

# TriCounty STEMersion Capstone Project

Project Title: "STEM IS IN THE AIR"

## Tri-County Champs

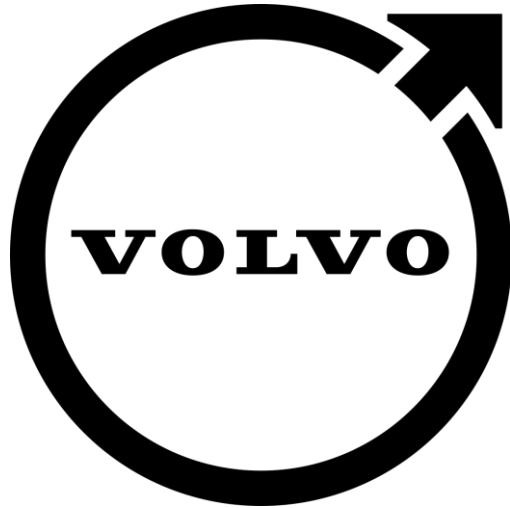
*Annie Jenkins*

*Jessica Wilkinson*

*Janet Dangerfield*

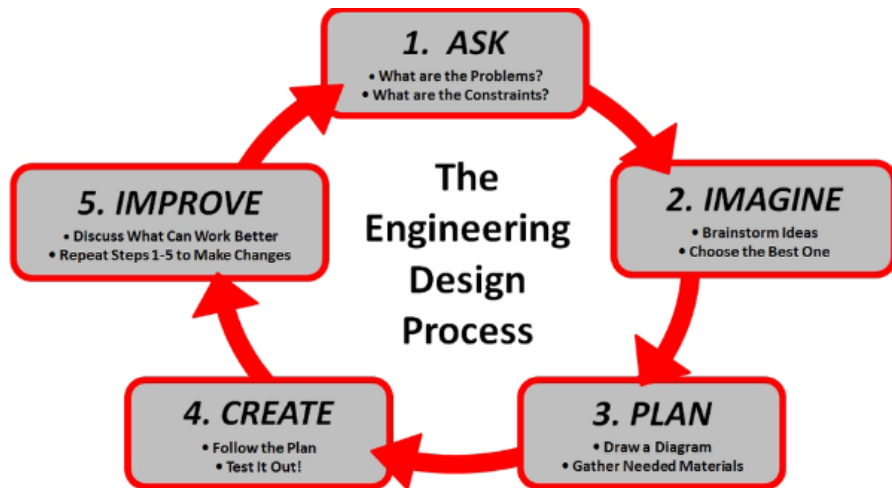
*Tracie Flowers*

*Cassandra Parker*

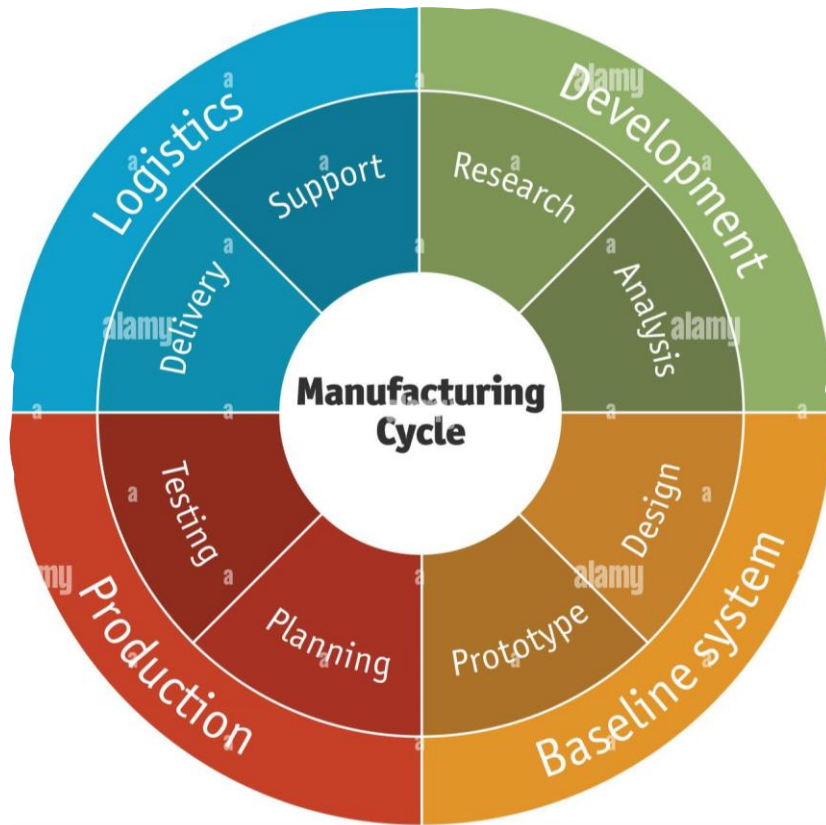


# LESSON OVERVIEW

- Students respond to air purification issues in environmental and health industries
- Based on an article from Volvo
- Teams of students use the Engineering Design Process to create an air purifier using specific materials
  - Household items
  - Arts/craft supplies
  - (examples: cotton swabs, cotton balls, pipe cleaners, glue, tape, string, plastic cups, paper plates)
- Teams present a sales pitch to the class
- Individual students write up a report on how the product could be improved
- Badges will be awarded to students based on participation in the engineering design process.



# MANUFACTURING CYCLE CONNECTION



## Research/Analysis

- Evaluate the environmental and health concerns at hand (pandemics, allergens)

## Design/Development

- Draw a blueprint of their final product (air purifier)

## Production

- Building their product

## Marketing

- Brochure on Canva

## Distribution and Product Support/Sales

- Students present their brochures and products to the class in the form of a sales pitch



### Intellectual Challenge and Accomplishment

Students learn deeply, think critically, and strive for excellence.



### Project Management

Students use a project management process that enables them to proceed effectively from project initiation to completion.



### Authenticity

Students work on projects that are meaningful and relevant to their culture, their lives, and their future.



