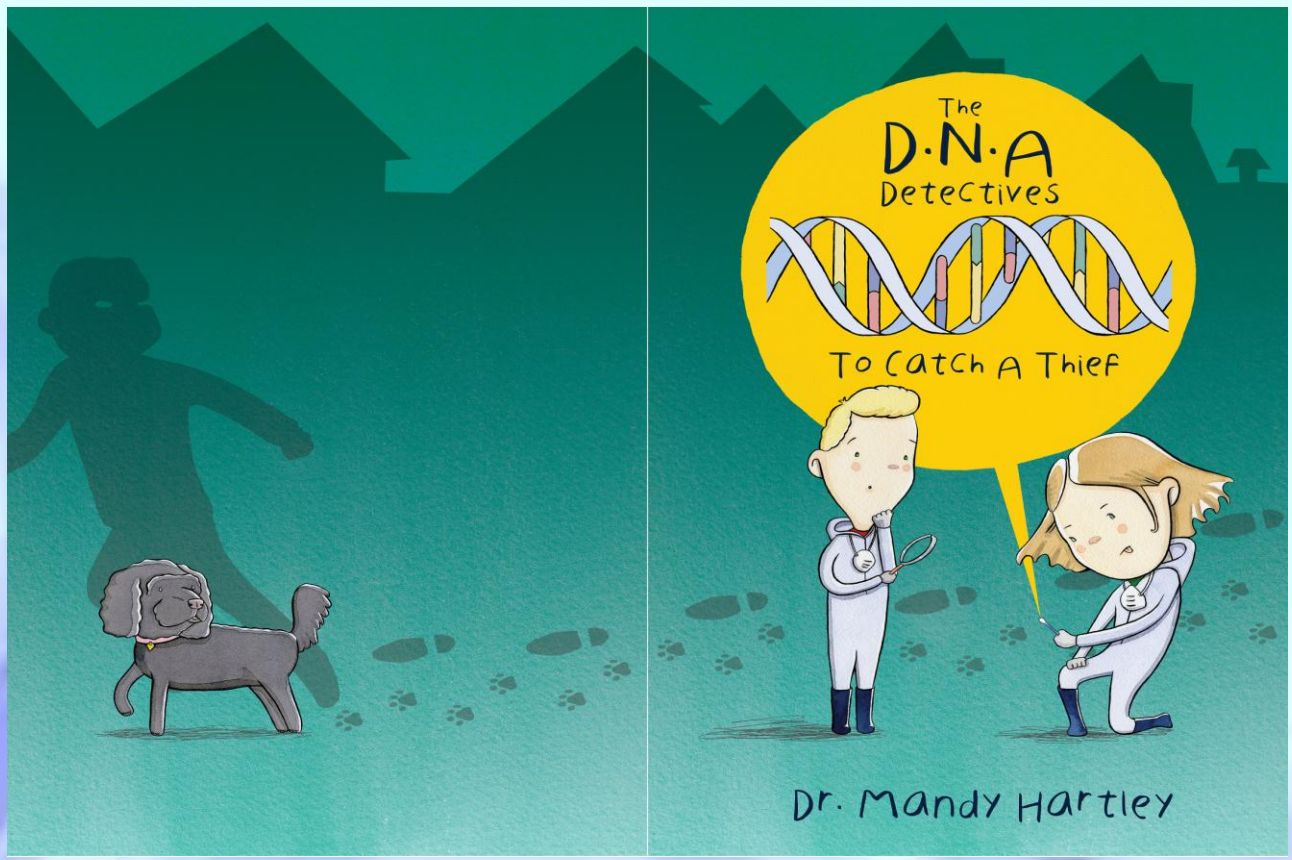
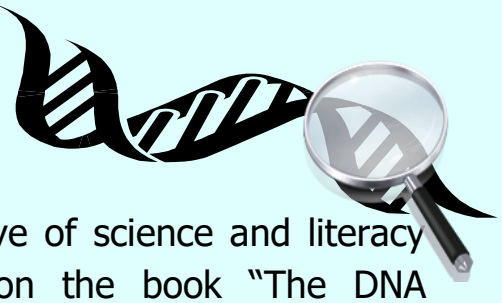
‘DNA Detectives – To Catch a Thief’





Aim:

The aim of this session is to inspire children with a love of science and literacy through a "hands-on", interactive workshop based on the book "The DNA Detectives – To catch a thief". In this book the characters use DNA to find out the identity of a pet thief. Alongside the thrilling plot children reading this book learn about DNA, cells and forensic science.

Introduction:

It has been argued that the discovery of DNA and the understanding of its structure and functioning may well be the most important discovery of the last century. DNA is fundamental in our lives today in helping us to understand and treat diseases, develop gene targeted drugs and therapies, introduce better strains of crops and animals to feed the world, to trace families, unlock historical secrets and establish paternity and combat crime through forensic investigation. With such a key role in modern life it is a huge advantage for children to have a good understanding of the fundamentals of this subject.

