Your Mission if you choose to accept it…

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Mission: 2025

Corie Maffett

Grades 4-6

August 6, 2015

Mission 2025: Table of Contents

Mission: Introduction

A. Rationale

When designing a topic for our summer practicum, an idea trifecta immediately converged. I had recently watched Mission Impossible III, read an article on sustainability in an environmental magazine, and was reminiscing with a colleague about my experience building solar powered cars the previous summer at Honeywell Green Boot Camp for teachers. Creating an alternative energy unit that encompassed elements of our current and future worlds would be an opportunity for academically gifted students to unleash their inner-architect in a thought provoking and academically rigorous environment. The unit would be laden with higher order questioning that encouraged conversation, opportunities for research, and multiple activities that inspired design and promoted creativity. The concept of innovation would be threaded throughout the unit (mission) in the essential understanding: *creativity influences innovation*.

This unit was designed to give academically gifted students a foundation that would properly prepare them to research, design, and build a solar powered car that would be a prototype for the highways of 2025. The concept of innovation was introduced on day one as students researched famous scientists that had made contributions to our world through their inventions and innovations. Students were then given an opportunity to become a scientist for a day and made posters detailing the contributions of their assigned scientist. Day two began with an introduction to design as students (in pairs) created cars using edible items. Creating a car from candy and cookies was an abstract exercise in design, but was a systematically planned connection to the solar powered car that they would eventually build. It gave an opportunity for students to become comfortable in asking questions of each other and to take a creative spin on the design process. Day three consisted of viewing prototypes of cars that may one day occupy the highways of the future. These pictures generated discussion on chassis (frame) design, axle placement, gear ratio, and energy efficiency. What was supposed to be a 15 minute introduction to the lesson became a 30 minute in-depth conversation using YouTube as a catalyst for further discussion. Students used the remainder of the class time to make preliminary sketches of their solar powered car designs using the items in the Carolina Biological Stem Challenge Kit. Day four was allocated for the building of the solar powered car as well as the opportunity to race their cars. Students used the knowledge that they had gained from their research, collaboration, and classroom discussions to build their solar powered cars from the materials provided. It was evident that the knowledge obtained in the previous three lessons carried through in their designs. Students were engaged throughout the design process and their products showed planning, precision, and execution. Unfortunately, the weather did not cooperate for the race, but in an Academically Gifted twist, the students chose to create a plan B and raced their cars without the use of solar power. They found an incline in the parking lot and used it as a ramp for their cars. One student referred to the day as a wash out, but out of this world. I'll take it as *Creativity Influences Innovation*!

B. Differentiation for Gifted Learners

I spent a lot of time determining the instructional models for this unit as I wanted to make sure that the model matched the lesson. This alternative energy unit was multi-faceted, which required more than more model to accommodate the individualities of each student. I chose Bruner's Structure of Intellect Model for lesson one since it promotes inquiry-based instruction. During the research portion of the lesson, it would allow learners to discover facts and relationships about themselves in a problem solving situation. Bruner's model would also promote active engagement, be a catalyst for motivation and creativity, and foster responsibility and independence.

Lessons two through four were developed using the Problem-Based Model. Problem-based learning (PBL) is a student-centered pedagogy in which students learn about a subject through the experience of creating a problem. Students learn both thinking strategies and domain knowledge. The lessons coincided with this methodology from inception to conclusion of the unit. Students were able to use creativity, through collaboration (self-selected pairs) to solve multiple tasks and products. This model also provided the opportunity for students to lead and be responsible for their learning while the teacher served only as facilitator. Students were able to proceed through the PBL at their own pace, determine their respective responsibilities, and assist each other when necessary to complete the task. My responsibility for each lesson was to "hook" them each day dressed as a character or entice their curiosity with a covered table, give instructions (rules of engagement), answer and facilitate questioning, and provide supervision. Their responsibility was to work well collaboratively, rely on each other to solve problems, effectively use their time to create an authentic product.

III. Goals and Objectives

Goal 1: Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).

Students will be able to (know) …

A. Analyze the materials and manufacturing limitations of car design.
B. Describe the proper angle at which a solar cell is positioned in relation to the sun affects its power input
C. Examine several renewable and alternative energy resources that have become beneficial to our environment
D. Compare and Contrast the innovations and inventions that have had a major impact on our lives

Goal 2: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Students will be able to…

A. Manipulate materials to assist creativity while designing a solar powered car
B. Manipulate the photovoltaic cell for optimum sun exposure and power output
C. Use problem solving skills to make adjustments to their designs
D. Test the designs of their solar powered cars through a race-like competition with their peers
E. Present their solar powered cars to their peers while identifying strengths and weaknesses in their designs
F. Reflect what has been learned after conducting research by formulating ideas, opinions, and personal responses

Goal 3: To understand the concept of Innovation.

Students will be able to understand…

A. The relationship between creativity and innovation
B. That creativity influences innovation
C. That creativity is a catalyst for technological advancements

IV. Assessment Plan

Performance Assessment

Press Announcement: For Immediate Release

Winston-Salem, NC—WKIDS-Channel 10 is working with their corporate sponsors; The National Student Success Foundation (NSSF) and the American Council on Energy Innovation (ACEI) in sponsoring a contest to find innovative and creative minds for the future. We're looking for the next Albert Einstein, Isaac Newton, or Marie Curie. Are you a Winston-Salem/Forsyth County School Student in grades 6-12 that has an innovative STEM idea that could one day eliminate our nation's dependence on fossil fuels and use alternate energies (solar, wind, water, biofuels, and geothermal) for future generations?

Nominate yourself by submitting a photo or drawing of your design along with a short essay (500 words or less) explaining your innovative idea and how it integrates the advancements of science, technology, engineering, or math to make the world a better and cleaner place for future generations.

Please submit your essay and drawing/picture by Thursday 7/16/15 at 11:59p.m. to www.WKIDS10.com or on Facebook-WKIDS10NEWS.
Official Rules can also be found at www.WKIDS10.com or on twitter #WKIDSENERGYCONTEST
Winners will be notified on or about Friday, July 24, 2015. Contest winners will appear on WKIDS10 6:00 p.m. broadcast to present their ideas on August 1, 2015.

The performance task for this unit served as a capstone for our essential understanding: *creativity influences innovation*. Since there were multiple student created products (scientist poster, edible car and solar powered car), I chose a writing prompt for the performance task. I had originally planned for the students to complete the task on the fourth day. However, due to time constraints and over planning on my part, I chose to incorporate the performance task into each day's lesson. I was fortunate to have my students during the first block, so we began our class early to accommodate the task. Each student believed that the task was real and authentic and were very excited to have the opportunity to submit their innovative STEM ideas for the contest.

The ideas expressed in each of their responses were creative, imaginative, and appropriate for and academically gifted student, and revealed their acquisition of the content for the week. Their STEM ideas articulated their knowledge of the technology needed to invent a product that could indeed influence our future energy requirements. Their submissions would easily be selected as the winner for the performance task scenario.

This performance task was intended to be solely a summative assessment. However, since the students worked on it over multiple days, I used the task as formative assessment. At the conclusion of each performance task session, I had a brief talk with each student. These "chats" allowed me to ask questions to determine if they had acquired new or additional information during the unit, as well as "sneak a peek" of the creativity process in their performance task.

