## THE MANHATTAN PROJECT:

## STEM Learning with a Twist!



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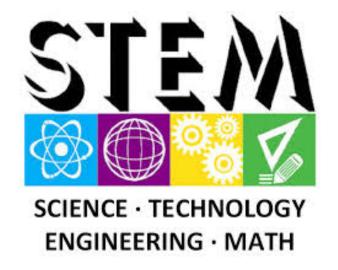


Tammy Estes Fry
CAPS Teacher Education
tfry@bluevalleyk12.org
www.teachertek.net

In association with
Dr. Lucas Shivers
Director of
Elementary Education
Manhattan USD 383
LUCASS@usd383.org

This presentation is available at

### www.teachertek.net



## Activity

Collaborative Partnership between Manhattan, KS USD 383 and Blue Valley Center for Advanced Professional Studies CAPS

March 2015



## In the beginning...

### **Conversation at a Conference**

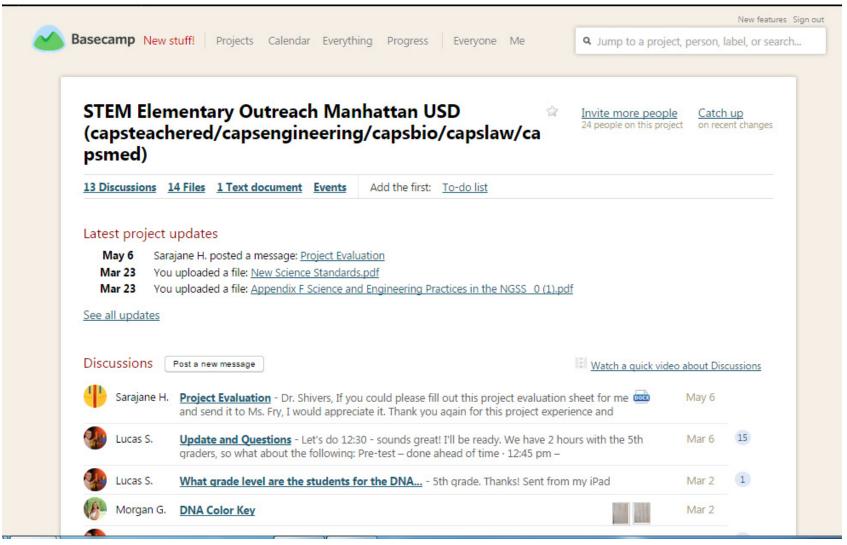




# Meeting with students in the CAPS Teacher Education program

- P.M. students-time of day determined for lesson to take place
- All students had a chance to participate
- Lead selected
- BaseCamp account set up and included the appropriate parties

## BaseCamp project management site



## Setting up the Project

- Students brainstormed and researched
- Presented lessons to Dr. Shivers
- Discussed lesson effectiveness
- Decided to do something on DNA
- Determined professional areas to include Medicine, Engineering, Global Foods
- Added others to BASECAMP as needed

