

# Teacher's Handbook



Written by

Karen Carney, Janine Carpenter, Andie Hughes,  
Anne-Marie James, Dawn McCann and  
Jules Pottle

Contents	Page
Foreword	3
Introduction	4
The Action Research Project	5
Guided Reading Questions	8
Teaching Resources	
Vertebrates vs invertebrates	11
Odd One Out	12
Headband Identification Game	13
Classification Keys	14
Ant/Spider Drive	15
Choice Chambers	16
Queen Ant Rant	17
Playscript	17
Nature Documentary Role Play	18
A final word from SAtC	18

#### Disclaimer

Artful Fox Creatives (Jules Pottle and Rufus Cooper) and SAtC are not liable for the actions or activities of any reader or anyone else who uses this book or the classroom activities associated with this book. Artful Fox Creatives and SAtC assume no liability with regard to injuries or damage to property that may occur as a result of using this book.

## Foreword by Jules Pottle

### Why use stories to teach science?

Research shows that our brains are hard-wired to receive information in the form of a story: we pay more attention to a story and become more engaged in it than when we read the same information in a non-fiction form. (If you'd like to know more about this then I would like to point you in the direction of G H Bower and D T Willingham.)

We found this to be true when we researched the effectiveness of 'Jasper the Spider' in schools in Stoke. The children were able to access the information in the text easily and cared about the characters. The story activated their curiosity and they went on to ask more questions and find out more about spiders and insects as a result.

Our previous picture book, 'The Molliebird' also tackled a few common misconceptions held by children on the topic of evolution. We found that the use of a picture book also stimulated discussion as there was a level of ambiguity in the text. Careful questioning highlighted these misconceptions and this was really helpful when encouraging children to let go of their half formed ideas and grasp a better understanding of how the process of natural selection can lead to evolution of a species.

Lastly, stories are loved by all teachers; science, often, is not! Supplying a hesitant teacher with a book to read to a class can be a great support and a familiar tool to teach a point – one that is non-threatening and perceived as easy to use.

The team at Artful Fox Creatives is committed to producing high quality texts to use in primary science teaching as they believe it is a brilliant way to learn, to engage and to support learning.

Watch out for our next book!

[www.artfulfoxcreatives.com](http://www.artfulfoxcreatives.com)



# Introduction

## Why use 'Jasper the Spider to teach classification?

'Jasper the Spider' has been written by two award-winning primary science teachers who have noticed that children often assume that all small animals belong in the same group. As teachers, we often refer to animals that we might find in the outdoor spaces around us as 'mini-beasts'. This can lead to children thinking that all small animals somehow belong in one group.

Whilst collecting animals and observing them is a very exciting activity for children, it can be difficult for some classes to access outdoor spaces to collect their own. Furthermore, the classification of these animals can be quite a dry topic to those who are not already interested in animals, or 'yucky' to those who have learned to be afraid of touching 'dirty' things.

Jasper is an engaging character who has been designed to be appealing to children. The emotive storyline is one that children can relate to as the desire for friends and to be part of a group is a fundamental part of being human for most. The science is embedded into the story and the children are learning the science unconsciously. It is science by stealth. Some of the story is told in the pictures so that the children can discuss their interpretation of what is happening, and their dialogic talk reveals any misconceptions to the teacher.

Our action research project, testing the effectiveness of this story as a teaching tool, showed that children could indeed learn from a story and retain the information. However, what was startlingly clear was that the children were much more engaged in the topic when it was presented in the picture book form. The children were more curious, asked more questions and used the specific vocabulary more readily. They were more interested in spiders and insects as a result and went on to do their own research having read the book.

Why not see if it has the same effect in your classroom?



