. Modelling and scaffolding was needed to extend the children's explanations.
- Unanticipated outcomes were that the children used their previous knowledge of materials to as a base for their airplane, parachute and kite designs. The children mentioned shape in some of their observations. An activity could have been set up to make the children think more about shape **and air resistance** when making their paper airplanes, parachutes and kites and how it would affect their design. Also further experiences to underline the existence of air and idea of wind as moving air.

### Next steps: Future Planning

- I will ensure that play and exploration is at the heart of my science lessons. It is vital to allow the children to gain experience through exploring first, **before the children undertake more systematic investigation**. I will also ensure that when planning a sequence of lessons the children will be given opportunities to make connections **about a phenomenon which they experience in different contexts**.

# Reflection questions for the reader

- What opportunities do you offer for children's problem solving?
- In what ways do you foster children's creativity in coming up with solutions?
- How do you support children in making connections between experiences and developing their ideas over time?



## Acknowledgements

**Creativity in Early Years Science EDUCATION (2014-2017)**

[www.ceys-project.eu](http://www.ceys-project.eu)



The Open University



© 2017 *CREATIVITY IN EARLY YEARS SCIENCE EDUCATION Consortium*

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view a copy of this license, visit

<http://creativecommons.org/licenses/by-nc-nd/4.0/>.



The CEYS project has been funded with support from the European Commission under the Erasmus+ programme (2014-1-EL01-KA201-001644).

