Cities In Space

Kim Collins

Ann Richards School for Young Women Leaders

8th Grade Math/Algebra 1/Engineering Design & Problem Solving

2019 Austin ISD Secondary Teacher of the Year

Passion & Inspiration

- Research Experience for Teachers at University of Texas
  - Chemical Coding, Clean Lab, Lasers, and Research
- United Space School
  - Collaboration, Mentorship, Design, and Mars
- Cities In Space Competition
  - Opportunity, Experiences, STEAM

Anatomy of an Inter-Disciplinary Unit (IDU)

- Team Collaboration
- Meaningful Experiences
- Relatable Outcomes
- Extends Outside the Classroom
- Planning, Planning, Planning

Cities in Space Iterations & Disasters

Iterations

- 2015 – Seniors
- 2016/2017 – 7th/8th Algebra
- 2018/2020 – Entire 8th Grade

Disasters

- Time
- Communication
- Rubrics
- Planning

Project Example -TBD

Interdisciplinary

- History – Colonization
- English – World Building
- Science – Biomedical
- Math – Engineering
- Media Technology
- PLTW – 3D Model/Robotics
- Art –Interactive Art

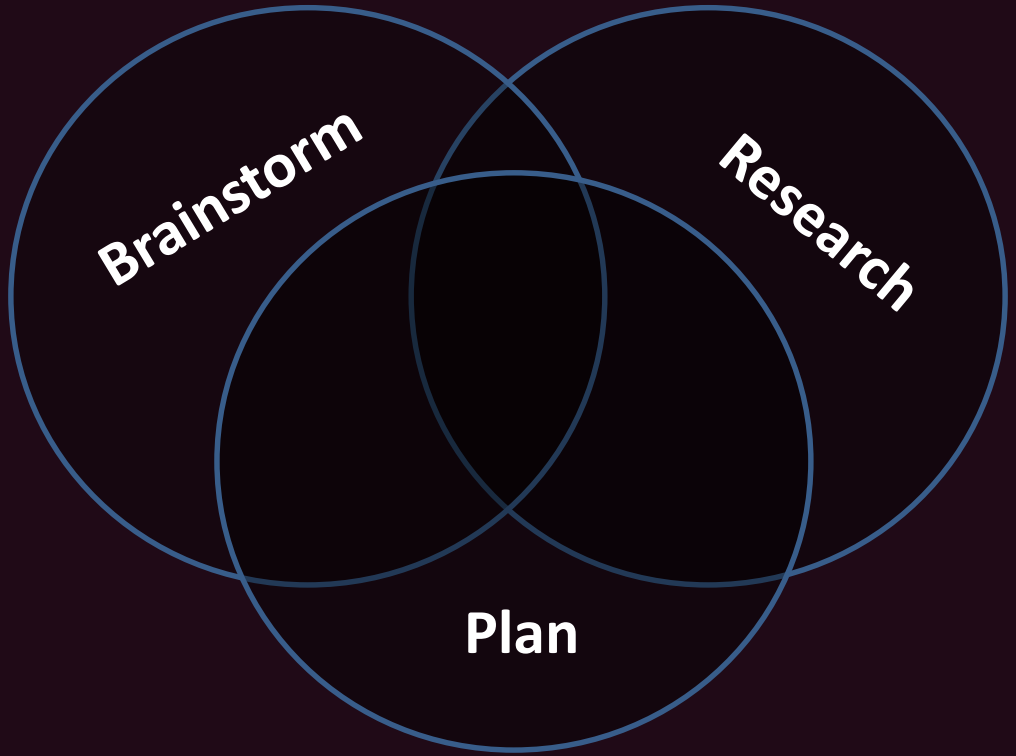
Outcomes

- Colony Charter/Bill of Rights
- Anthology of Colony Life
- Choice of Problem/Research/Solve
- Energy/Radiation/Choice of Design
- Create an Advertising Video & Posters
- Laser Cutting/3D Print/Coding/Robotics
- Create an original art piece

Student Take-Aways

- Time Management
- Collaboration
- Research Pathways
- Choice
- Cities in Space Competition
- Reflection

Where will your passion take you?