# The Action Research Project

Science Across the City (SAAtC) in Stoke upon Trent gathered a group of teachers to try out 'Jasper the Spider' (Artful Fox Creatives, 2021) in the classroom to see how effective of a fictional text could be in teaching a concept (classification in Y2 and Y4). The book was trialled as a PowerPoint presentation in its draft form with various options for the wording of certain pages. The children were asked their opinion on these options and their knowledge was assessed before and after the use of the book. In most classes, the children's knowledge before and after the book was measured. In a few schools, we were able to compare the effectiveness of the book versus a factsheet as there were two parallel classes to compare.

## The Methodology

Our action research project used pilot groups of children from classes in Year 2, Year 4 and Year 6 across five primary schools to increase the scale and validity of the evidence gathered. Careful consideration was also given to the methods and the timescale of how to collect both qualitative and quantitative data to ensure we could measure and compare the impact of the project.

Children repeated the activities- once prior to reading the book, then again one week and six weeks after reading the book to provide opportunities for the collection of measurable and comparable data. Upon completion, the data was obtained from all schools and examined and analysed altogether, through the comparison of statistics and responses, to create a bigger picture of the research findings.

## Data Collection Methods

### Kahoot quiz

This interactive game-based learning platform involving answering multiple-choice questions around the science book topic was used to identify children's prior knowledge, misconceptions and measure the impact from learning science through a story. The method involved children completing a specifically generated insect and spider Kahoot quiz '*What do you know about insects?*' prior to exposure to the book, then one week after reading the book through shared/guided reading and again six weeks later to measure if children retained the science knowledge featured within the book.

You can access this resource here <https://create.kahoot.it/course/2ca7db33-63b6-430c-89d0-0fcffe30a37f>. You don't have to pay for 'Kahoot!' if you have a free account. To play this game with your class, click start and display the pin code on the interactive whiteboard. The children use their own device and open the Kahoot.it webpage ([www.kahoot.it](http://www.kahoot.it)) and enter the pin. Once they're all logged on you can play the game by following the prompts on the screen. You can even record their scores.

### Odd One Out

The aim of using the 'Odd One Out' activity was to gather children's prior knowledge, misconceptions and again to measure the impact of using stories as a science teaching and learning approach. With the 'Odd One Out' activity, there is

usually no right or wrong answer, however for the purpose of this project, we wanted to collect what children did (or did not) recognise between insects and spiders. We asked the children to look at three carefully selected images, and then asked the children to think about what they can see, and look for the similarities and differences between each image and choose one odd out image. This could be related to their appearance, how they move and where they might be found. Individual ideas and answers were collected using slips of paper or post-it notes for future comparison of individual responses when revisiting the activity again after the shared/guided reading of the book. Upon completion of the same 'Odd One Out' activity after shared/guided reading the book, the individual responses from prior and after reading the book were compared to measure the variation and development of responses.

### **Forest Schools**

For this activity we focussed on five random children in each of the pilot groups to gather and examine closely the knowledge, misconceptions and knowledge retaining as a result of science learning through a story.

The first session was used to collect data prior to reading the book, the children utilised the outdoor natural environment to look for microhabitats and invertebrates and collect natural resources to make a model with labelled body parts. Staff recorded children's responses and photographed models featuring the labelled body parts for data collection. This was repeated after reading the book.

### **Guided reading**

Children read the book as a group or a class and were asked a set of specific questions related to the book. In the case where a pilot group was not being exposed to the book, these children read a spider related non-fiction text and again were asked a set of text related questions. During the guided reading, using the set of reading questions, staff gathered evidence of what children said through written comments. The responses obtained were then collated, compared and analysed by determining keywords, phrases and children's reactions to the story/ non-fiction text.

### **Teacher Questionnaires**

Questionnaires were distributed to staff involved in the project in order to gather insight and views of the proposed new book and to evaluate the effectiveness of science learning through stories. The questionnaires gathered both statistical data and qualitative responses to examine the impact of the project and identify project and book developments and recommendations.