## STEM Elementary Outreach Manhattan USD (capsteachered/capsengineering/capsbio/capslaw/capsmed)

			_			
Show	/ discussions	s sorted by newest and filter by title	Dis	C	USS	sion
4	Sarajane H.	<u>Project Evaluation</u> - Dr. Shivers, If you could please fill out this project evaluation sheet for me and send it to Ms. Fry, I would appreciate it. Thank	May 6		Archive	
4	Lucas S.	<u>Update and Questions</u> - Let's do 12:30 - sounds great! I'll be ready. We have 2 hours with the 5th graders, so what about the following: Pre-test – done ahead of	Mar 6	15	Oh	
1	Lucas S.	What grade level are the students for the DNA 5th grade. Thanks! Sent from my iPad	Mar 2	1	₫ Archive	
18	Morgan G.	DNA Color Key	PMA	5		AMI
4	Lucas S.	<u>Process</u> - Sounds great. Yes, let's stick with the DNA-focus and expand with a strong medical career focus in bio-tech or medicine. I think teachers will jump - I'll	Feb 25	3	& Archive	41411
8	Morgan G.	Materials for DNA project - We have the lesson plan structured out, but are working on how to put it into the engineering process. Attached is the	Feb 11	2	Archive	
4	Sarajane H.	<u>Dates to begin lessons</u> - We were curious if beginning to present the lesson between March 30th- April 3rd would be a good week for you and the teachers?	Feb 9		Archive	
4	Lucas S.	<u>Update</u> - Thanks for the updates. I really like the DNA focus. Can you share more on the egg drop lesson? We have several already doing this type of project - so	Feb 3	2	Archive	
8	Keith M.	Engineering Design Process PPT and Design Briefs - I added some powerpoints and design briefs to the files. Have a look and see if we are on the right track.	Jan 26		Archive	
3	Lucas S.	<u>Update</u> - Thanks! Do you feel like you'd be ready for teaching the lesson the second week of April? Any topics you've narrowed down? Thanks!	Jan 21	1	å Archive	
4	Lucas S.	First Steps - http://community.ksde.org/LinkClick.aspx? fileticket=MCOLp_kHGNU%3d&tabid=5785∣=14106 Link to the KCCRS	Jan 14	(4)	& Archive	
	Tammy F.	Second Semester start I talked to Dr. Shivers, and we will begin work on this project at the start of second semester. Please allow time in your project schedules	Nov 25, 2014		& Archive	
4	Lucas S.	Thanks! - Hello Everyone - Thanks for charting the waters to explore a new opportunity. Let me know how to best support you all. Blessings.	Nov 6, 2014		Archive	

## **Files Shared**



#### Haney, Sarajane - Project Client Evaluation.docx

Added by Sarajane H. on May 6 · 746 KB

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#### SCHOOL

#### UPPENDICE F - National and Registering Provides in the NEXE.

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April 2011

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#### Appendix F Science and Engineering Practices in the NGSS \_0 (1).pdf

Added by Tammy F, on Mar 23 · 615 KB

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#### rangements of the Next Generation Science Standards

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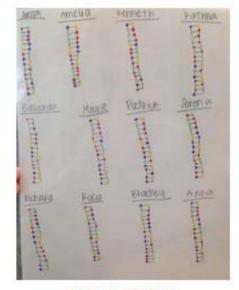
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#### New Science Standards.pdf

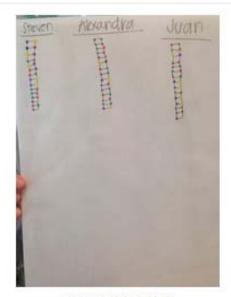
Added by Tammy F. on Mar 23 · 12 MB

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Added by Morgan G. on Mar 2 - 290 KB



IMG\_7919.JPG

Added by Morgan G. on Mar 2 - 214 KB

gumdrop	color	DNA base			
purple	A	c ě			
yellow	C				
green	G	G 🚆			
red	T	-			
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Eyes:	Mor	AGG			
99700	green.	AGC			
	becwe	TGG			
	hazel	TGC			
Hair	becom	GCC			
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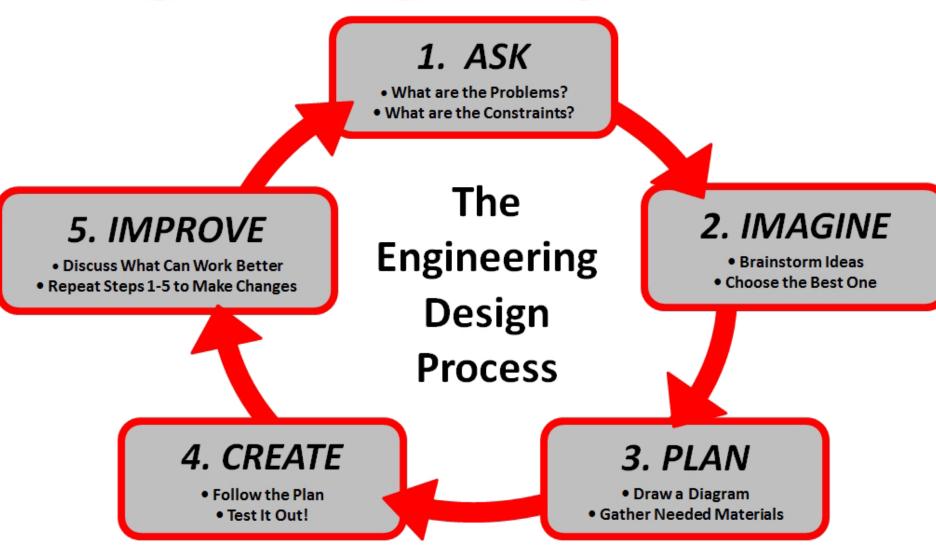
#### dna.pdf