---See Performance Task Samples Below

Landon Greenwood
Brunson

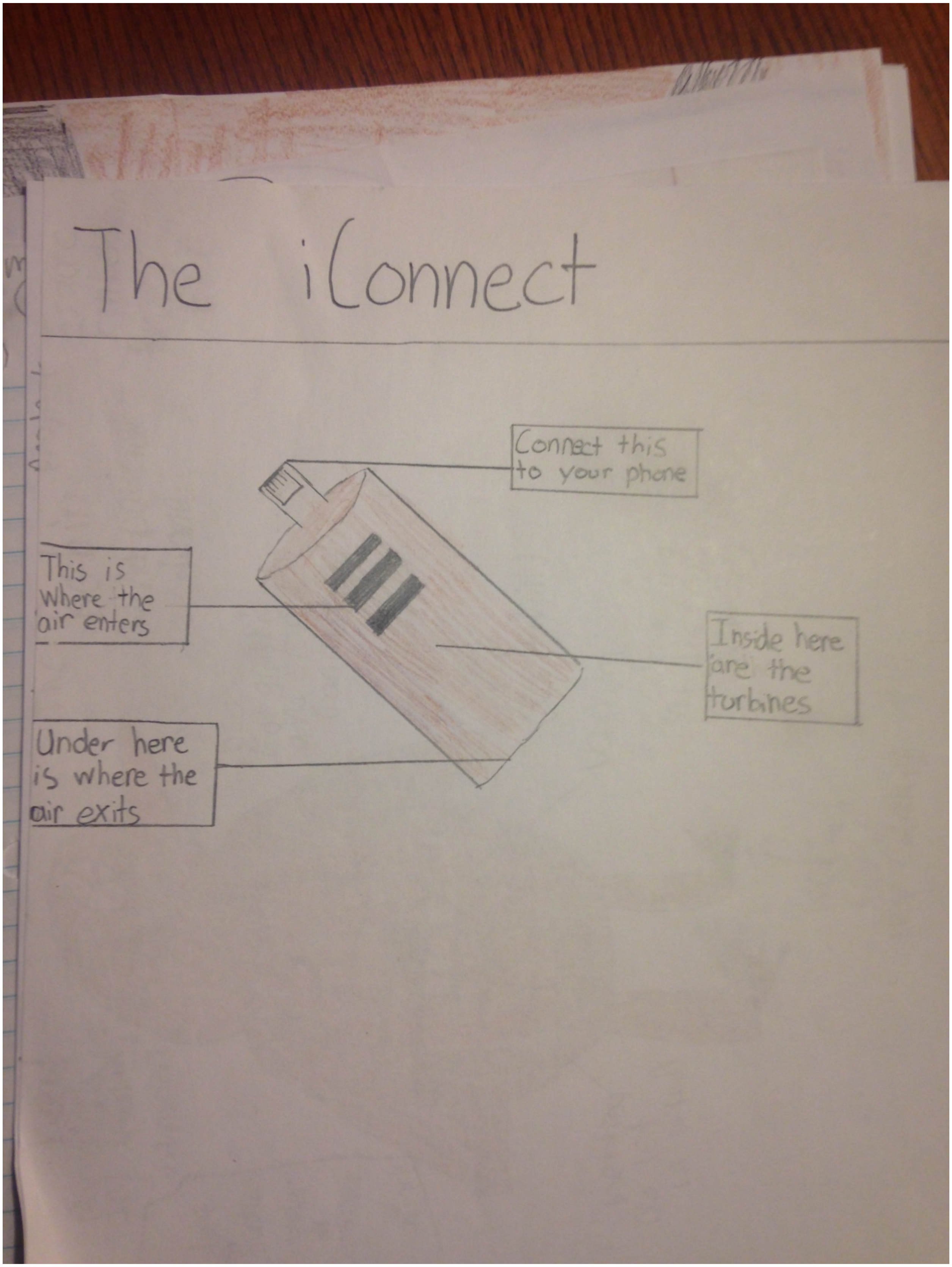
Could an apple charger be good for the environment? Well, take the iConnect for example. This wind-powered device will charge your Apple product almost 2x faster than your regular charger. This is the first phone charger with wind-powered technology.

Starting at $139.99, this device will work in most closed areas, and have your battery filled in no time. The iConnect is 1.5 inches long, the smallest charger possibley used for Apple. It can easily snap on to the bottom of any Apple product.

Inside this small charger is 2 wind turbines, 2 generators, and the connecter. The metal turbines are turned by the wind proceding through the air holes. Connected to the turbines are generators. The generators use magnets inside of metal to create electricity to charge the connector, which connects to your device.

I think the iConnect could make our nation depend less on fossil fuels and use alternate energies such as what the iConnect will use, wind. The iConnect will be the next generation charger. The electric or plug-in charger numbers will probably decrease once the iConnect comes into play.

For future generations, this is one small step for electronics, one giant leap for the environment. So, yes, a charger can be good for the environment.


The iConnect
Connect this to your phone
This is where the air enters
Inside here are the turbines
Under here is where the air exits

illatary use ONLY!