SCAN ME

https://docs.google.com/forms/d/e/1FAIpQLSdjghQuE1GPnOiEulYq37QoI2jqKcZeo4INlZUSA98FCKQh5A/viewform

Date:

Agenda Item	Person Responsible	Action Items/Notes
Celebrations/ Jokes/ Silly Fun!		
Team Lead Update		
Biomed update		
Engineering Update		
Media Tech Update		
Problems/Solutions		
Upcoming Due Dates		

Engineering Rubric

Task Description: **Engineers will research how to create a design for primary & secondary energy sources and radiation shielding/protection for colony, suit, and transportation. They will also choose 3 or 4 (depends on number of engineers) other choice research/design options to help focus their colony on sustainability and success.**

Criteria		Exemplary (4)	Admirable (3)	Acceptable (2)	Attempted (1)
Research & Citations	**10%**	☐ Use of three or more sources, including at least two Internet and one print source; use of two search engines ☐ Variety of domain name suffix (.com, .edu, .net) ☐ Factual information is accurate ☐ Narrow focus of topic ☐ All sources are correctly cited in APA.	☐ Use of two sources, including, including at least one Internet source; use of one search engine ☐ Most information can be confirmed ☐ Topic could be more narrowly focused ☐ Most sources are correctly cited in APA.	☐ Use of one Internet source ☐Some errors in information ☐Topic somewhat broad ☐Some sources are incorrectly cited	☐Use of only one source ☐Numerous errors in information ☐Topic too general ☐Sources are not cited
Primary & Secondary Energy Sources	**20%**	☐ Detailed description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Detailed explanation of constraints ☐ In depth exploration of alternatives to answer need or problem. ☐ Detailed identification of solutions (primary & secondary) . ☐ Prototype is designed using TinkerCad (primary & secondary) and all parts appropriately labeled.	☐ Good description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Explanation of constraints ☐ Exploration of a few alternatives to answer need or problem. ☐ Identification of solutions (primary & secondary) . ☐ Prototype is designed using TinkerCad (primary & secondary) and most parts appropriately labeled.	☐ Weak description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Explanation of constraints has few details. ☐ Exploration of one or two alternatives to answer need or problem. ☐ Identification of solutions has few details (primary & secondary) . ☐Prototype is designed using TinkerCad (primary & secondary) and few parts appropriately labeled.	☐ No or little description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary) is missing. ☐ Explanation of constraints has no details. ☐ No exploration of alternatives to answer need or problem. ☐ Identification of solutions has no details (primary & secondary) . ☐Prototype is designed using TinkerCad (primary & secondary) and no parts appropriately labeled.
Radiation Shielding & Protection	**20%**	☐ D Detailed description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Detailed explanation of constraints ☐ In depth exploration of alternatives to answer need or problem. ☐ Detailed identification of solutions (primary & secondary) . ☐ Prototype is designed using TinkerCad (primary & secondary) and all parts appropriately labeled.	☐ Good description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Explanation of constraints ☐ Exploration of a few alternatives to answer need or problem. ☐ Identification of solutions (primary & secondary) . ☐ Prototype is designed using TinkerCad (primary & secondary) and most parts appropriately labeled.	☐ Weak description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Explanation of constraints has few details. ☐ Exploration of one or two alternatives to answer need or problem. ☐ Identification of solutions has few details (primary & secondary) . ☐Prototype is designed using TinkerCad (primary & secondary) and few parts appropriately labeled.	☐ No or little description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary) is missing. ☐ Explanation of constraints has no details. ☐ No exploration of alternatives to answer need or problem. ☐ Identification of solutions has no details (primary & secondary) . ☐Prototype is designed using TinkerCad (primary & secondary) and no parts appropriately labeled.