### **The Results**

#### **Karen:**

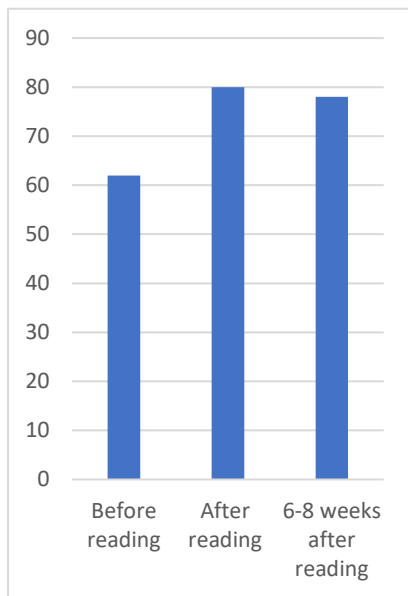
*"When we read the book, we had to keep stopping whilst they discussed things.*

#### **Anne- Marie:**

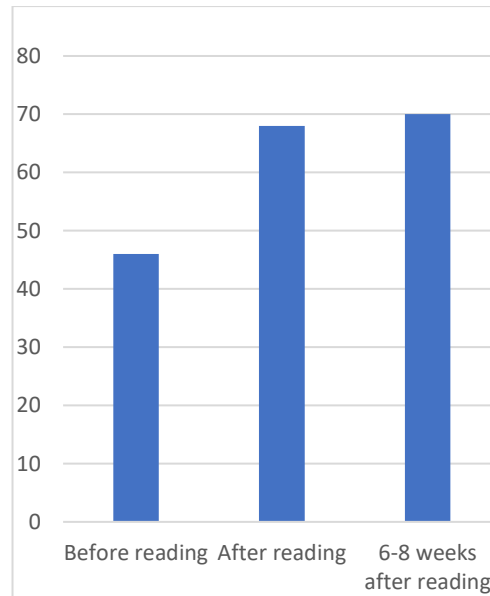
*“Reading the book inspired them to go and find out more about spinnerets and spiderlings and the fact that spiders eat each other. They brought me images of them eating each other!”*

### The Project

We assessed the children’s learning and retention of the facts taught by the book in a Kahoot! Quiz. We collected the class scores before the book was read, after the book was read and 6 weeks after the book was read. The results were really promising (see graph). In my school, the children scored 66% before reading the book and 88% after and 87% 7 weeks after, suggesting that this is ‘sticky learning’, retained by the children.



Picture Book  
Average percentage on Kahoot! Quiz.



Non-fiction text  
Average percentage on Kahoot! Quiz.

In some schools we were able to contrast this with a parallel class who learned the same facts from non-fiction Twinkl fact sheets. The results shown are from many classes for the picture book but only one class for the non-fiction text. You can see that both texts raised levels and the picture book learning is retained at a similar level to that of the non-fiction text.

Another teacher devised a forest school activity where the children were asked to draw or make an insect and a spider, before and after reading the book. These were analysed for anatomical accuracy and showed that the children who read the book demonstrated more understanding and knowledge than the non-fiction group: 92% of children who read the book improved their knowledge as compared to 60% of children who read a non-fiction text improved their knowledge.

### Andie:

*“We followed up the book with an ant colony in the classroom- they really engaged with what was going on inside. We also had caterpillars. When one came out of the pupa with a deformed head, they really noticed and were looking for all the body parts. They noticed that it only had one antenna straight away.”*

# Guided Reading Questions

## Guided reading Questions

Cover

*Key Question*

*What do you know about spiders?*

Do you like spiders?

Have you ever seen a purple spider?

Is this a real spider?

Page 1-2

What do you think a spinneret is?

What do you know about spiderwebs?

How would you describe Jasper?

Which one is Jasper on this picture do you think?

Page 3-4

*Key Question*

*Where are the spinnerets on a spider?*

What did Mum mean by "It's time!" ?

Page 5-6

What happens when the spiders make their first line of web?

What does 'scattered' mean?

