



2020 National Engineering Design Challenge Judges Training: Poster & Symposium

Thank You!

Thank you for volunteering to score posters!

We created this slide deck to provide some information about scoring. Thanks for taking the time to review it!



Agenda

- What is MESA?
- Things to keep in mind
- About the competition
- Rubric scale
- Rubric parts
- Logistics of scoring

Pro Tip:

Have a copy of the rubric in front of you while we go over it

[Poster Rubric](#)

[Poster Overview](#)

[Entire Competition Rules](#)

What is MESA USA?

- Mathematics Engineering Science Achievement
- Classroom and After School programs
- Human Centered Design & STEM
- 10 States
- Underrepresented in STEM
- Over 49,000 K-12 and college students are served annually

Why Training?

1. Inter-rater reliability
 - The degree of agreement among raters.
 - Common understanding of expectation for each part of rubric
2. Consistency among states
3. Context of the Poster within the scope of the entire National Competition
4. Familiarity with specifications and the rubric
5. Provide information about MESA students. Set expectations

About the Competition

- Teams of 3-4 students
- Must be designed around the needs of a client.
- An Arduino microcontroller must be part of the solution
- Students will
 - Write a Product Report
 - Give a Product Pitch
 - Give a Technical Presentation and have an Interview
 - Create a Poster

Competition Components

- Technical Presentation & Interview-100 points
- Poster & Symposium - 50 points
- Project Report - 100 points
- Prototype Pitch - 100 points

Total: 350 points

The Poster

Objective

Provide an overview of the project, highlighting key points of the design process including relevant data, presenting the resulting prototype, and share conclusions and recommendations for further development.

Contents: Poster

- a. Problem Statement
- b. Objective
- c. Prototype
- d. PseudoCode
- e. Trade Table
- f. Data
- g. Results/Conclusions
- h. Client Requirement List
- i. Readability
- j. Title/Tagline

Scale for all items

No half points!

(5)-Exceptional: Exceeds all aspects of the standard when possible.

(4)-Excellent: Meets all aspects of the standard very effectively.

(3)-Good: Meets all aspects of the standard effectively but no more;

(2)-Fair: Almost meets the standard. May be inaccurate or unclear.

(1)-Poor: Attempts to meet the standard but provides information which is irrelevant or unnecessary.

(0)-Not present: No attempt appears to have been made to meet this standard.

Pro Tip: Judges may not award half points. Whole points only!

Poster Rubric 2019-2020

School: _____ MS HS State/Center: _____

Poster Rubric	LEVEL OF MASTERY					
	Exceptional (5 points)	Excellent (4 points)	Met Criteria (3 points)	Fair (2 points)	Poor (1 point)	Not Present (0 points)
Problem Statement: The team adequately defines the problem being addressed and the client being served by the team in 50 or fewer words						
Objective: An adequate describes how their project address the problem and may include information about the variables addressed, desired attributes, and/or design choices made in 50 words or less						
Prototype: A visual graphic of the prototype is present and highlights innovations and/or important components of the design						
PseudoCode: Includes an adequate description or example of the processes that run the Arduino and the prototype that can be understood by most observers.						
Trade Table: Provides an adequate comparison between the prototype and current products on the market. Includes at least two points of comparison						
Data: Provides graphs or tables that present relevant information from the results of testing to increase the observers understanding of the project.						
Results/Conclusions: Includes an adequate summary of design process including final results and discussion about the next steps of the project to improve design or bring it to market						
Client Requirement: A graphic or list of requirements that the client has identified to be addressed by the team						
Readability: The poster is easy to read and has a balanced amount of graphics vs. text			Graphics: About half Text: Concise	Graphics: Some Text: About half	Graphics: A few Text: More than half	Mostly text
Title/Tagline: Includes a title and takeaway line for the poster.			Creative & Memorable	Sufficiently Explanatory	Simple Summarization	None
Size: No more than 36" x 48" and no less 24" x 36"					Yes	No
School Name included					Yes	No
Team Member's Names included					Yes	No
Official MESA logo included					Yes	No
Column Totals:						
Total:						

Sample Poster for Training



National Engineering Design Competition Arduino Based Solutions for Humans



Peoria High School - High School Division

"Delta CO"

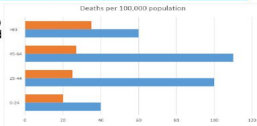
Team: Addison Sears, Diego Cardenas, Teresa Thai, Zhela Sabir

Background

History has shown us that as our world has constantly been advancing, progress is shown through man's endeavor to reach new goals. Like noted "necessity is the mother of invention", through the application of engineering, mathematics, science, and design, humanity can positively impact various obstacles.