Choice Research & Design Options	**20%**	☐ Detailed description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Detailed explanation of constraints ☐ In depth exploration of alternatives to answer need or problem. ☐ Detailed identification of solutions (primary & secondary) . ☐ Prototype is designed using TinkerCad (primary & secondary) and all parts appropriately labeled.	☐ Good description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Explanation of constraints ☐ Exploration of a few alternatives to answer need or problem. ☐ Identification of solutions (primary & secondary) . ☐ Prototype is designed using TinkerCad (primary & secondary) and most parts appropriately labeled.	☐ Weak description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary). ☐ Explanation of constraints has few details. ☐ Exploration of one or two alternatives to answer need or problem. ☐ Identification of solutions has few details (primary & secondary) . ☐Prototype is designed using TinkerCad (primary & secondary) and few parts appropriately labeled.	☐ No or little description of practical need or problem to be solved. ☐ Definition of criteria for proposed solutions (primary & secondary) is missing. ☐ Explanation of constraints has no details. ☐ No exploration of alternatives to answer need or problem. ☐ Identification of solutions has no details (primary & secondary) . ☐Prototype is designed using TinkerCad (primary & secondary) and no parts appropriately labeled.
Poster	**20%**	☐ Correct grammar, usage, mechanics, and spelling. ☐ Logical organization of material. ☐ Clarity of graphics and legends. ☐ Supporting documentation sited and displayed. ☐ Poster represents all requirements of the research and design.	☐ Few grammar, usage, mechanics, or spelling errors ☐ Logical organization of most of the material. ☐ Clarity of most graphics and legends. ☐ Most supporting documentation sited and displayed. ☐ Poster represents all but one of the requirements of the research and design.	☐Several grammar, usage, mechanics, or spelling errors. ☐ Logical organization of some of the material. ☐ Clarity of some graphics and legends. ☐ Some supporting documentation sited and displayed. ☐ Poster represents all but two of the requirements of the research and design.	☐Obvious grammar, usage, mechanics, or spelling errors ☐ No logical organization of the material. ☐ Graphics and legends are not clear. ☐ No supporting documentation sited and displayed. ☐Poster does not represents all of the requirements of the research and design.
Teamwork	**10%**	☐ Work load is divided and shared equally. ☐ Team communicates and collaborates to create a common vision.	☐ Work load is divided, though somewhat unevenly. ☐ Team has some struggles with communicating and/or collaborating.	☐ Work load is not divided and one student does the bulk of the work. ☐ Team does not communicate or collaborate on a regular basis.	☐Team did not produce cohesive products through lack of communication or collaborations.

Research & Design Energy: Due 10/07/2019

You will research and design a primary energy source and secondary energy source for your Colony. Creativity in your design is crucial to the success of your colony.

Step 1: Research possible Energy Sources.

- **Read and discuss each of the following articles and discuss options for your colony.**
  - How Astronauts get Energy in Space (Links to an external site.)
  - Can we harness energy from outer space? (Links to an external site.)
  - Energy Resources in Space (Links to an external site.)
  - What is Radiant Energy? (Links to an external site.)
  - Fuel Cells: A Better Energy Source for Earth and Space (Links to an external site.)
  - Possible Energy Sources on Mars (Links to an external site.)

- **Questions that you need to answer.**
  - Which energy source has the potential to persist in the future?
  - Does it produce renewable energy?
  - Can the energy source be sustained for future generations?

Step 2: Design your primary energy source for your colony.

- Characteristics of a good source of energy.
  - It should be a sustainable and renewable source of energy.
  - It should provide great amount of energy per unit mass or volume.
  - It should be easily accessible and provide energy for the maximum period of time.
  - It should not cause pollution.
  - It should be safe for the surrounding colonists.
  - It should be big enough to provide energy for your entire colony.
    - Energy Usage Data (Links to an external site.)
- Use TinkerCad (Links to an external site.) to design your primary energy source.
- Your design and research will be added to your engineering poster.

Step 3: Design your secondary energy source for your colony.

- Read the following article and then design a secondary energy source for your colony. It must be a different design and source than your main energy design.
  - Why have a back up energy source? (Links to an external site.)
- There are only two characterstics for your secondary energy source.
  - It should not cause pollution.
  - It should be safe for the surrounding colonists.
  - It should be big enough to provide energy for your entire colony.
    - Energy Usage Data (Links to an external site.)
- Use TinkerCad (Links to an external site.) to design your secondary energy source.
- Your design and research will be added to your engineering poster.

Research Radiation Shielding/Protection: Due 10/21/2019

You will research materials that could help create radiation shielding for your Colony, radiation shielding for a vehicle, and radiation protection for colonists/tourists. Creativity in your design materials is crucial to the success of your colony.

Step 1: Research possible Radiation Shielding/Protection Options.

- **Read and discuss each of the following articles and discuss options for your colony.**
  - How to Protect Astronauts from Space Radiation on Mars (Links to an external site.)
  - Space Radiation Won't Stop Human Exploration (Links to an external site.)
  - The Radiation Challenge (Links to an external site.)
  - (Links to an external site.)Plastic Could Protect Astronauts from Deep-Space Radiation (Links to an external site.)
  - (Links to an external site.)Shielding Astronauts from Space Radiation on the Way to the Moon (Links to an external site.)
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- **Questions that you need to answer.**
  - What type of shielding will you need for "buildings" or "habitats"?
  - What type of shielding will you need for a "suit" or "outdoor protection"?
  - What type of protection will you need for vehicles?