The Robin Project

Wind powered drone

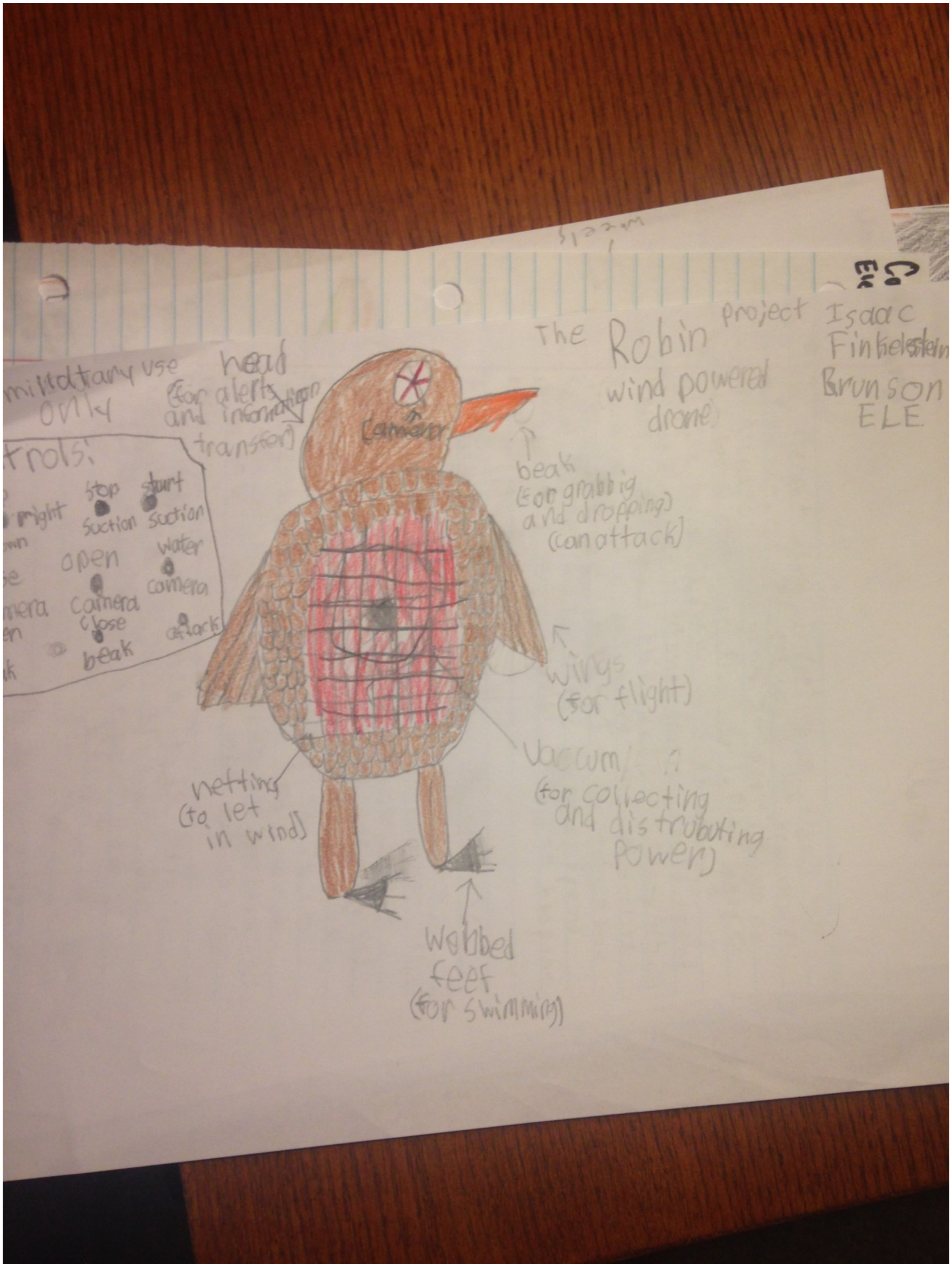
Isaac Finkelstein
Bronson ELE.

This project ensures safety for CIA and troops. It will grab important items, drop items, send alerts, collect footage and attack if neccesary. It also uses wind power which is safe for the envinoment. It can swim, fly and walk to get to any location.

This amazing robin can be controlled by just a simple remote. It will vaccum air and use it to power the drone. With a buit in water camera and diving speeds that of a peregine falcon it is perfect for underwater expedition.

With one spark of electricity to start it up the drone use its own flying mechanism to fuel the vaccum. That means no fossil fuels are used to fuel it. It is great for search and rescue, since it can defend and send alerts. It can fly through wind and snow because of the realistic flying mechanism

In conclusion, this bird could replace a search and rescuse officer or a CIA agent, while being good for the enviroment. With a bird like this you can do so many good deeds for your country. In my opinion, are country needs this drone.


The Robin project
Isaac Finkelstein
Brunson ELE
(wind powered drone)
military use only
head (for alerts and information transfer)
camera
beak (for grabbig and dropping) (can attack)
trols:
stop suction
start suction
right
open camera
water camera
close beak
attack
wings (for flight)
netting (to let in wind)
(for collecting and distrubuting power)
webbed feet (for swimming)

Cash Elementary

Clark

I thought about inventing a flying solar powered car. If used gas woud not be needed and gas pollution will be gone. In addition we do not have to defend on fossil fuel. Plus people do not have to reals on high airline prices. With this vechal people could spend less money at the gas station. Which could therefor put more money into the consumers pocket. In addition that will most likely make people spend more money at stores wich can help the econimy.

Also with less pollation some animals will have less of a change to become extinct or badly engered. That then helps animals stay alive. Also with my veicle will not blow up if hit. That will help safe lives. In addition you will not have to get an oil change every mounth or so. Which will put more money in the averge person pocket. Plus with its photobaltais on top it will absorb 3 times enough enegy neady.
In addition even when it is cloudy raining or dark it will still run for at 1,000 miles. I hope you oaceter my brilliant Idea.