Added by Abby S. on Mar 2 · 102 KB

## Learning Objectives

- The students will...
- Learn that traits are observable characteristics that are passed from parent to child.
- Learn that an individual's overall combination of traits makes him or her unique.
- Discover that DNA is a set of instructions that specifies the traits of an organism.
- Discover that law professionals use science and DNA to solve crime
- Discover that engineering/chemical engineering professionals alter DNA to genetically modify food
- Discover that Bio-medical professionals can use DNA to predict genetic diseases
- Use the engineering design process to complete a model that provides a visual aide for DNA makeup
- Demonstrate their knowledge on DNA outside of the collaborative group
- Explain certain DNA sequencing codes for different characteristics
- Investigate basic gene sequences to determine the genotype and phenotype of an individual
- Learn to work virtually with someone outside of the classroom
- Learn to work in a collaborative environment
- Replicate a DNA model using common objects
- Recognize common terminology in the study of DNA
- Demonstrate understanding of DNA sequences
- Synthesize their understanding of DNA sequencing in writing

## **Engineering Design Process**



## +Engineering Design Process

#### ASK

- Learn that traits are observable characteristics that are passed from parent to child
- Learn that an individual's overall combination of traits makes him or her unique

#### **IMAGINE**

- Discover that DNA is a set of instructions that specifies the traits of an organism
- Discover that law professionals use science and DNA to solve crime
- Discover that engineering/chemical engineering professionals alter DNA to genetically modify food
- Discover that Bio-medical professionals can use DNA to predict genetic diseases

#### **PLAN**

- Investigate basic gene sequences to determine the genotype and phenotype of an individual
- Learn to work virtually with someone outside of the classroom
- Learn to work in a collaborative environment

#### **CREATE**

- Replicate a DNA model using common objects
- Use the engineering design process to complete a model that provides a visual aide for DNA makeup
- Explain that certain DNA sequencing codes for different characteristics
- Demonstrate understanding of DNA sequences

#### **IMPROVE**

- Recognize common terminology in the study of DNA
- Synthesize their understanding of DNA sequencing in writing
- Demonstrate their knowledge on DNA outside of the collaborative group

### +Kansas Science Standards

#### <u>ASK</u>

Learn that traits are observable characteristics that are passed from parent to child Learn that an individual's overall combination of traits makes him or her unique

#### **IMAGINE**

Discover that DNA is a set of instructions that specifies the traits of an organism

Discover that law professionals use science and DNA to solve crime

Discover that engineering/chemical engineering professionals alter DNA to genetically modify food

Discover that Bio-medical professionals can use DNA to predict genetic diseases

At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)

#### PLAN

Investigate basic gene sequences to determine the genotype and phenotype of an individual

Learn to work virtually with someone outside of the classroom

Learn to work in a collaborative environment

Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)

Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)

#### CREATE

Replicate a DNA model using common objects

Use the engineering design process to complete a model that provides a visual aide for DNA makeup

