

A Fun Way to Introduce DNA to Any Age Group

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Welcome!

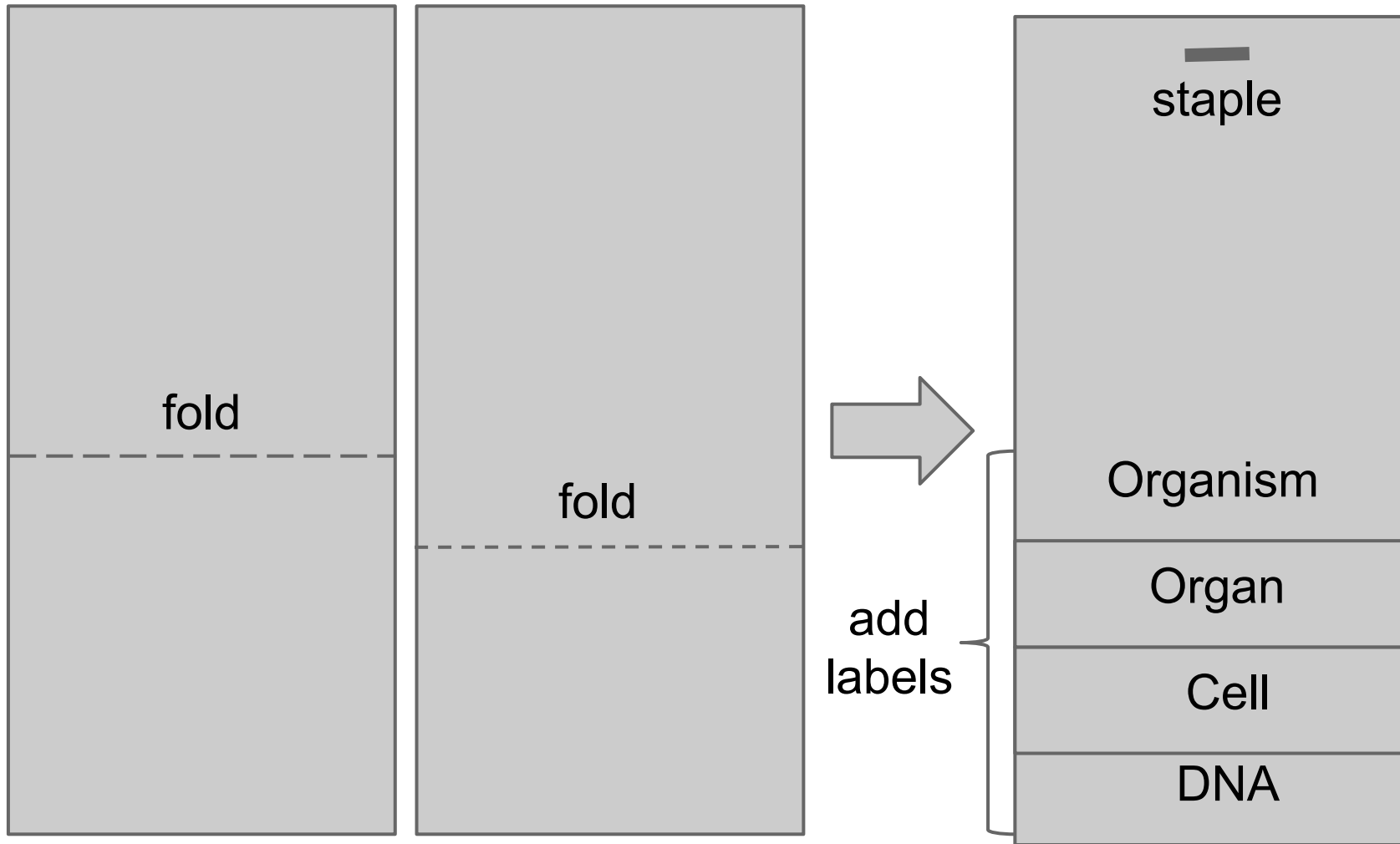
- We're going to make a flip book that introduces students to DNA.
- The complexity of the project can be scaled up or down depending on the age level of the students
- This hands-on workshop will
 - 1) Demonstrate a simple technique for DNA extraction
 - 2) Demonstrate how to construct a flip book and use it effectively to teach a scientific concept
 - 3) Provide more in-depth understanding of DNA and the science related to this lesson