Sincerly,

Clark B Easley

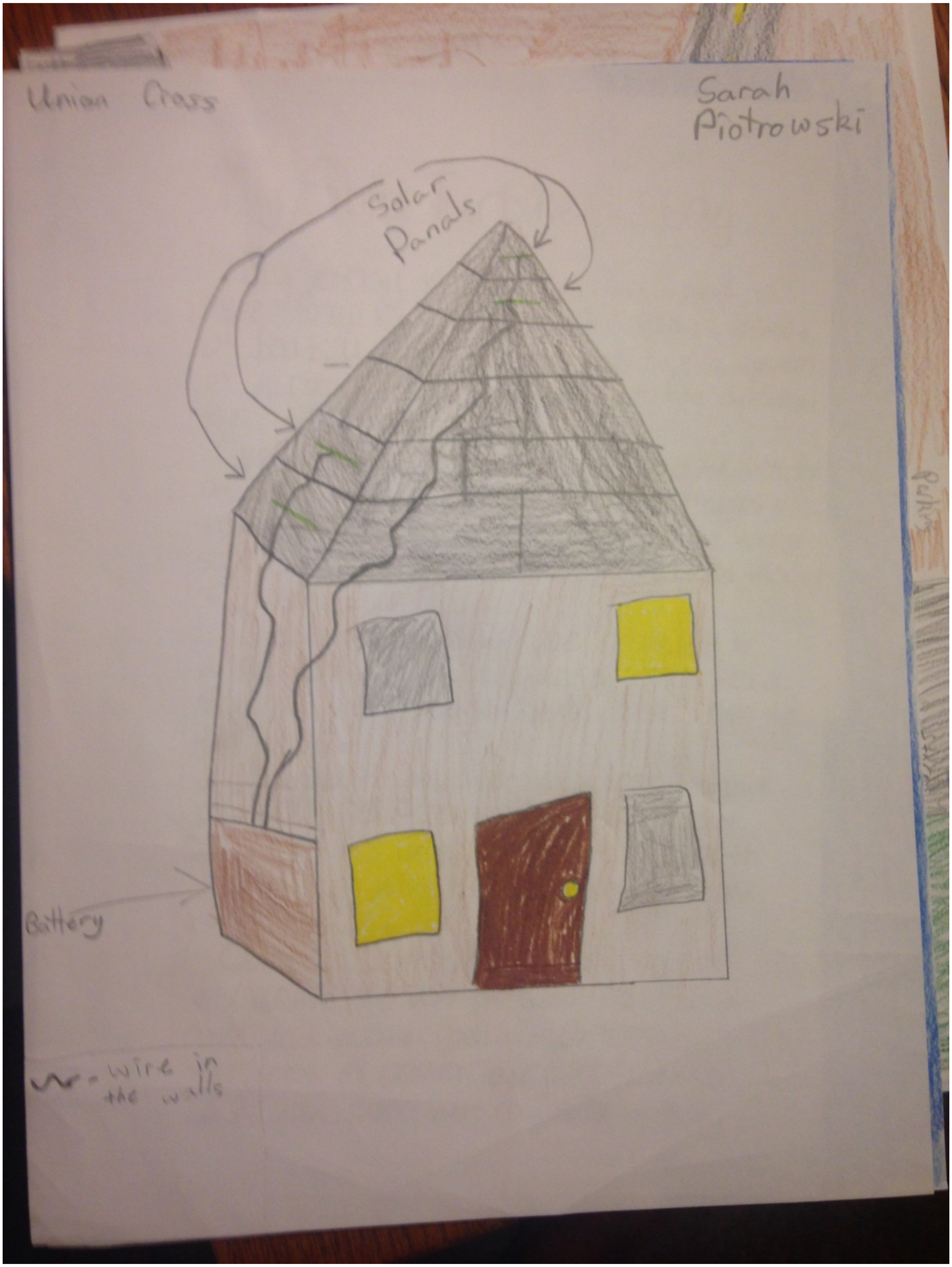
Sarah

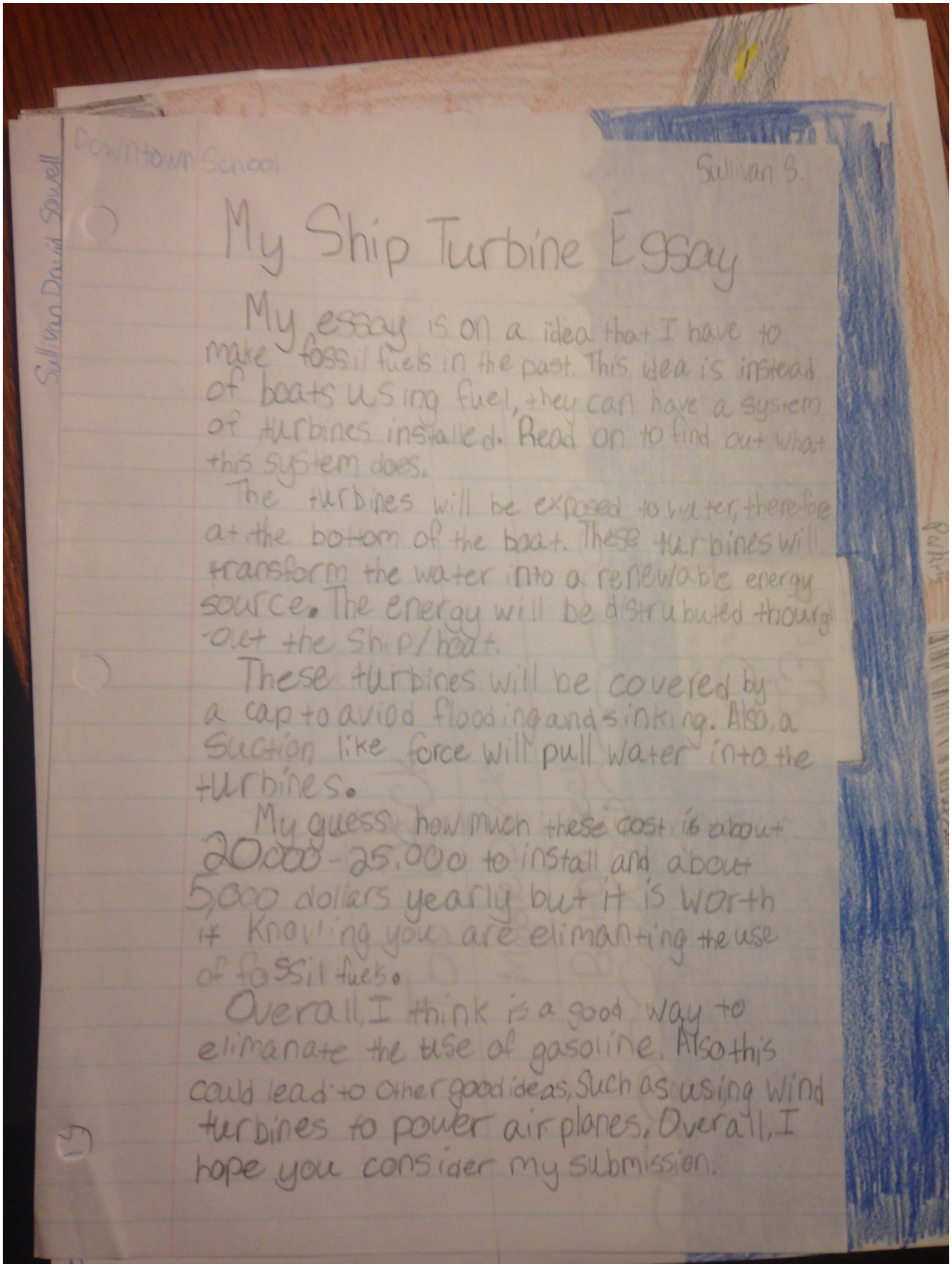
Union Cross Sarah Piotrowski

The world is useing up all of the fossil fules. For future generations to have electricity, we must use alternate energies. I have an idea of how the world can use solar power.

We can use solar power to generate electricity for homes. There could be a few solar panals on houses. In the walls, there would be wires going from the panals to a battery. The battery would store electricity. The electricity would be used as normal electricity from fossil fules.

This might be an expencive option but it will really help in the future. This will be a step to get people off of fossil fules. Once this step and many others are taken, we may get off of fossil fules for good. But we need to take action for the future generations to have electricity. We can get the world


Union Cross
Sarah Piotrowski
Solar Panals
Battery
= wire in the walls



Downtown School

Sullivan David Sewell

Sullivan S.