Explain that certain DNA sequencing codes for different characteristics

Demonstrate understanding of DNA sequences

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

#### **IMPROVE**

Recognize common terminology in the study of DNA

Synthesize their understanding of DNA sequencing in writing

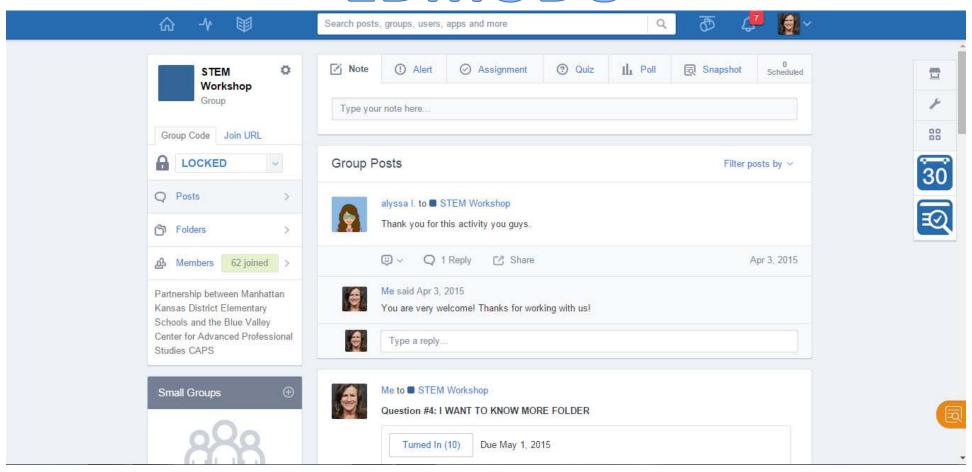
Demonstrate their knowledge on DNA outside of the collaborative group

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)

## How will we measure Learning?

# Instructions for activities & resources posted EDMODO



# EDMODO site

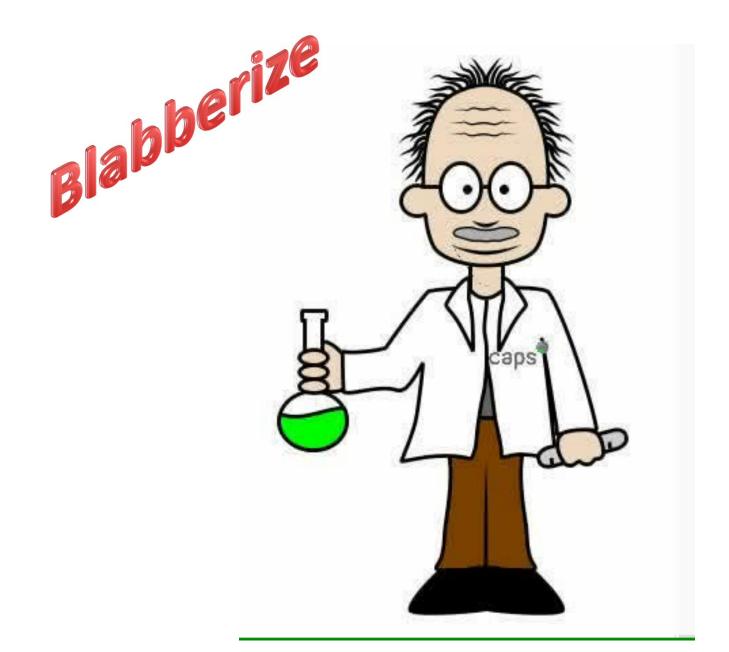


## **Double Robot**





**Lesson Powerpoint** was broadcast so that **Blue Valley CAPS** students' and Manhattan 5<sup>th</sup> graders' views were synchronized!





Today, we're going to explore DNA, but before we begin, we'd like for you to know us better!

