Introductory script for Fantastic DNA

What is this document?

This is the full script that Cell EXPLORERS explainers can use when facilitating a *Fantastic DNA in a Box* session. It contains:

- **The introduction:** this is to introduce pupils to the key concepts of living things, cells and DNA, before they begin the DNA extraction experiment
- **The wrap-up:** this is said after completing the DNA extraction experiment to help contextualise the experiment for pupils i.e. it explains the point of extracting DNA from cells, and what scientists in a laboratory would do next.

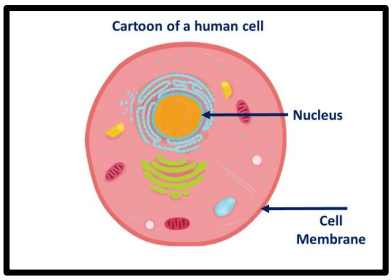
What is the aim of saying this script?

Cells & DNA are not topics included in the primary school curriculum, so it is important to introduce pupils to these new concepts before doing the DNA extraction experiment. Understanding these key concepts is necessary to fully understand the steps of the experiment, and its relevance to science.

Are there any visuals I can use in my explanations?

Yes! In fact, visuals must be used to explain this – you can hold up the materials on screen in front of you and point to them as you are speaking. You can also refer to these visuals later on when explaining the actual steps of the experiment. You can either print them off yourself, or ask your CE coordinator for a copy. Available visual aids include:

- A4 paper print-outs of a cartoon cell (pdfs available to printout to use at home)
- A 3D model of a cell (in CE lab only)
- A 3D double helix model (in CE lab only)
- Large A1 posters (in CE lab only)



How can I use this document to prepare for a FDIAB session?

Learn the scripts on the following 2 pages. Rehearse with your friends or family members at home.

Try to get it to sound natural, like you are speaking to a friend!

You can also print if off and bring it your hands-on FDIAB training!

Introductory script:

Below is a full introductory script in *purple italics*.

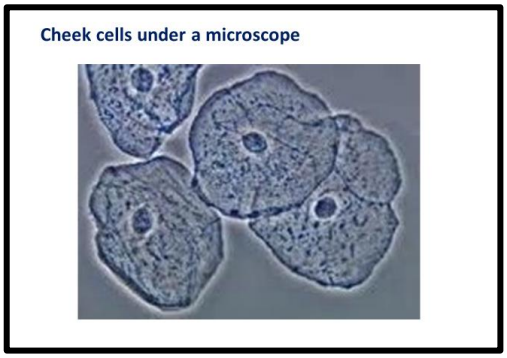
It includes key places where you can interact with the pupils. Engagement directions are written in black inside square brackets [like this!]. Asking the class 1-2 questions throughout helps to keep them involved – there is a balance to this though-too little and they will disengage; too many and it will take too long.

To answer a question, you can invite pupils to raise their hands. Teachers will then either (i) direct pupils to speak from their desk or approach the camera or (ii) relay their answer you. IN the script below, question prompts are in **bold and blue**.

Today we will be doing a real experiment – this is the same experiment that many scientists working with DNA do around the world. You will be using a kit that contains real science equipment – your classroom will act as a laboratory. Before we start doing the experiment together, there are first some things we need to talk about!

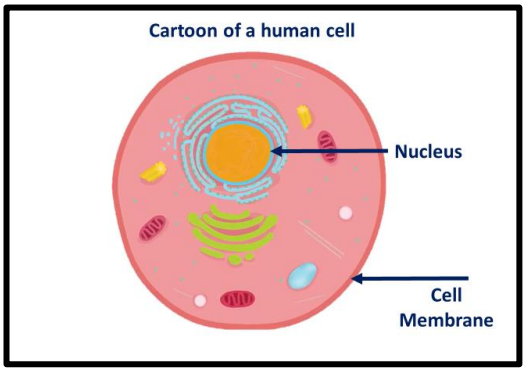
Our experiment today is about cells and DNA. ***Hands up anyone who has ever hear of DNA before?*** [Wait for response]*. Wow! That's great. We are going to be learning a bit more today. All living things, like humans, plants and animals, are made up of cells. Bananas are living things so they too are made up of cells. Cells are the smallest unit of life. Humans are made up of 100 trillion cells. Cells are so tiny that we cannot see them with the naked eye – we have to use a special piece of equipment called a microscope to see them. Here is an example of what human cells look under a microscope* [Hold up visual aid 1]– *these are red blood cells cells.*

Visual aid 1



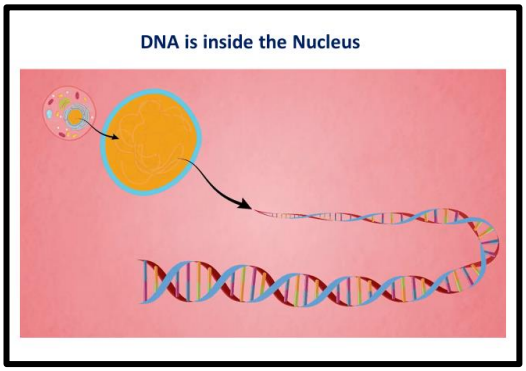
Different cells have different jobs and look differently depending on what type of cell they are. You can think of cells like a water balloon, with an outside barrier called a membrane and a liquid inside. There are different parts inside a cell that do different things. [Hold up visual aid 2]. *Some important parts for today's experiment are the cell membrane and the nucleus. The cell membrane keeps everything inside the cell, whilst the nucleus acts like the brain of the cell* [Point parts on visual aid 2 as you are talking]