My Ship Turbine Essay

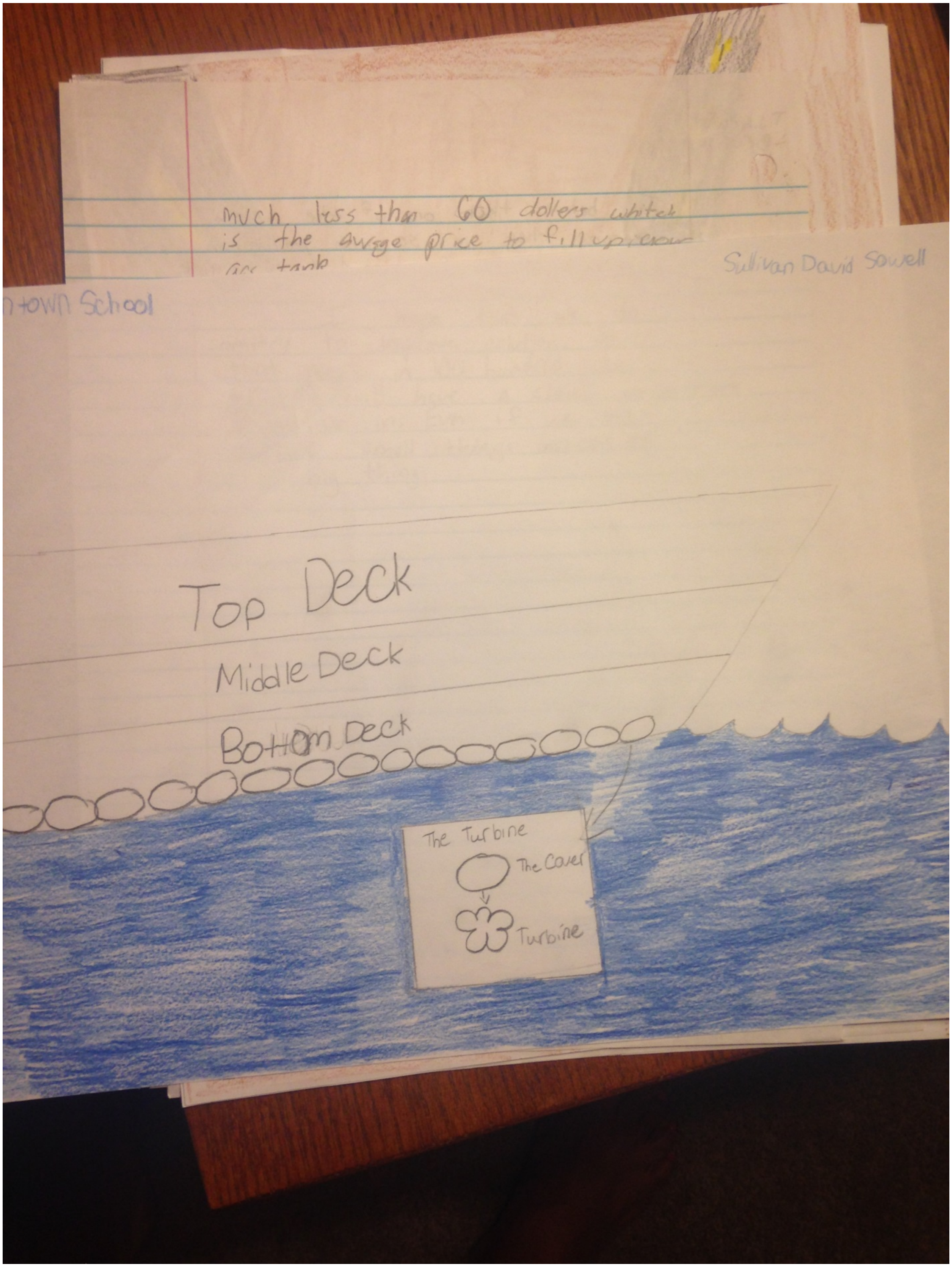
My essay is on a idea that I have to make fossil fuels in the past. This idea is instead of boats using fuel, they can have a system of turbines installed. Read on to find out what this system does.

The turbines will be exposed to water, therefore at the bottom of the boat. These turbines will transform the water into a renewable energy source. The energy will be distrubuted thourgh-out the Ship/heat.

These turbines will be covered by a cap to aviod flooding and sinking. Also, a suction like force will pull water into the turbines.

My guess how much these cost is about 20,000-25,000 to install and about 5,000 dollars yearly but it is worth it knowing you are elimanting the use of fossil fuels.

Overall, I think is a good way to elimanate the use of gasoline. Also this could lead to other good ideas, such as using wind turbines to power airplanes. Overall, I hope you consider my submission.


much less than 60 dollers which
is the avrge price to fill up your
Sullivan David Sowell
ntown School
Top Deck
Middle Deck
Bottom Deck
The Turbine
The Cover
Turbine

V. Lesson Plans

TEACHER NAME	Lesson #
Corie Maffett	1

MODEL	CONTENT AREA	GRADE LEVEL
Bruner's Structure of Intellect	Science	6th

CONCEPTUAL LENS	LESSON TOPIC
Innovation	Inventions and Innovations through history

LEARNING OBJECTIVES *(from State/Local Curriculum)*

6.P.3.3. - Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).
CCSS.ELA-LITERACY.RST.6-8.1- Cite specific textual evidence to support analysis of science and technical texts.
CCSS.ELA-LITERACY.RST.6-8.2
Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
CCSS.ELA-LITERACY.RST.6-8.3
Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?*	**THE ESSENTIAL QUESTION** *(What question will be asked to lead students to "uncover" the Essential Understanding)*
Creativity Influences Innovation	How does creativity influence innovation?

CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS** (What will students be able to do as a result of this lesson?)
Science is constant, historic, probabilistic, and replicable (NCDPI). Creativity has been a catalyst for scientific innovations and inventions throughout history Innovations and inventions have a major impact on our daily lives Learn about scientific advancements through innovations/inventions in history	Students will reflect on what has been learned after conducting research by formulating ideas, opinions, and personal responses Students will identify and gather appropriate resources to conduct online biographical research Students will create a final product which communicates biographical finding through a wax museum presentation to their peers

GUIDING QUESTIONS *What questions will be asked to support instruction?* *Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding*		
Pre-Lesson Questions:	**During Lesson Questions:**	**Post Lesson Questions:**
Close your eyes…What is your favorite field trip memory? Why is it your favorite? Have you ever been on a virtual field trip? If so, when and where did you go? Can you name a scientist (the first one that pops into your head) and tell how their significant innovation/invention made/makes an impact on our daily lives?	In addition to basic biographical information for each scientist… Why is this innovation/invention important to our world, country, or community? What impact does the innovation/invention have on you personally? Have some innovations/inventions become springboards for other scientific contributions in history?	How would our lives be different if this innovation/invention had never been created? What innovation/invention could you create to make an impact on our future? What is one scientific innovation/invention that you found most interesting during your research? Explain you answer. How does creativity influence innovation?

DIFFERENTIATION *(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.*			
Content	**Process**	**Product**	**Learning Environment**
Students will gain knowledge of the innovative contributions made by scientists throughout history in above grade level on-line research.	Students will research scientists' innovations/inventions using predetermined websites for information, analysis, and synthesis	Wax Museum- Student Scientist Display	Collaborative (pairs and small groups)

PLANNED LEARNING EXPERIENCES *(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)*

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

The teacher stands at the doorway to greet students dressed as Miss Fizzle (it's really Mrs. Maffett) from the Magic School Bus series. The theme song from the series plays simultaneously from the classroom speakers. The words **VIRTUAL FIELD TRIP TODAY** are predominately displayed on the white board in the front of the room. Students are given a few minutes to get excited and sing the theme song out loud in an effort to pique their interests. The teacher advises the students that today they will be going on a virtual field trip to visit scientists that have made significant innovations/inventions in our history. Prior to beginning the virtual field trip, students are given a T-Chart and asked to list scientists that they know of that have made a significant impact in our lives through their inventions/innovations (use left side of T-Chart). These T-Charts will be collected and saved for an activity at the conclusion of today's lesson.

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Students will be placed in pairs prior to today's class and will be given a field trip itinerary sheet with times and locations (differentiation strategy). The sheet will give them the order of each scientist that they will visit (15 minute/scientist) as well as a question sheet asking for important information for each scientist. Computers and/or I-Pads will be placed around the room with the name and a picture of each scientist (Albert Einstein, Marie Curie, Isaac Newton, Benjamin Franklin, Alexander Graham Bell, etc.) as well as a list with predetermined research websites (URL links can also be linked on the teacher website to expedite the research process). Each scientist location will resemble a welcoming and interactive display (children's museum style) to ensure that students are engaged and enjoying the virtual field trip. Students will use a graphic organizer to help facilitate their research.