Flip Books

- Flip books and foldables are fun, creative types of graphic organizers (Google foldables for great examples!)
- Online tool for building flipbooks: <http://www.readwritethink.org/files/resources/interactives/flipbook/>

DNA Flip Book

- Our flip book will demonstrate the hierarchy of living organisms, and introduce DNA.
- The number of levels and amount of detail will vary depending on the grade level.
- Let's start by making a four-level flip book to demonstrate the process and go from there....



Organism

Elementary School:

- Students learn the term “organism”
 - *What are some different types of organisms?*
- Plants are living things too
- Living things have different parts
 - *How do the parts of a plant differ from those of an animal?*



Organism

Organ

Cell

DNA

Organism

Middle School:

- Living organisms have specific characteristics and needs in order to stay alive
 - *What are they?*
 - *How do plants differ from animals?*



Organism

Organ

Cell

DNA

Organism

High School:

- Living organisms are grouped into species, which are genetically distinct from one another



Organism

Organ

Cell

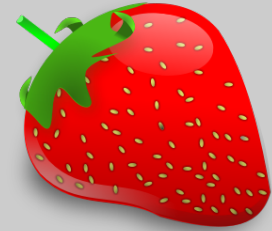
DNA

Organs

Elementary School:

- The parts of living things are called organs
 - *What are some different types of organs?*
- Different organs have different jobs
- Strawberries are fruit
 - *Their job is to produce seeds so more strawberry plants can grow*

You can add details up here (on the back of the previous page)



Organ

Cell

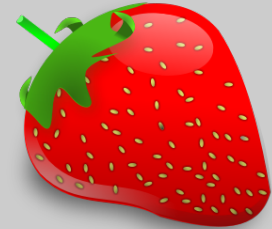
DNA

Organs

Middle School:

- Organs are specialized to meet the needs of the living organism?
 - *How do the various organs of a plant meet its needs?*
 - *How does this compare to animals?*
- Strawberries are the reproductive part of the plant
- Leaves are important for photosynthesis

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Organ

Cell

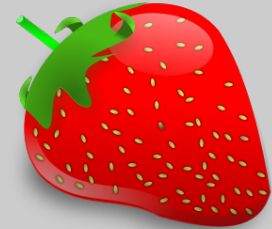
DNA

Organs

High School:

- Include a “Body Systems” level
 - organs work together in body systems
- The fruit is part of the reproductive system
- Could possibly touch on Meiosis and animal reproduction

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Organ

Cell

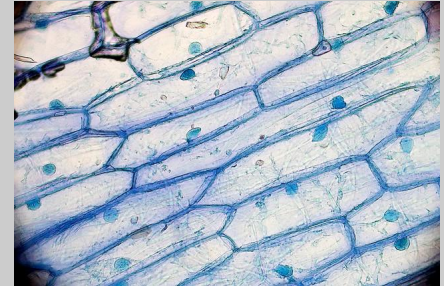
DNA

Cell

Elementary School:

- All living organisms are made of cells (they are the building blocks of living organisms)
- Cells are so tiny you need a microscope to see them

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Cells

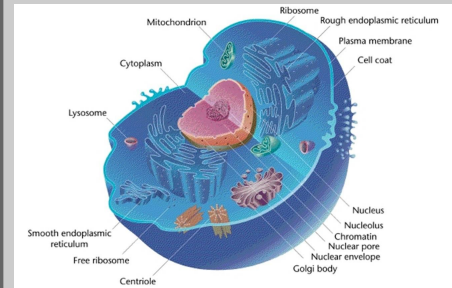
DNA

Cell

Middle School:

- Different types of cells look different from one another and have different jobs
- Cells are their own living organisms
- Cells are made up of parts called organelles
- Add an “Organelle” level - organelles each have a specific job to do