What does 'disbanded' mean?

Page 7-8

Is Jasper good at spinning webs?

Page 9-10

How does Jasper feel about being parted from his family?

What does Jasper do to make friends?

Does he make friends with the fly?

Page 11-12

How does Jasper feel when he sees all the ants?

What is he thinking?

Page 13-14

*Key Question*

*Why won't the guard ant let him in?*

*Key Question*

*How does Jasper disguise himself?*

Page 15-16

What work do the ants do?

What does Jasper do?



How do you think he feels about it?  
How do the ants feel about Jasper?

Page 17-18

*Key Question*

*What has the queen noticed?*

Why is the queen angry?

How do the ants feel about Jasper now?

Page 19-20

What happened when it rained?

What does essential mean?

What does torrential mean?

What does vacate mean?

How does Jasper help?

*Key Question*

*Why couldn't the ants do this for themselves?*

Page 21-22

How do the ants feel now?

*Key Question*

*What has the queen noticed now?*

Page 23-24

*Key Question*

*How does the queen know Jasper is a spider and not an insect?*

Chant the lines on these pages - pretend to be the queen.



Page 25-26

What does 'evicted' mean?

How does Jasper feel now?

How do you think the ants might be feeling now?

Page 27-28

How does Jasper feel about the lady spider arriving?

Page 29-30

What is Jasper feeling here?

What is he thinking?

What is he excited about? Why?

*Key Question*

*Which of these animals is an insect?*

Page 31-32

What had he forgotten?

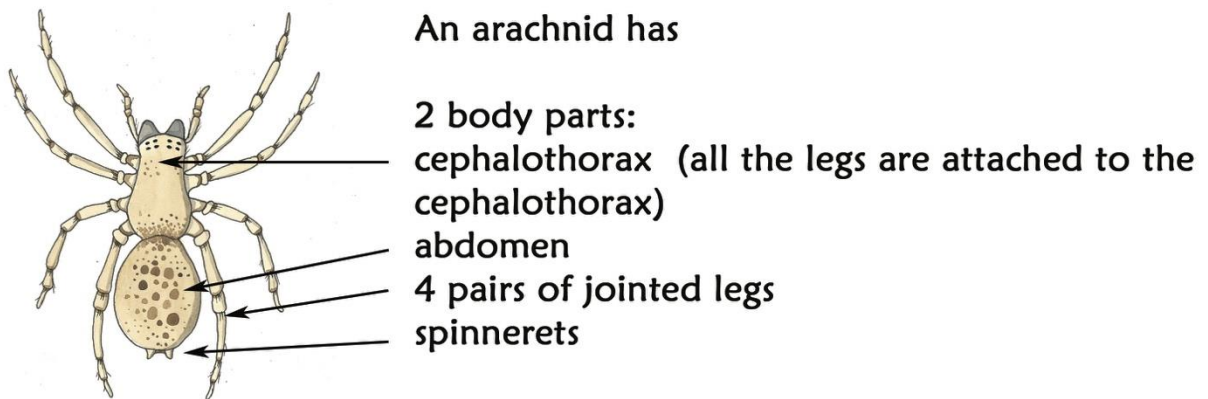
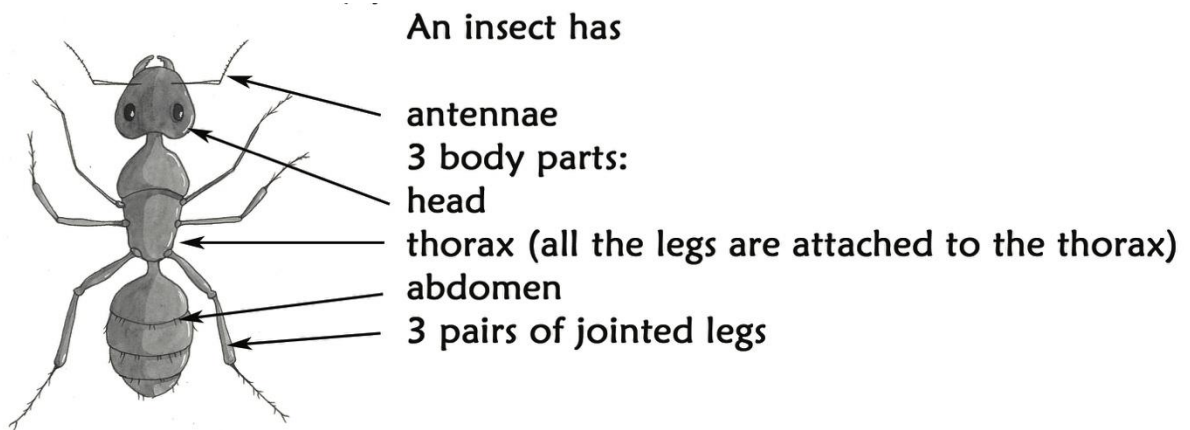
*Key questions to ask after reading the end of the book*