## Sarajane

Senior
Blue Valley Southwest High School
Going to attend KU



## **Amanda**

Senior
Blue Valley High School
Going to attend KU



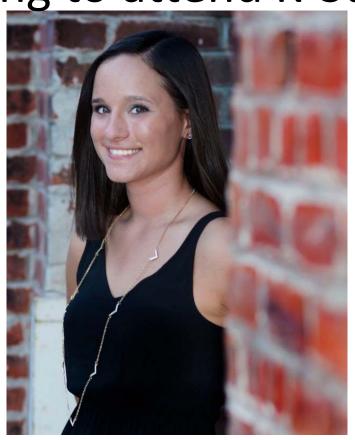
## Morgan

Senior
Blue Valley High School
Going to attend Iowa State



## Abby

Senior
Blue Valley West High School
Going to attend K-State



## Lindsay

Senior
Blue Valley West High School
Going to attend K-State



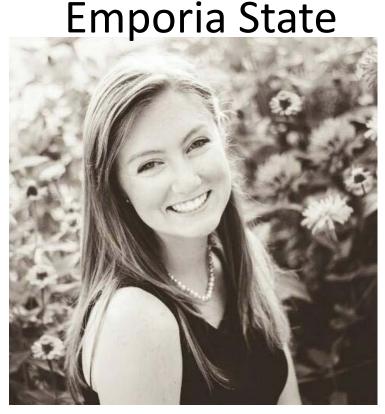
# Priya Senior Blue Valley North High School Going to attend KU



## Claire

Senior

Blue Valley Northwest High School
Going to attend Johnson County JuCo and
Emporio State



## Connor

Senior

Blue Valley Northwest High School Going to attend K-State, Missouri, or



## Lauren

Senior
Blue Valley North High School
Going to attend Rose-Hulman Institute
of Technology or Franklin W. Olin
College of Engineering

## Zac

## Senior Blue Valley Northwest High School Going to attend K-State



## Alec

## Senior Blue Valley Northwest High School Going to attend K-State



## And also special thanks to Courtney & Abby CAPS Global Food Industries Class for helping with research and information!



#### Blue Valley Center for Advanced Professional Studies



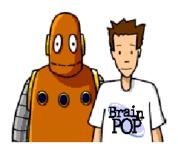
### **Goals for Today**

- Learn about DNA
- Create a model
- Review Engineering Design Process
- Think about DNA and careers
- See how you could learn more about DNA later...

### Edmodo

- www.edmodo.com
- Student account
- Code for STEM WORKSHOP group: 9623at

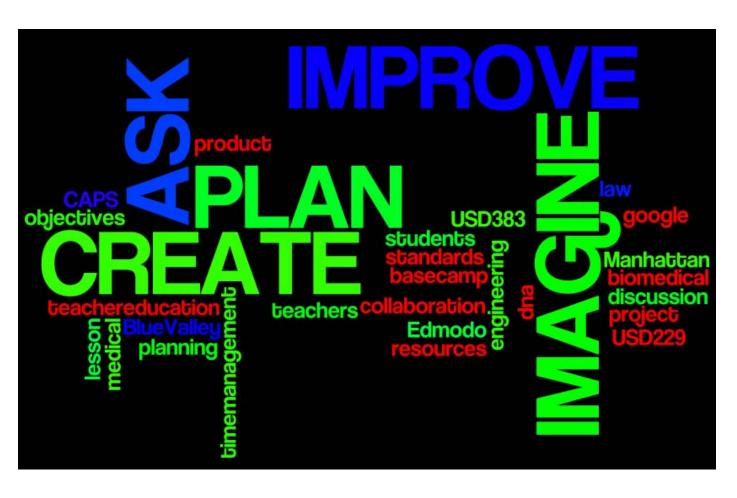
## Let's take a look...





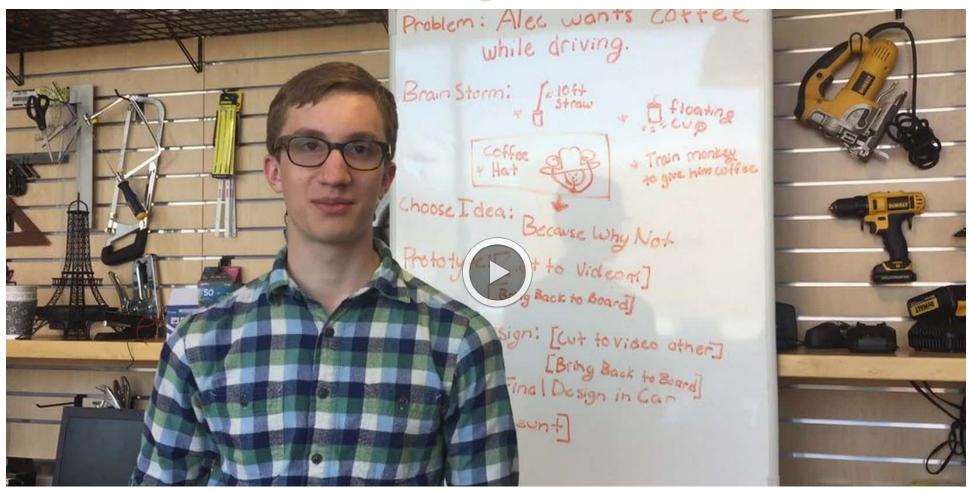
https://www.brainpop.com/science/cellularlifeandgenetics/dna/