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Cells

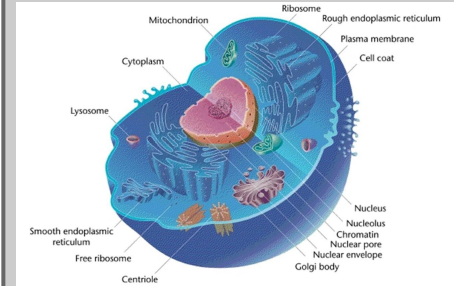
DNA

Cell

High School:

- Cell Differentiation
- Add a “Tissue” level - cells can be grouped into similar types
- The cell membrane is made of a phospholipid bilayer that can be broken open using detergent, mechanical action, and natural enzymes in the fruit

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Cells

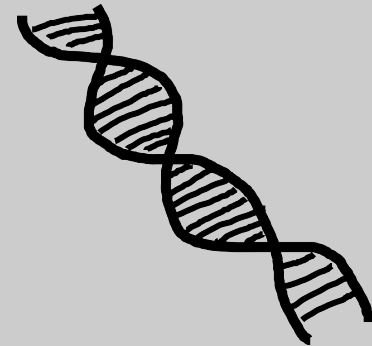
DNA

DNA

Elementary School:

- DNA is the stuff that makes us who we are, it is the instructions our body uses to build all of our body parts
- Every cell in the body has DNA inside of it controlling each cell
- The cells work together to control our body
- You can take the DNA out of the cells by breaking them open - If you break open enough cells, you can collect enough DNA to “see” it

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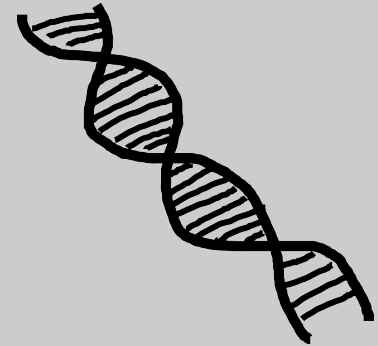
DNA

DNA

Middle School:

- The DNA is protected inside of the nucleus
- The general molecular structure of the DNA (double helix, made of atoms)
- Add an “Atom” level - *why is carbon special?*

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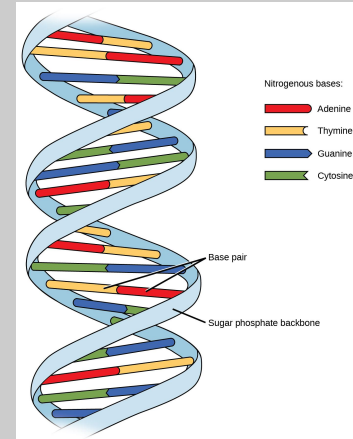
DNA