In my experience if you have a solid understanding of the basic concepts of a topic, this will provide a fantastic platform that can be built on and makes it easier for children to understand more complicated extensions of this subject later on. For example a child who has learnt the basics of DNA is likely to find it easier to understand topics such as transcription and translation at secondary school.

The workshop is designed so that children learn about what it is like to be an author, write a chapter in a book, discover some "wow" words and investigate the importance of word order in a sentence. They will learn what DNA is, where DNA is found in the body and use DNA to find out which pets have been kept in the shed (just like in the book) and which of them is the pet thief! They will get a flavour of what it is like to be a real forensic scientist and collect evidence from the crime scene. We finish the workshop by investigating electromagnets just like those used by the characters in the book. We will have a competition to see which team has the strongest electromagnet and then find out why! This interactive workshop is a unique and exciting way to get children interested and excited about literacy and science.

Within the workshop there are lots of visual demonstrations and tasks for the children to take part in so they can really understand what is going on. The work shop is designed to be interactive with children encouraged to come up with the answers and to ask their own questions. In my experience this approach to learning is a fantastic way for children to really grasp different concepts.

I want them to get really excited about reading and writing, being creative and using DNA to solving a crime.

My aim is to share my love of science and literacy with the children and to inspire them to become interested in learning about literacy, being an author, science and forensic science. I think this is particularly important for the girls who sometimes fail to engage with science as they perceive it to be too hard. This workshop could be the starting point for budding forensic scientists, authors or geneticists of the future!

Proposal:

This interactive workshop can take place in a classroom or hall with approx. 30 - 35 children. Ideally children will have read my book "DNA Detectives – To Catch a Thief" as a class prior to the workshop but it is not a problem if this has not been possible. The children will be given a thesaurus each to help them during the workshop. The workshop will take approx. 1 hour (depending on how the children interact, extra if including the art and design activities).

The sessions always start with an introduction. I will introduce myself to the children and explain how I spent many years working with DNA in a laboratory and used DNA to solve crimes and find out about different diseases. I tell them that now I am an author and I write exciting fictional books where children use DNA to solve crimes. I then explain what we are going to do in the session.

1. I will explain what made me want to become an author and what I like about being an author.

2. I will explain to the children where my ideas for the book came from and introduce the characters. This will involve showing them photos of myself when I worked in a laboratory, my children and our dog Milly.

3. I explain the process I go through when I am planning my books. I explain when I have a location where something is happening I think about the five senses. I think about if you were standing in that location what you can see, hear, taste, touch and smell. I explain how I thought it would be great if they could help me plan a chapter.

4. I explain the plot is that something has been stolen. Annabelle and Harry the characters from my book have found some evidence that will help find what has been stolen but they get discovered. The chapter must end on a cliff hanger!

5. First we have to decide the location. I produce a story cube (a big dice). There are six possible locations; a secret tunnel, a wizard's potion room, a secret shed, a house made of sweets, a ship or a class room. The children roll the dice to find out the location for our chapter. I write the location on my notepad/white board.

6. I ask the children to describe what the location looks like. I explain as an author you are trying to get the reader to create a picture of the location from your description in their heads and allow them to imagine that they are really there. We will think about what they can see, hear, taste, touch and smell. Is it cold, warm, dark, light? Small or big? We will also use the thesaurus to come up with "wow" words to describe our location. I will make a noise with a light up bell to celebrate any amazing "wow" words the children come up with and we will add a person to our "wow" sculpture (using plastic people for each wow word to build a sculpture – see picture). The child who comes up with the word gets to pick a plastic person to add to the sculpture. I write the words down on my notepad/whiteboard.

7. I ask the children to decide what has been stolen and what the evidence will be. What is our cliff hanger? We write this information onto my note pad/whiteboard.

8. Next we need to decide who will discover the children. I have a set of model dolls and ask the children to choose a character from; a pirate, a skeleton pirate, a wizard, teacher, pupil, witch, a man or a woman. We write this information onto my note pad/whiteboard.

9. I explain that we now have all the information to write a chapter in one of my books. I explain that one of the other things that I have to think about is what my sentences mean especially when I am trying to describe DNA to children.

10. I ask for volunteers to each hold a word in the following sentence; "ONLY she told me she loved me". I ask the children what this means (she is the only one who told me they love me). I then ask the child holding "ONLY" to move places so the sentence reads "She ONLY told me she loved me". Again I ask them what this mean (the only thing she told me was that she loved me).

11. I then ask the child with "ONLY" to move to the next position so the sentence reads "She told ONLY me she loved me". I ask what does this mean (she didn't tell anyone else only me that she loved me). The child with "ONLY" goes to the next position "She told me ONLY she loved me". I ask what this sentence means (she told me nothing else, only that she loved me).

12. I ask the child with "ONLY" to move to the next position. The sentence reads "She told me she ONLY loved me". Again I ask what this sentence means (she only loves me and no one else or that the she only loves me and nothing else). Again the child with "ONLY" moves along so the sentence reads "She told me she loved ONLY me". We discuss what this sentence means (she doesn't love anything else only me).