### Reflection

Students reflect on their work and their learning throughout the project.



### Collaboration

Students collaborate with other students in person or online and/or receive guidance from adult mentors and experts.



### Public Product

Students' work is publicly displayed, discussed, and critiqued.

HANG ME UP!

## Framework for High Quality Project Based Learning

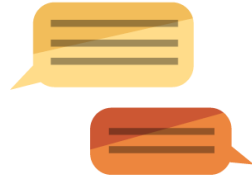
For the full framework see:  
[hqpbl.org](http://hqpbl.org)

# CONNECTION TO HQPBL

- **Authenticity**
  - Connection to real-world issues
- **Collaboration**
  - Students work in teams
- **Intellectual Challenge/Accomplishment**
  - Teams use critical thinking to solve a problem
- **Project Management**
  - Development is based on EDP
- **Public Product**
  - Teams share their solutions in a presentation
- **Reflection**
  - Students write a reflection on how the product could be improved following testing data

# SOFT SKILL INTEGRATION

## The Top 10 Soft Skills



Communication



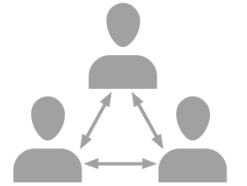
Self-motivation



Leadership



Responsibility



Teamwork



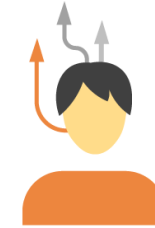
Problem solving



Decisiveness



Ability to Work  
Under Pressure  
and Time Management



Flexibility



Negotiation  
and Conflict Resolution



# HISTORY CONNECTION

- **The project will follow a discussion on the Industrial Revolution**
  - Environmental issues (air purity changes due to pollution from coal powered factories)
  - Health concerns (pandemics that spread due to problems of urban life such as increased population density, increase in lung-related diseases due to smoke inhalation in factories)
- **We will also connect this issue to the Black Plague, COVID-19 and other historical pandemics**
- **Students will manufacture a solution to these historical concerns**