# Using the Engineering Design Process

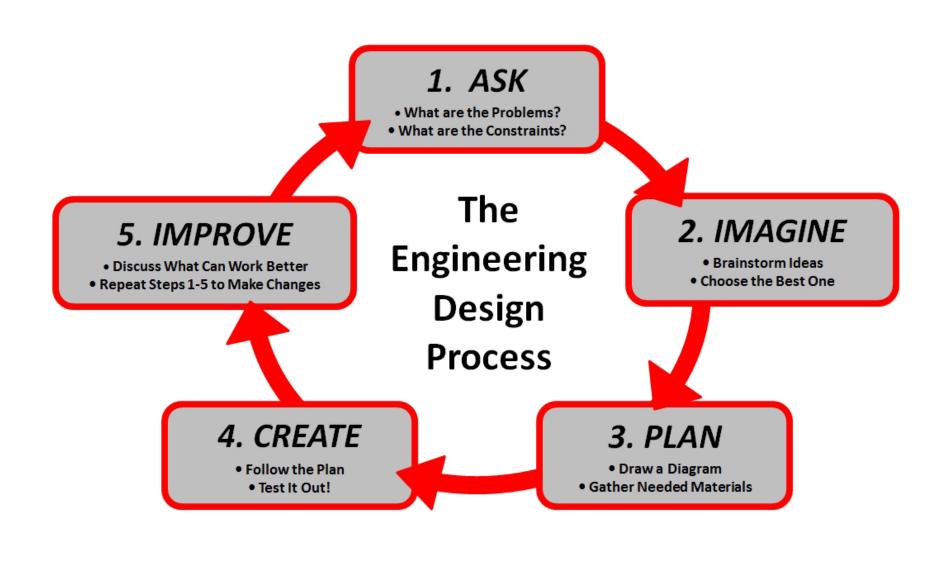


# The Engineering Design Process is used for Effective Product Development

# CAPS Engineering students had fun demonstrating the PROCESS



https://www.dropbox.com/s/2tpdiyfu7rpguf0/EngineeringProcess.mov?oref=e&n=2 08699767





# Steps 1 and 2 /magine

- Look at the list of names that is in your bag of supplies.
   As a group, choose ONE person...
- Question 1 on Edmodo ASSIGNMENTS
- Click "TURN IN" and then answer the following...
   What are the differences between the people listed? Why is this important?
- One answer per group
- List your group members' names with your answer
- Then, CLICK "TURN IN ASSIGNMENT"

5 minutes to answer

### Step 3



### Groups of 4

- **LEAD** (instruction reader)
- CODE CHECKER (quality control)
- BUILDER 1
- BUILDER 2

## **Supplies**

- Clay in four colors
- Toothpicks
- Instructions (3 pages)

# create... Step 4

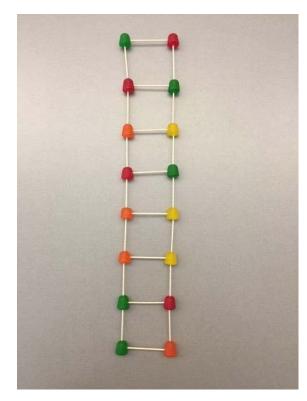
Now we're going to make our own DNA Model

## Let's get started...

First, let's go over the instructions that are in your group's bag of supplies.

Now finish the strand by creating the DNA code for your chosen person's remaining characteristics! You will include eye color, hair color, right- or left-handedness, height, and nose size!

When complete, it should look something like this ....but with the colors that match the traits of your group's chosen person...