13. Finally the child with "ONLY" moves to the final position so the sentence reads "She told me she loved me ONLY". We decide what this sentence means (she only loves me and no one else). We discuss how it is important to think about what your sentences actually mean and that moving just one word can change their meaning.

14. We now come onto the science section of the workshop. I start with box of Lego and ask the children what they could use to help them make the Lego model. I wait for someone to say 'use the instructions'. I then explain that DNA contains the instructions to make a whole human being. I ask the children to think about what might be in those instructions and take examples from some volunteers e.g. the instructions to make the heart, lungs etc. I explain DNA stands for DeoxyriboNucleic Acid but they can call it DNA!

15. I remind the children what we have learnt that DNA contains the instructions to make a human being and ask 'but where is it in our bodies? I explain that DNA is kept in a special bag in the body called a cell and that the cells protect the DNA and stop it from being damaged. I show them the model of the cell. I show them the cell membrane around the outside which keeps all the bits in. I then show them my gel filled model to demonstrate the role of the cytoplasm. I also demonstrate this using bubble wrap like Annabelle and Harry use to describe cells in the book. I explain our DNA is found in the nucleus of the cell and show them the nucleus in the model.

16. We play a game of Operation to look at the different parts of the body and decide whether they are made of cells. I explain we have 37 trillion cells in our bodies and they all contain DNA (apart from the red blood cells). I explain that cells are so small we have to look through a microscope to see them. I show them a slide with cells from different parts of the body. We discuss how cells can be lots of different shapes but they all have a nucleus which contains DNA.

17. I explain to the children that just like in my book "DNA Detectives – To Catch a Thief" someone is stealing pet dogs from the local area. I get one of the children to dress up in a burglars outfit with a bag (which contains the stolen pets). They steal the bag and hide it in the shed which is on stage. I then ask the children to reveal which pets have been stolen. There are five dog beds on stage. Each dog bed has the name of the dog on it and either a toy or a brush from that dog. Volunteers from the audience are asked to reveal a picture frame with a photo of their pet. They reveal details of their dog including it's name, age, something funny it does and what type of dog it is.

18. I explain the thief has been keeping the dogs in the shed but has had to move them and is now hiding them in their house. I explain there is DNA evidence in the shed to help us find out which pets have been stolen and who the thief is. I ask if they will help me use DNA to solve the crime!

19. I say it's just for fun and that someone here did it and they are all under suspicion! The first thing we need to do is take a reference sample from everyone. I explain this is what the police do if they suspect someone of a crime, but make it clear this is just for fun and so they can see what happens!

20. I then explain we are going to the crime scene and we talk about the types of samples scene of crime officers would be looking for which may contain DNA. I explain this applies to animals as well as people. I ask the children to take samples out of my "black box" to help them understand what we are looking for. This will include saliva, urine*, poo*, blood*, bogies*, a glass, socks, hair/fur and nails (*these samples are fake and made to look like the real thing).

21. I explain to the children that in order to go to the crime scene we will need to dress like a scene of crime officer. I ask them why they think they need to dress like this? I ask for four volunteers. I explain there are five pieces of evidence in the shed which we can get DNA from which will hopefully reveal which of the missing dogs were kept in here and to identify who is our thief. I want each child to dress up as a scene of crime officer and collect some evidence explaining to their friends what they are collecting and why.

22. I turn the shed to reveal the inside. There are three empty dog cages with newspaper in the bottom. In the first is a fake dog poo. The second is an empty dog bowl. In the third is some fur that has been caught between the bars of the cage. On the floor is a fake cigarette and a syringe.

23. I ask for three more volunteers. I ask them to collect DNA from the dog beds either from the toys, brushes or dog bowls. Once the evidence has been collected I explain to the children it has been sent to the laboratory and the results are in. I ask them to open the results from the laboratory (each child will have an envelope with the results inside). On stage I reveal the results from our five missing dogs. I explain it is now time for them to be the detectives. Can they play criminal snap and match up the DNA patterns to reveal which dogs were being kept in the shed.

24. We go through the evidence. I then put up the DNA profile of the thief. I ask the children to see if their DNA profile matches the thief. We reveal who stole the pets. I give the bag containing the stolen pets from earlier to this child. I ask one of the children to dress as a police officer and get them to handcuff the thief. They take the bag and reveal what dogs are inside. We see if we got the results right. I return the dogs to their owners. The dogs are mechanical and will bark and move about to show their excitement at being returned!

25. We finish the workshop with a competition. I explain how Bella and Harry use an electromagnet to help them escape in the book. I explain we are going to make an electromagnet. I ask for two volunteers and show them how to make an electromagnet. I explain how it works as I make it. One will have a large iron nail the other a stainless steel nail file plated in nickel. I ask them to show the audience beforehand that neither object will pick up paper clips. Once built the children have to see which team can pick up the most paper clips. I split the children into two groups and get them to cheer for the children. We see which made the better electromagnet and ask why? I ask the children what else might make the magnet stronger. I remind them how important it is to turn off an electromagnet as it gets hot. Each child will be given an experiment card to take home of how to make an electromagnet. This section can be done separately to the main workshop if required.