*What do you know about spiders now?*



*What do you know about ants now?*

*What is the difference between an insect/ant and a spider?*



# Teaching Resources

## Vertebrates vs Invertebrates

Before reading the story, give the children two sheets, one titled vertebrate and the other invertebrate with the pictures below to help their understanding of what each word means. This dinosaur has a very long spine. The spine is made up of vertebrae so it is a vertebrate.



© Raimond Spekking / [CC BY-SA 4.0](#) (via Wikimedia Commons)

Then, give them a selection of plastic animals for them to sort onto the two sheets. E.g. snake, ant, scorpion, spider, beetle, wasp, butterfly, giraffe, frog and bird.

While the children are sorting, listen to their reasoning as this will help with your assessment of their understanding.

For example, during our sorting activity one child said: Birds have bones because we have them when we eat chicken. I don't think insects have bones because they'd be too tiny to see. Snakes don't have bones because they're too wriggly.

This will inform you about prior learning and to correct any misconceptions.

Repeat at the end of the topic to assess their understanding.

As you can see from this picture, the children still needed support with understanding that frogs are vertebrates!



### Odd One Out activity

With Odd One Out activities, there is (usually) no right or wrong answer, however the aim will be for the children to recognise that there are differences between insects and spiders.

Ask the children to take a look at the three carefully selected images, then ask the pupils to think about what they can see, and look for the similarities and differences between each image. If they get stuck, prompt them to think about:

- appearance
- how they move
- where they might be found

Capture all the ideas, you might try one of these methods:

- whiteboard notes of the class' suggestions
- ask your class to pair up and write down their answers

Explain that now everyone needs to decide which one they think is the odd one out and why. Give them a short time to think or discuss in partners or small groups before sharing their odd one out. Remind them that they must clearly explain their reasons. Discuss as a class. Explore the pupils' answers, one image at a time, showing how each picture could be the odd one out. What did they think about there being no wrong answer?

Which is the odd one out and why?



## Headband Identification Game

This activity can be used as:

- a pre-learning activity to identify the children's prior knowledge and understanding of the classification of 'minibeasts'.
- a fun assessment warm up/plenary to check in on current knowledge and understanding.
- at the end of a unit of teaching/end of a term/year to support with summative assessments.

You will need:

- strips of card
- tape
- scissors
- animal cards photocopied from the resource below

The game can be played in table groups or as a whole class but groups work much better as there is more interaction between the players.

Firstly, create a simple card headband that will fit easily around a child's head and create a slit in which to place a card. Choose one child (per class or per group) to wear the headband. Then, using the card provided (with creatures from the book) choose one card to place in the headband, which the child who is playing will be wearing. Note: they must not see the card on their band.