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

After completing the research at each scientist station, students will return to their tables for a brief "show what you know" panel discussion. Each student will be assigned a scientist to discuss their innovations/inventions with the other students (the democratic way of choosing is to pull scientist names out of a hat). The student will serve as an expert for their particular scientist. If needed, students may consult with other students at their table for additional information that they may have missed during their research. Students will also be asked to think of an innovation/invention that they could develop that could one day be the next best scientific innovation/invention (real-world/real-life connection).

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

Using the supplies provided by the teacher's dress-up collection and yard sale finds (keep concealed until the reveal); students will transform themselves into the scientist that they have become an expert on for our Madame Maffett's Wax Museum (borrowing the idea from Madame Trousseau**). **Show a mini clip on Madame Trousseau's wax museum**

Students from other classes will be invited to visit our classroom wax museum and will be able to ask students about their particular scientist. Students will be able to keep key discussion points on an index card to assist them with presenting.

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

The T-Chart used at the beginning of class will be returned and each student will be asked to complete the right side of the T-Chart. The expectation is that students are more aware of scientists that have made significant contributions through their innovations/inventions. Remind students about the significance of creativity during the innovation and invention process.

The question sheet that students used during their research will also be used as an assessment for their research.

TEACHER NAME			**Lesson #**
Corie Maffett			**2**

MODEL	**CONTENT AREA**	**GRADE LEVEL**
Problem Based Learning	Science	6th

CONCEPTUAL LENS	**LESSON TOPIC**
Innovation	Edible Car Design

LEARNING OBJECTIVES *(from State/Local Curriculum)*

6.P.3.3. – Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).
6.V.2- Apply creative and critical thinking skills to artistic expression.
6.V.3- Create art using a variety of tools, media, and processes, safely and appropriately.
6.TT.1- Use technology and other resources for the purpose of accessing, organizing, and sharing information.

THE ESSENTIAL UNDERSTANDING ***(What is the overarching idea students will understand as a result of this lesson?***	**THE ESSENTIAL QUESTION** ***(What question will be asked to lead students to "uncover" the Essential Understanding)***
Creativity Influences Innovation	How does creativity influence innovation?

CONTENT KNOWLEDGE **(What factual information will students learn in this lesson?)**	**PROCESS SKILLS** **(What will students be able to do as a result of this lesson?)**
Students will understand that technological advancements in car designs are a result of creativity, multiple engineering attempts, and configurations. Creativity is a catalyst for future automotive concept prototypes that evolve and change over time. Availability of materials and access to manufacturing resources may limit and challenge creativity.	Students will be able to design and create based on collected criteria and information. Students will be able to collaborate in design teams. Students will articulate the reasons for their material and design choices with the other teams.

GUIDING QUESTIONS *What questions will be asked to support instruction?* *Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding*		
Pre-Lesson Questions:	**During Lesson Questions:**	**Post Lesson Questions:**
What is the difference between the car that you see in the poster and the ones that you see on the roads today? Who might purchase this car and for what purpose? What are the advantages and disadvantages of putting a prototype like this into production? What do you think the production cost(s) of this prototype would be in 2025? What type of fuel (if any), do you think this prototype would require? What would you suggest as a possible fuel source for this prototype? How would this prototype be manufactured? What technology/material would be needed to build it?	Why did your group decide on those items for your edible car? How do your food items resemble the car prototypes that you viewed earlier? What additional food items do you wish were included? Why did you choose that food item for that part of the car? What other edible item(s) on the table that might work better for your design?	What challenges did you encounter when building your car? And, how did you overcome them? How would you change the design of your car to make it better? If you could have access to materials from the ones that were provided, what would you have requested? What designs did you see from other teams that you thought worked well? Why do you think that automotive engineers have to adapt their original plans during the design process? Why might they?

DIFFERENTIATION *(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.*			
Content	**Process**	**Product**	**Learning Environment**
Availability of materials and limited access to manufacturing resources may challenge creativity.			In teams, Students will design and create an edible car

PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

The students enter the room to find pictures of futuristic car designs (affixed to the walls using tape or other non-harmful adhesive☺). These are prototypes of cars that are displayed at car shows and have yet to hit the roads in 2015. The teacher has on a tool belt (complete with screwdriver, wrench, rule, and hammer) and goggles. Allow the students to ask about the tool belt and goggles, but remain silent---keep them guessing. There is also a table in the rear of the room covered with a sheet with the words "No peeking" written on top of it. Students are handed a sticky note pad and are asked to take a gallery walk around the room to each poster (in pairs or in groups based on size of class and allow 3 minutes at each poster). While at each poster, students will be asked to answer a question (place above poster during room prep). Their answers should be written on their sticky note and affixed to the wall next to the poster.

Sample Questions (questions would be catered to each prototype):
What is the difference between the car that you see in the poster and the ones that you see on the roads today?
Who might purchase this car and for what purpose?
What are the advantages and disadvantages of putting a prototype like this into production?
What do you think the production cost(s) of this prototype would be in 2025?
Do you believe that it would be too expensive for most Americans to be able to afford?
What type of fuel (if any), do you think this prototype would require?
What would you suggest as a possible fuel source for this prototype?
How would this prototype be manufactured?
What technology/material would be needed to build it?

The students return to their desks and discuss the prototypes that they viewed during the gallery walk. On chart paper, the teacher makes a list of the talking points made by the students.

Students are then placed in groups to make sure that all groups are even and not too large.

The teacher then goes to the back of the room to unveil what is under the sheet….

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Under the sheet are a variety of food items (candy, cookies, crackers, and anything else that can be used as a creative tool) that students can use to create an edible car. Students can view the items, but cannot touch them at this time. Students are then asked to return to their seats and are given instructions on the rules of engagement (list will be in unit plan). It is the expectation that students' work well in groups and that everyone participates. After all instructions/rules have been discussed. Teams are given 20 minutes to sketch their designs (use online stopwatch).

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

After the buzzer sounds for the 20 minutes planning time, students are given 30 minutes to build their edible car (time can be adjusted if necessary). The teacher should constantly roam the room noting that all students are engaged and participating (rubric). Students should have a list of supplies prior to having ONE student (materials manager) to get the edible car supplies.

Questions for students while they are working…

Why did your group decide on those items for your edible car (ask specifics about wheels, axles, chassis)?

What other edible item(s) on the table might work better for your design?

How do your food items resemble the car prototypes that you viewed earlier?

What additional food items do you wish were included?

How many attempts were necessary to create your car?

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

After the 30 minute build time has concluded, the teacher calls "time" while students remain in their teams. In a round robin style, the teacher asks each group to display their car and describe their designs to the class. Students will then place their edible cars on a ramp to see if they actually move. If time, students can race their edible cars (use online stopwatch) on an incline ramp (requires set-up time).

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

While the students are eating the leftover edible supplies☺, they are asked to reflect on the following questions in their groups. A recorder (group chooses) should write down their responses to turn in with their groups' rubric.

How would you change the design of your car to make it better?

If you could have access to materials other than the ones that were provided, what would you have requested?

What designs did you see from other teams that you thought worked well?

Why you think that automotive engineers have to adapt their original plans during the design process?