DNA

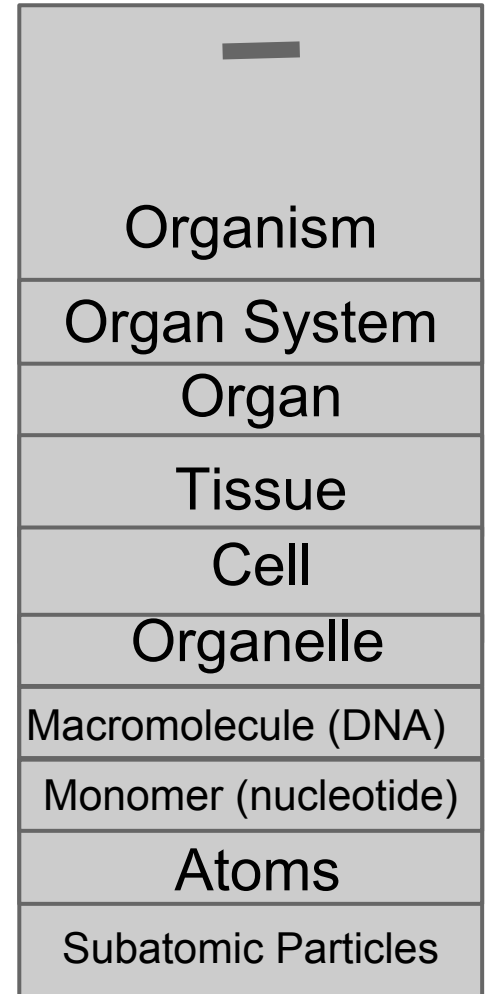
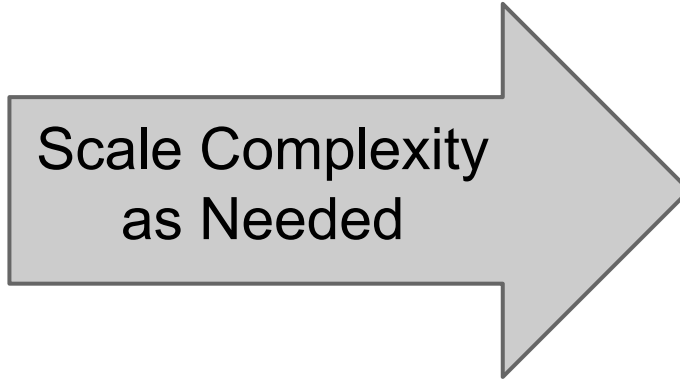
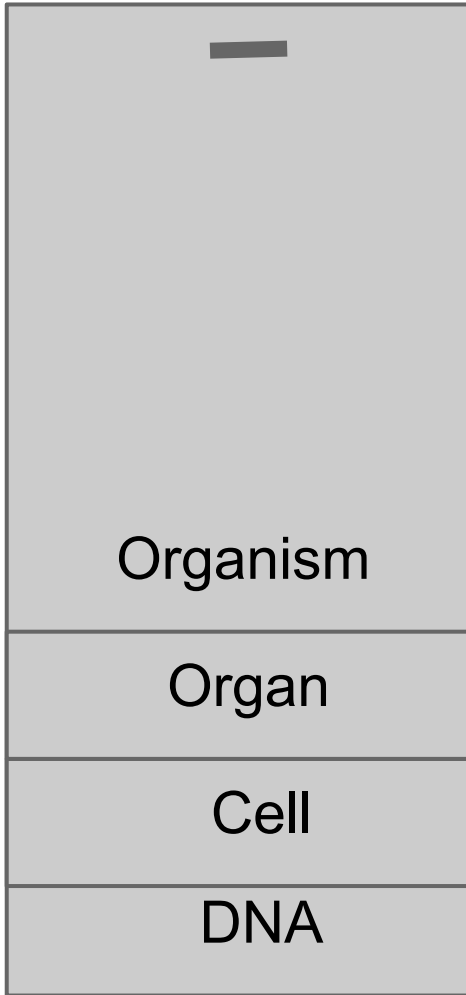
High School:

- The specific structure of DNA (made of phosphate-sugar backbone that is negatively charged, nitrogenous bases between the two backbones, base pairing) - Nucleotides
- DNA is wrapped around proteins so it can fit into each cell
- Chromosomes (strawberries have eight copies)
- Tie in hydrophobic/hydrophilic / polarity lesson during DNA extraction
- Precipitation

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DNA



DNA Extraction

1. Smash strawberries and mix with extraction buffer (water, salt, and detergent)
2. Filter strawberry solution
3. Add 95% or greater alcohol to filtrate
4. Wait and then gently swirl and collect the DNA
5. Transfer the DNA into a vial with alcohol
6. Tape the vial into your DNA flip book!

For Older Students

- Experiment with what happens if you store the DNA in water instead of alcohol
- Go deeper into the polar/hydrophobic/hydrophilic and enzyme principles
 - *Why does the alcohol remain in a separate layer on top of the filtrate?*
 - *Why did the DNA remain dissolved in the filtrate but precipitated out of solution in the alcohol if alcohol is a polar substance?*
 - *What role did the salt and detergent play in this activity?*
 - *What role do the strawberries' own enzymes play?*
 - *Why should the alcohol be ice cold when added to the filtrate?*

Thank You!

- Slides and additional materials posted on GCSN website (conference page)