The other children will each need a 'yes'/'no' card to respond to the questions. The aim of the game is to find out which invertebrate they have on their headband in as least questions as possible by asking the others questions which require only a yes/no answer. For example:

"Do I have antennae?" "Do I have wings?" "Am I an insect?" "Do I have spinnerets?"

After each question, the audience will respond with their yes/no response by showing the relevant side of their yes/no cards. At this point, teachers can assess the understanding of individuals and intervene to support knowledge and misconceptions where needed.

Alternative version 1:

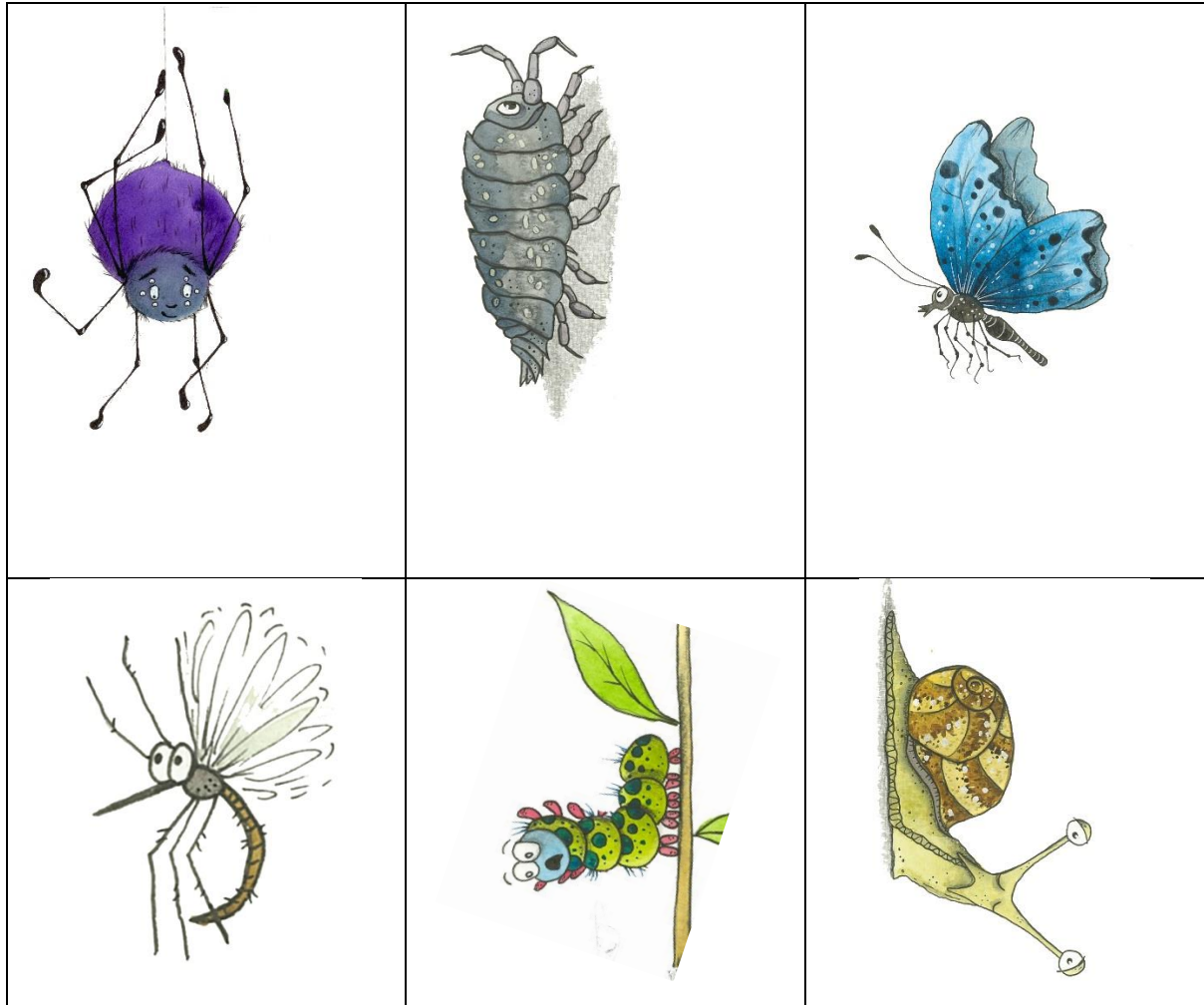
Everyone has a headband and a card. Take it in turns, within the group, to ask questions about their invertebrate. The first one to guess correctly is the winner.