TEACHER NAME	Lesson #
Corie Maffett	3

MODEL	CONTENT AREA	GRADE LEVEL
Problem Based Learning	Science	6th

CONCEPTUAL LENS	LESSON TOPIC
Innovation	Solar Powered Car Design

LEARNING OBJECTIVES *(from State/Local Curriculum)*

6.P.3.3. - Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).
6.P.3.2. - Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.
6-8.RST.1. - Cite specific textual evidence to support analysis of science and technical texts.
6.TT.1**.-** Use technology and other resources for the purpose of accessing, organizing, and sharing information.
6.RP.1.- Apply a research process for collaborative or individual research.

THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?*	**THE ESSENTIAL QUESTION** *(What question will be asked to lead students to "uncover" the Essential Understanding)*
Creativity Influences Innovation	How does creativity influence innovation?

CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS** (What will students be able to do as a result of this lesson?)
Solar energy is a renewable energy source, and its utilization has numerous benefits for our environment. The angle at which a solar cell is positioned in relation to the sun affects its power output Proper gear ratio and wheel placement affects car design and aerodynamics	Students will work collaboratively to design a solar powered car using materials provided by the teacher. Students will use an interactive science notebook to brainstorm and record design ideas. Students will manipulate materials to assist with creativity while designing the solar powered car.

GUIDING QUESTIONS *What questions will be asked to support instruction?* *Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding*		
Pre-Lesson Questions:	**During Lesson Questions:**	**Post Lesson Questions:**
• How is solar energy harnessed and converted into energy? • What is a photovoltaic cell? • Where do you we see photovoltaic cells? Are there particular industries/businesses that use PV cells?	• Where on a car would solar panels be most efficient? Why? • How does sunlight angle affect voltage?	In order to construct a solar powered car that works at optimum efficiency, what design factors should be considered during the design process?

DIFFERENTIATION *(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.*			
Content	**Process**	**Product**	**Learning Environment**
Solar energy is a renewable energy source, and its utilization has numerous benefits for our environment.	Students will record their research and design notes in their interactive notebook using a pre-determined format that promotes inquiry, critical thinking, and analytical skills.		

PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

Students enter the room to the sounds of revving engines and "gentlemen and ladies…start your engines" coming from the computer speakers. There is also a checkered flag displayed in the front to the room letting the students know that today is RACE DAY! Students are asked to proceed to their work areas from yesterday. Before commencing the build, the teacher asks the students to take out their interactive science notebooks and share their responses to the writing prompt from yesterday.

Yesterday's Prompt: in order to construct a solar powered car that works at maximum efficiency, what design factors should be considered during design?

A brief discussion should include the following questions to give students the opportunity to share and brainstorm ideas and to clear up any confusion or challenges that may exist among teams.

What were some of the challenges your group encountered during yesterday's design and pre-build?

What decisions did your group make regarding the wheels and axle?

What external factors may affect the placement of your photovoltaic cell (i.e. weather conditions or time of day)?

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Students are given approximately 50 minutes to complete the solar powered car "build." Students were given 30 minutes during yesterday's class. Students will be given the opportunity to test the placement of their PV cell outside and should consider the position of the sun during this time (one teacher should remain inside while the other teacher supervises outside). During the build time, the teacher roams the room and asks the following questions:

What is the best location/position for the photovoltaic cell?

Did the placement of the cell affect the position of the wheels and axles on your car?

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

After the timer sounds (after 50 minutes), time is called and students are instructed to stop working on their cars. All students are then instructed to proceed outside to the racing track (the teacher that was outside supervising should have already set up the track). Teams should report to the start line and pose for a photo-op (these will be sent to the students in the mail after developing and placed in a frame). Teams are also given an opportunity to "show off" their designs through a "show and tell" type demonstration. The teacher allows time for questions.

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

Students are asked to go to the grass and form a circle (if weather permits) with their teams for a "debrief" and to answer the following questions:

What additional resources could have been provided to assist your group with the design and building process?

If given the opportunity to redo or redesign the solar powered car, what would your group do differently?

On a scale of 1-10 (with 10 being the highest and 1 being the lowest), how creative do you believe your car design was and why?

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

After the teams have "raced" and the victory lap has been completed, students will be asked to answer the following Performance task:

Press Announcement: For Immediate Release

Winston-Salem, NC—WKIDS-Channel 10 is working with their corporate sponsors; The National Student Success Foundation (NSSF) and the American Council on Energy Innovation (ACEI) in sponsoring a contest to find innovative and creative minds for the future. We're looking for the next Albert Einstein, Isaac Newton, or Marie Curie. Are you a Winston-Salem/Forsyth County School Student in grades 6-12 that has an innovative STEM idea that could one day eliminate our nation's dependence on fossil fuels and use alternate energies (solar, wind, water, biofuels, and geothermal) for future generations?

Nominate yourself by submitting a photo or drawing of your design along with a short essay (500 words or less) explaining your innovative idea and how it integrates the advancements of science, technology, engineering, or math to make the world a better and cleaner place for future generations.

Please submit your essay and drawing/picture by Thursday 7/16/15 at 11:59p.m. to www.WKIDS10.com or on Facebook-WKIDS10NEWS.

Official Rules can also be found at www.WKIDS10.com or on twitter #WKIDSENERGYCONTEST

Winners will be notified on or about Friday, July 24, 2015. Contest winners will appear on WKIDS10 6:00 p.m. broadcast to present their ideas on August 1, 2015.

VIII. Resources

Day One Resources

Links for Student Research (linked on classroom website):

The following resources were used by students to research and collect information on famous scientists. The research was used during the virtual field trip portion of the lesson.

(n.d.). Retrieved July 1, 2015, from http://www.biography.com/people/groups/famous-scientists

Biographies of Notable People. (n.d.). Retrieved July 1, 2015, from http://www.sldirectory.com/studf/bio.html#science

Famous Scientist Facts & Quotes - Inventors, Chemists, Biologists, Physicists. (n.d.). Retrieved July 1, 2015, from http://www.sciencekids.co.nz/sciencefacts/scientists.html

Famous Scientists. (n.d.). Retrieved July 1, 2015, from http://www.famousscientists.org/

Next Stop: Washington DC - Madame Tussauds Wax Museum. (n.d.). Retrieved July 1, 2015.

Sciography. (n.d.). Retrieved July 1, 2015, from http://www.sciography.com/

The Famous People. (n.d.). Retrieved July 1, 2015, from http://www.thefamouspeople.com/scientists.php

The Magic School bus audio clip was used to "hook" students and to gain excitement for the virtual field trip.

The Magic School Bus Intro With Lyrics. (n.d.). Retrieved July 1, 2015.

Day Two Resources

The following resources were used in the gallery walk that students took of concept cars of the 2015. These resources were also used to prepare the teacher to discuss (in detail) how gears work, wheel placement, and aerodynamic design.

Chapa, J. (2008, November 18). TRANSPORTATION TUESDAY: Mazda's Futuristic KAAN Racer. Retrieved July 1, 2015.

Deaton, Jamie Page. "What will race cars look like in 2025?" 04 March 2009. HowStuffWorks.com. <http://auto.howstuffworks.com/auto-racing/motorsports/race-cars-2025.htm> 28 July 2015.