Step 2: Justify the radiation shielding for your colony, colonists, and transportation.

- Characteristics of good radiation shielding.
  - It should absorb or fragment a good portion of the radiation colonists are exposed to, inside & outside of the habitat.
  - It should be lightweight and flexible.
  - It should be able to reflect micrometeoroids.
  - It should be durable and long-lasting.
- Your research and justification will be added to your engineering poster.

Research & Design Choice: Due 11/04/2019

Step 1: Choose an option below for your own independent research.

- **Each engineer must choose an area to research. Three (3) Engineers means three different options. If you have another idea for your research & design, don't hesitate to pitch it to me.**
  - Terra-forming Design
  - Communications (Satellite) Design
  - Ground Transportation Design
  - Drone Exploration Design
  - Artificial Intelligence
  - Entertainment Venue Design
  - Robotics Design

Step 2: Research your chosen option above.

- **Questions that you need to answer.**
  - How does this help my colony thrive?
  - How will this improve the welfare of the colonists?

Step 3: Design your option.

- Provide Characteristics of your design
- Use the program of your choice to design your option.
- Your design and research will be added to your engineering poster.

<u>Engineering Poster Set Up: Due 11/18/2019</u>

You will pick up your trifold form me on our Cities in Space Competition Day on 12/02/2019. The format of your poster is below. You will use 11/18/2019 to plan and print all items for your poster.

Energy Source Research & Design Primary & Secondary	Choice Research & Design	Radiation Research & Design Habitat Suit Transportation

Your poster should include:

- **Energy Source Research & Design(Left)**
  - Design #1: Primary Source
    - Research Highlights
  - Design #2: Secondary Source
    - Research Highlights
- **Choice Research & Design (Middle)**
  - Design#1: Engineer #1 Choice
    - Research Highlights
  - Design#2: Engineer #2 Choice
    - Research Highlights
  - Design#3: Engineer #3 Choice
    - Research Highlights
- **Radiation Research & Design(Right)**
  - Justification #1: Habitat
    - Research Highlights
  - Justification #2: Suit
    - Research Highlights
  - Justification #3: Vehicle
    - Research Highlights

Strengths and Weakness:

Name	Strength	Leadership Role	Pathway Role

Roles and Responsibilities(Roles & Responsibilities will rotate)

1.Who will check final deliverables against Rubric?
2.Who will check to see that all images have citations?
3.Who will check to make sure all slides or paragraphs have citations?
4.Who will proof-read all work (grammar & spelling)?
5.Who will be in charge of making sure your group is ready for the presentation?
6.Who will be in charge of emailing the teacher and group members all documents/submitting work on Blend?
7. Who will be in charge of making sure all work that is submitted is checked as “complete”?

Contact Information:

Email:	Phone #/Best time to contact

Team Agreements:

Category	**Team Agreements**
Roles + Work Ethic	
Respectful tone	
Equal Participation	
Offering a “Seat at the Table”	
POD Norms	

Team Member Dismissal Procedures

1.First written warning –verbal

2.Second written warning – written warning (email) * you must write this email with your coaches guidance!

3.Third warning –Meeting with teacher

4. Dismissal from group –Upon dismissal group member is entitled to group products leading up to dismissal date, but all future assignments completed as an individual.
*Individuals dismissed from the group may not form or join another team.

Responsibility Statement:

We understand that working with our team is important, supportive, and a learning opportunity. We understand that in the event that we; are not performing our assigned role (as outlined above), hurting the culture of our team, choosing to do what is best for ourselves and not our team, or exhibiting any other behavior that does not support learning, that our team has the right to fire us. We understand that if we are fired, our collaboration and community grade will be very low.

Signatures: **Date:**

Date: 10/7/19

Agenda Item	Person Responsible	Action Items/Notes
Celebrations/ Jokes/ Silly Fun!	AnnaCate	"What is a ghost's favorite color" "Boo"
Team Lead Update	Athena	(Read what BLEND said)
Biomed update	Marlen+Michelle	Researching on water
Engineering Update	Hannah+Ella	● Energy ● Tinkercad ● Radiation ● Read ALL articles
Media Tech Update	Isaiah	Getting posters done, work on skript
Problems/Solutions	Whole Group	Need to give Mariah a second warning
Upcoming Due Dates	Whole group	Media Tech-Posters due, the 21st Engineering-Energy+Radiation, due the 21st also