Alternative version 2: by Nicky Waller in her book 'A Creative Approach to Teaching Primary Science':

Use a Post-it with the name of an invertebrate from the book, attached to every child's back and they have to walk around asking questions to others to find out which animal is written on their Post-it.



## Headband Identification Game Cards



You can find more cards like this on the internet. The following ones show the number of legs, which will help children to identify the animals.

<https://www.twinkl.co.uk/resource/T-CR-3476-minibeast-picture-cards>

### Classification keys

The text is a perfect opportunity to support the teaching of classification keys in both Year Four and Year Six. Using the cards provided above, ask each pair/group to sort the invertebrates in a variety of ways, allowing the children to initially choose their own criteria for sorting. Take feedback on how the cards have been sorted and use these criteria to lead into identifying the features of the different invertebrates from the text. Aim for questions which have a yes/no answer, for example, 'Does it have 8 legs?'

After becoming familiar with and using a range of classification keys, ask the pairs/groups to classify the invertebrates from the text. Explain that each question should have a yes/no answer so that it divides the set up into approximately two equal groups. Ensure relevant and appropriate vocabulary is used in their questioning and that their yes/no questions relate directly to the invertebrates being sorted. Children will then create their classification key which will lead to the sorting of the invertebrates from the text.



## Ant/Spider Drive

This is an activity which enables the children to draw the different parts of the spider/ant to form the complete body.

Play Spider Drive/Ant Drive with your partner or a group!

You will need:

- paper
- dice
- pencils

The aim of the game is to be the first one to complete your spider or your ant.

### *Spider*

6 is for a body part. You will need to roll two of these as spiders have two!

5 is for a leg. You will need to roll 8 of these as spiders have 8 legs.

4 is for the head of which there is one.

3 is for the spinneret of which there is one.

2 is for an eye. You will need to roll 2 of these.

1 is for a fang. You will need to roll 2 of these.

### *Ant*

6 is for a body part. You will need to roll three of these as ants have three!

5 is for a leg. You will need to roll 6 of these as ants have 6 legs.

4 is for the head of which there is one.

3 is for the antennae of which there are two

2 is for an eye. You will need to roll 2 of these.

1 is for a mandible. You will need to roll 2 of these.

### *The Game for Spider*

- Take it in turns to roll the dice.
- You must draw the body parts first so must roll 2 sixes.
- After the body, you can then draw legs, head or the spinneret.
- After the head is drawn, you can then draw the fangs and eyes.
- The first player to draw all of the parts is the winner.

### *The Game for Ant*

- Take it in turns to roll the dice.
- You must draw the body parts first so must roll 3 sixes.
- After the body, you can then draw legs or the head.
- After the head is drawn, you can then draw the antennae, mandibles and eyes.
- The first player to draw all of the parts is the winner.

## Choice Chambers

One way to study animals in their habitat is to create a choice chamber. This works well with woodlice and can be carried out in the classroom, as long as the usual safety precautions are taken to avoid harming the woodlice and the children. If you are not sure about this then I would suggest you join CLEAPPS and follow their advice.

[www.cleapss.org.uk](http://www.cleapss.org.uk) – it costs from just 15p per child.