Fagone, J. (2013, December 5). Why Won't Big Automakers Build the Car of the Future? Retrieved July 28, 2015.

Day Three Resources

The Carolina Stem Challenge Solar Powered Car Kit contains all of the components needed to build a solar powered car. The kits come complete with gears, cardboard chassis, axles, wheels, and photovoltaic solar cells. There are also detail teacher instructions for prepare teachers for design questions and obstacles that may arise.

Carolina Stem Challenge Solar Powered Car Kit, Carolina Biological, Burlington, NC

The Rocky Theme audio clip was used as a hook to encourage a competitive atmosphere for build day.

Rocky Full Theme Tune. (n.d.). Retrieved July 1, 2015.

Stella is the solar powered car that was designed and built by a team from the Netherlands. The video gives each student important information on the designs of solar powered cars, the distance in each charge, as well as the elements required to build the vehicle.

Stella Solar Powered Car. (n.d.). Retrieved July 1, 2015.

Day Four Resources

Carolina Stem Challenge Solar Powered Car Kit, Carolina Biological, Burlington, NC

Other Useful Resources

(n.d.). Retrieved July 1, 2015, from http://www.dpi.state.nc.us/docs/acre/standards/new-standards/science/6-8.pdf

National Association for Gifted Children | Supporting the needs of high potential learners. (n.d.). Retrieved July 1, 2015, from http://www.nagc.org/

(n.d.). Retrieved July 1, 2015, from http://www.ncpublicschools.org/docs/academicservices/gifted/aigplans/2010-13/general/winstonsalemforsyth2010.pdf

Discovery Learning (Bruner) | Learning Theories. (2007, January 22). Retrieved July 1, 2015, from http://www.learning-theories.com/discovery-learning-bruner.html

Problem-Based Learning. (n.d.). Retrieved July 1, 2015, from http://www.wakeproblembasedlearning.com/

New [School] Year Resolutions. (n.d.). Retrieved July 1, 2015, from http://www.amle.org

The Multiple Menu Model for Developing Differentiated Curriculum*. (n.d.). Retrieved July 30, 2015, from http://www.gifted.uconn.edu/mmm/mmmart01.html

Pictures of all the Fun!

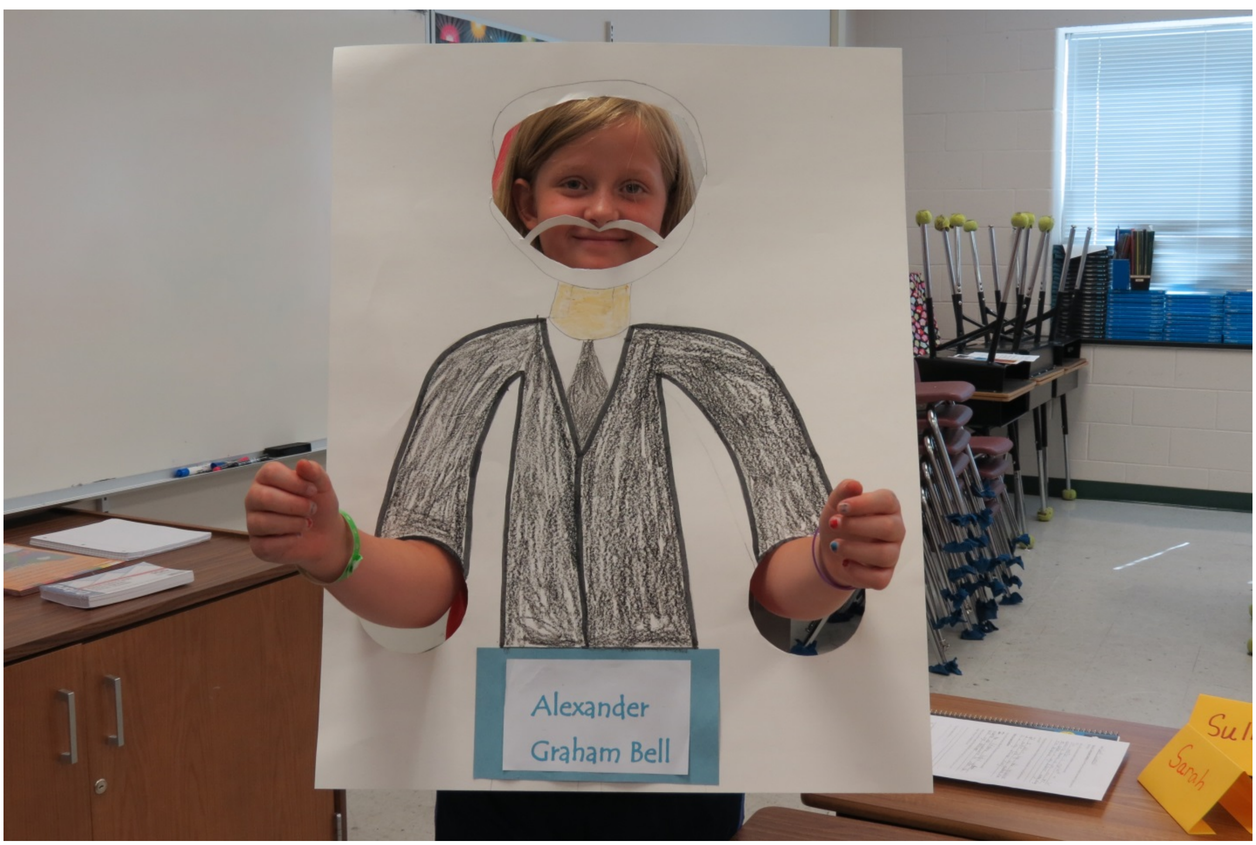

The Hook!
It's Mrs. Frizzle


Mrs Maffett
Mission 2025
Monday
assignment
Teacher Check
① Get to know you activity
② What does a Scientist look like?
③ Virtual field trip Scientists!
④ Create a living museum
⑤ Wrap it up!
EQ:
How does Creativity influence Innovation?


Mrs Maffett
assignment
Teacher Check
what does a scientist look like
wsfcs k12nc us
Select a school
middle
East middle
Maffett, Corie
Marie Curie


Jonas Salk


Mrs Maffett
Mission 2025
Monday
assignment
Teacher Check
① Get to know you activity
② What does a Scientist look like?
③ Virtual field trip Scientists!
④ Create a living museum
⑤ Wrap it up!
EQ:
How doe
influence
Albert Einstein
Lunchboxes


Alexander
Graham Bell


Jonas Sak
Alexander Graham Bell
Benjamin Franklin
Thomas Edison


Hooked Them!
T


Sarah
Crayola


S.T.E.P.S
SUMMER INSTITUTE
Beatrice
Issac
Crayola
COLORED PENCILS
12


8:30-10:30 Class #1
10:30-11:00 Break
11:00-11:35 Lunch!
11:40-1:40 Class #2
S.T.E.P.S


MATHLETES UNITED
CODE OF ETHICS
S.T.E.P.S
SUMMER INSTITUTE


MATHLETES UNITED
Mathematicians
S.T.E.P.S
SUMMER INSTITUTE
Design Your Mind
2015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