# ENGLISH CONNECTION

- Through the 5Ws and H method, students will read the article and identify what needs to happen to get from start to finish.
- **What:** Volvo needs a state-of-the-art air purifier for use in newer car models.
- **Why:** Customers are seeking ways to incorporate better air quality inside their vehicles.
- **When:** The air purifiers need to be complete and ready to implement with the fall release of the new Volvo S60.
- **Where:** Berkley, Dorchester and Charleston County school districts.
- **Who:** STEM STARS (students in the Tri-County area) will design their version of the air purifier and submit to Volvo in hopes of having their design make it to implementation.
- **How:** STEM STARS will use the engineering design process to create the air purifier.





# SCIENCE CONNECTION

*What is COVID-19?*

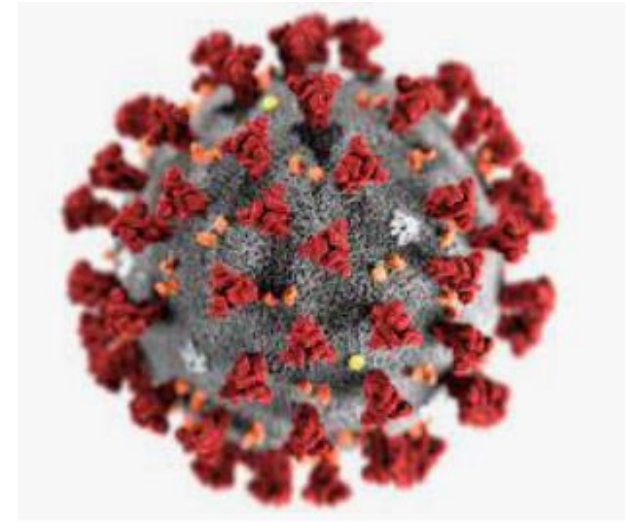
**A disease caused by a virus named SARS-CoV-2 that can be easily transmitted from one person to another.**

Science research discovered that COVID-19 can be transmitted by little droplets from coughs or sneezes.

Research shows that the particle size of SARS-CoV-2 is around 0.1 micrometer ( $\mu\text{m}$ ). <https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html>

"When used properly, air purifiers can help reduce airborne contaminants including viruses in a home or confined space. However, by itself, a portable air cleaner **is not enough** to protect people from COVID-19." <https://www.epa.gov/coronavirus/will-air-cleaner-or-air-purifier-help-protect-me-and-my-family-covid-19-my-home>

Standards: Companies that make purifiers need to adhere to state regulations and industry standards .





# Why it is so important to build the most efficient air purifier.

## Daily Update for the United States

### Cases

New Cases (Daily Avg)

110,353

Case Trends



May 2022

Jun 2022

### Deaths

New Deaths (Daily Avg)

307

Death Trends



May 2022

Jun 2022

### Hospitalizations

New Admissions (Daily Avg)

4,776

Admission Trends



May 2022

Jun 2022

### Vaccinations

% First Booster Dose

33.6%

People Age 5+



Total Cases

86,978,283

Total Deaths

1,011,508

Current Hospitalizations

25,643

Total First Booster Dose

105,093,591



# SCIENCE CONNECTION

- Ways that airborne particles can be trapped using a purifier
  - Static electricity
  - Two separate compartments
    - One to pull in dirty and one to blow out clean air
- Water



## TEAM ACTIVITY

- Student Teams will design an Air Purifier that is both efficient and cost effective using at least 5 common household items.
- Teams may also use classroom supplies such as paper products; glue, tape, rulers ...
- Teams will utilize the 5S and 5 Why steps to organize and construct product.
- Teams will use link below to assess team performance in the 5 areas listed.

Use this LINK to access FORMATIVE and COMPLETE the Survey...



# PROTOTYPE

*Will our design  
successfully  
purify the  
air??*





# MARKETING

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Commercial