### *You will need:*

- A tray per choice chamber – Gratnells trays are perfect.
- Dry wood
- Sticks
- Leaves
- Stones
- Damp wood
- Any other classroom materials you have to hand
- 8-10 woodlice per choice chamber

### *Method*

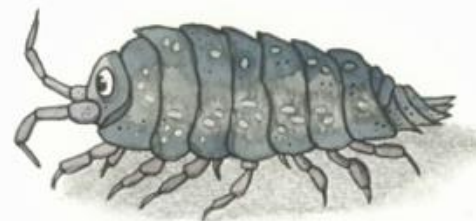
You are aiming to make 4 different habitats for the woodlice. Make them as different as possible e.g.

- Light and dry (empty)
- Dark and dry (leaves)
- Light and wet (wet stones with no way to get underneath)
- Dark and wet (damp wood and pieces of bark to hide in.

Allow the children to choose their own materials for each corner. Do encourage the inclusion of damp wood!

Release your woodlice into the middle of the tray and watch where they go. After ten minutes or so, you should be able to see that they like the damp wood the best and tend to go in the dark damp spaces. If you leave them longer, they will all tend to go into the damp wood.

When you are ready, count the woodlice which are in each corner of the tray. You can repeat this by collecting up the woodlice and leaving for the same length of time and then counting them again. Did you get the same results both times?



### Queen Ant Rant

Learn this text as a poem with the class. This will give your children the chance to practice their fluency as an oral activity. This kind of activity helps to reinforce their understanding as well as their fluency and phonics skills.

“I knew it,” she whispered. “I saw ya... I spied ya!  
Web spinner,  
eight-legged,  
arachnid...

**A SPIDER!**

You’re not an insect. You’re nothing like me.  
You’re a body part short – we insects have three.”

### Write a Play Script

This will help your children to internalise the story and connect with the emotional journey of Jasper as he tries to connect and become part of a group despite of his differences. This may well help the differences between spiders and insects to be remembered.

Write the story of Jasper as a play. Focus on the emotional aspects of the tale, pausing for dramatic effect when the ant’s nest is flooded, when the Queen Ant discovers his secret and the ending when he gets eaten!



### **Nature Documentary Role Play**

This will give your children to opportunity to compare out loud and consolidate their learning of the differences between spiders and insects.

Take on the role as David Attenborough (or other nature documentary presenter) and report on how many people think that spiders are an insect. Comment on the differences between a spider and an ant and describe how they are different. Use scientific terms such as arachnid, antennae, spinneret, fangs, mandibles.

## **A final word from SATC on talking about classifying**

### **Bridging**

Science is more memorable if the new learning can be used in everyday experiences or identified as relevant to family and others beyond the teacher and the lesson.

Classification and recognition of variables, their similarities and differences is an essential conceptual disciplinary knowledge within the text of Jasper the Spider. Application of sorting and classifying skills is needed in many everyday scenarios and in many jobs and roles.

Try to encourage the children to appreciate that when they look hard to notice details in the 'Odd One Out' pictures that they also use this skill when they look hard to notice details, in order to sort things in their everyday lives. You could point out that you use these skills when pairing socks, but you will have examples of identifying variables relevant to the interests of your class. The more personalised the examples, the more likely that the children will remember the learning when they come across that example. This might range from sorting books by genres or computer games by challenge, or dancing by steps, or football strips by colour.

Try to encourage children to talk to adults about their new learning by linking to relevant scenarios where classification is in place. Who do they know that has to sort items into groups? Where do they go with an adult that involves classified sections? There are many examples: the supermarket, the allotment, the warehouse, the launderette, the library, the toolbox etc.

Encourage children to start a conversation with an adult to explain why size or 'mini' might not be the best variable to sort things by and to think about how many variables are needed for the purpose in different situations. How many variables do you need to know when making decisions on where to find an item or how to sort it? This kind of talk will help children and adults to deepen their understanding of sorting and classifying - that groups of items won't always be of identical forms but that key variables need to be determined and clear.

Encourage children to feedback on conversations at home and praise the connections that children have found whilst 'bridging' the way scientists work to science all around them.