# You have 30 minutes to complete your person's DNA Chain

Get ready...

Get set...

GO

## Step 5

## **IMPROVE...**

# CODE CHECKER SHOULD CHECK COLORS AND THE MAKEUP OF THE DNA CHAIN

# If you have an ipad, take a picture of your DNA chain and add it to Edmodo

- On Edmodo, go to the Assignment "PICTURES OF YOUR GROUP'S DNA STRAND"
- Click on "TURN IN"
- List your group members' names and then tell us which person's (from the list) traits your DNA strand demonstrates.
- Click on the FILE icon and upload your picture!
- Then, click "TURN IN ASSIGNMENT"



## BILL NYE on DNA



# On Edmodo, go to Assignments and answer two questions:

Question 2--Why do you now think it would be important to know about DNA?

#### Click on "TURN IN"

List your group members' names and answer the question.

Then, click on "TURN IN ASSIGNMENT"

Question 3--Based on what you just learned from the lesson and from creating your DNA chain, how do you think DNA could be used in different jobs or professions?

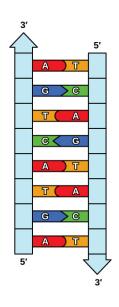
#### Click on "TURN IN"

List your group members' names and answer the question.

Then, click on "TURN IN ASSIGNMENT"

You have 10 minutes to answer these 2 questions

# Let's take a look at some professions and how they use DNA





## **LAW**

- Identify criminals and solve crimes
- Prove that some criminals are actually innocent.
- Forensic analysis of biological samples to get a DNA profile of a person
- Accurate evidence!

Priya

CAPS Law & CAPS Teacher Education

## Fingerprint Activity

#### http://pbskids.org/zoom/activities/sci/fingerprints.html

- **SUPPLIES** scratch paper, scotch tape, pencil
- Rub the pencil on the paper
- Rub your thumb on the pencil marking
- Place your thumb on the tape to see your thumbprint

#### Just for fun later...

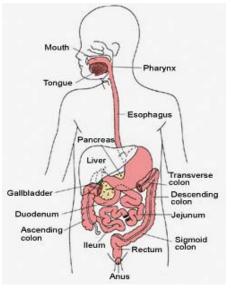
 In the "I Want To Know More" folder on Edmodo, see types of fingerprints and see what they might tell you about your personality!



You have 20 minutes to complete this activity

## Medicine & Bio-Engineering

- Predicting chances of getting diseases
- Researching cures for diseases
- Studying traits passed on from parents
- Researching cloning and other ways to recreate DNA patterns in humans and animals



CAPS Foundations of Medicine
Claire
CAPS Veterinary Medicine &
CAPS Teacher Education

## **Food Industry**





- Traditional breeding (Cross breeding plants to adapt them to new surroundings)
- Drought tolerance (Make plants stronger)
- Productivity (Grow more and bigger crops)
- Insect repellent (Giving plants ammunition to fight insects)
- Vitamins (to increase nutrition in plants, ex. golden rice)

Courtney & Abby

CAPS Global Food Industries

## We hope you enjoyed the lesson on DNA...

Look in the "I want to know more..."

folder on our Edmodo group for
ways to keep learning about DNA
after our lesson...

## To give us feedback, please go to the QUIZ "STEM Workshop Lesson **EVALUATION**" on Edmodo and click on "TAKE QUIZ"

You have 10 minutes to complete the survey

## Day 4



### Thank you students!

## Have a GREAT time learning more about DNA!



### For Teachers:

Standards, Objectives, and Information on the Engineering Design Process

can be found in the "Lesson Resources" folder in our Edmodo Group



## A view into the project...

http://youtu.be/ua890C06n6E

### **Contacts**

### **Tammy Fry**

CAPS Teacher Education Program
Blue Valley (Overland Park, KS) USD

tfry@bluevalleyk12.org

@tammyfry

### **Dr. Lucas Shivers**

Director of Elementary Education
Manhattan, KS USD
<a href="mailto:lucass@usd383.org">lucass@usd383.org</a>
@adaptinstruct