Visual aid 2



The nucleus controls what the cell does –it acts like the brain of the cell. Inside the nucleus is an important molecule called DNA [Point to visual aid 3]. DNA is the short name for *Deoxyribonucleic Acid.* ***Try to say it with me!*** [Wait for response]. *Perfectly said, well done!*

Visual aid 3



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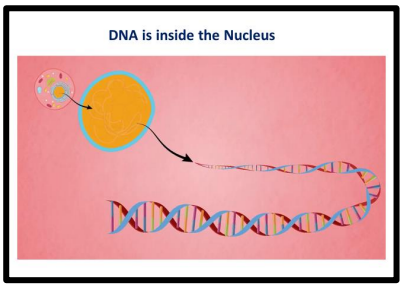
Scientists found that DNA has a double helix shape, that looks a bit like a spiral staircase. [hold up DNA model or visual aid 3].



DNA acts like the instruction book for the cell. It has all the instructions to tell the cell how to grow and make what it needs to stay alive and do its job. DNA describes much about how we look such as how tall we are, our hair, eye and skin colour, the shape of our face, etc. [Point to your own physical characteristics as you say this]

But it does not control what makes us who we are, like our personality or the things we like.

Studying DNA is important to understand how cells work. To study and work with DNA you first have to take it out of cells. There is an experiment to do this that every scientist around the world does. This is the experiment that we are going to do today

End of Introduction script

Wrap up script

This is said after all pupils have completed the experiment.

Everyone hold your tubes of DNA so that I can see them!

[Wait for response]

Brilliant! Everyone did a great job following the instructions and helping each other, just like real scientists working in a laboratory!

This experiment – extracting DNA from cells – is an experiment done by scientists all over the world that work with DNA. They may use slightly different equipment and techniques – but the experiment is very similar.

Often we get asked 'What do scientists do with the DNA?' That depends on what they are working on. For example, you can use DNA to help test patients for infectious diseases. Diseases can be caused by very small organisms like viruses or bacteria. These micro-organisms have instructions in them like DNA (or RNA, which is very similar). Looking for the DNA of these micro-organisms in cells taken from patients can help diagnose whether that person has the disease. In the case of COVID-19, scientists can test for coronavirus instructions in peoples' cells collected from a nose swab.

More examples of DNA technologies:

You only need to give **1** example of DNA technologies. However, you do not always need to use the COVID-19 testing example. Here are **some more specific examples:**

Identify someone on a crime scene:
Because we shed cells all the time, Forensic scientists can collect cells from a crime scene. By studying the DNA extracted from these cells they can see if it matches suspects and then identify the culprit

Diagnose a disease that might be caused by a change in DNA (cystic fibrosis):

DNA can also be used to help diagnose certain diseases. Some diseases are caused by a change in the DNA, which causes our cells to not work the way they should. An example of this would be Cystic Fibrosis, which is caused by a change in the DNA that causes lung cells to produce a very sticky mucous that clogs lungs. Scientists in a laboratory can check whether a patient has Cystic Fibrosis by extracting DNA form their cells, and by using a specific technique to read the DNA instructions, they can find out whether the patient has Cystic Fibrosis, and make sure S/he is treated as soon as possible.

Use it to produce in lab something that cells could produce but that can treat people – e.g. insulin

DNA acts as instructions for cells, to tell them what to make so they can do their jobs. Scientists can use this to get bacteria in the lab to produce certain medicines.

An example of this would be how to make insulin. Insulin is a substance in your body that helps to control levels of sugar in your blood. People with diabetes can no longer make working insulin, so need to inject it into themselves. The insulin that people with diabetes use has been produced in the lab by bacteria that have DNA that contains the instructions to make insulin.

Use it to genetically engineer more efficient crops/livestock:
Scientists can study the DNA of plants and animals and this can be useful in agriculture. For example, scientists are studying cattle and the information in their DNA that helps them to figure out which food is the most efficient. This helps farmers to decide on the specific diet (ie which food and how much of it is best for a specific animal) to give to cattle. This helps to increase profits for farmers while reducing the impact on the environment.

In some part of the world, in countries where malnutrition exists, people do not absorb enough vitamin A in their diet. That results in people becoming blind because vitamin A is needed for eye cells to work. In these countries the main source of food for people is rice. Rice does not contain vitamin A. Scientists have found a way to put the instruction on how to make vitamin A in rice plants. Rice cells can now make vitamin A, so that people are able to eat enough of it through their meal and this prevents them from becoming blind.

If you have some more suggestions about DNA technology examples to use in your warp up, **discuss them with your CE coordinator!**