Problem

Carbon Monoxide, a colorless gas, has caused more than 5,000 individuals to die. CO is produced from the partial oxidation of carbon-containing compounds. This displaces oxygen in the blood and deprives the heart and other vital organs of oxygen. CO poisoning may occur sooner in young children, elderly people, and so on.



Objective/Overview

Clients need a CO alarm to detect and warn; our design advances use by acting as a ventilation system also. An RF signal has been added to open the garage door alleviating the air. Our design is a compact, effective and visible one which is contained inside a 3D printed box we designed.

Data/Research

Carbon Monoxide

- CO is an order less and colorless gas, known as the "silent killer".
- CO poisoning symptoms are similar to the flu.
- Part of suicide
- Being exposed to such can lead to peripheral artery disease, cardiomyopathy, etc.

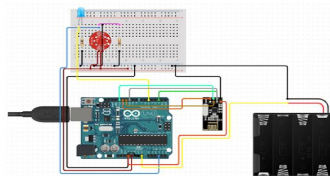
Information of Parts

- Arduino website offers software to download called IDE (integrated development environment) that runs on your computer, used to write and upload code to the physical board.
- A servo mechanism that uses position feedback to control its motion and final position.
- The carbon film resistor is a type of fixed resistor that uses carbon film to restrict the electric current to certain level.

Support

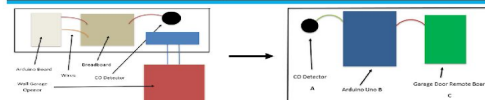
- January 12, 2018- Interview with Smoke's Garage Doors, Mr. Kevin M. Pettette, affected by CO.
- GCU- meeting with engineering students for wiring and programming basics.

Product Prototype



Once the CO sensor reaches an unhealthy amount of CO it will make the Arduino send a RF signal which then opens the garage. If the CO sensor doesn't catch a dangerous wave it will continuous run in the No loop until told otherwise.

Design Process



Our final idea is to take apart a wireless garage door remote tech that's inside (Bluetooth connection to main operator which sends signal to open the garage door.) and connect that to the Arduino board that has CO detectors connected to it. In simpler terms the signal of unhealthy CO would be sent to Arduino, secondly send signal to garage door opener tech, which lastly sends signal to operator to open the garage door.

Code



Code Excerpt:

```

// define vars for testing menu
const int timeout = 10000; //define timeout of 10 sec
char menuOption = 0;
long time0;

// Setup the essentials for your circuit to work. It runs first every time your circuit is powered with electricity.
void setup() {
    // Setup Serial which is useful for debugging
    // Use the Serial Monitor to view printed messages
    Serial.begin(9600);
    while (!Serial) {} // wait for serial port to connect. Needed for native USB
    Serial.println("Start");
}
    
```

Materials

Materials	Quantity
Arduino Uno	1
CO Sensor	2
RF Circuit Board	1
Breadboard	1
Battery Holder	1
Wires	9
Digital Switch	1
10K Ohm Resistor	1

- Employing Dermal Digilan 3D20 to make product presentable. This printer has a print resolution of 100 microns in a build volume of 230mm x 150mm x 140mm (9" x 5.9" x 5.5").
- Spark Fun package
- Programs: Tinker CAD and On-Shape

Trade Table

Aspect	Delta CO	Code One Battery Operated Carbon Monoxide Detector
Specifications	- Alarm sounds and opens garage door - Utilizes MQ7 CO sensor to detect levels	- Alarm sounds at high level of CO - Utilizes an electrochemical sensor to detect CO
Features	- Once triggered by a level of CO, the sensors cause the garage door to open - Battery operated	- After detecting dangerous CO levels, alarm goes off - Battery operated

Conclusion

During the production of the design, there has been challenges such as, finding a way to connect the RF signal board to the Arduino Uno and Breadboard. Now, the final design serves as a multipurpose tool for families and has the potential of increasing their protection tremendously. These tools are able to adapt to different areas including various climates. At minimum, the Penguin-1 is able to successfully complete the first mission required while having the potential and flexibility of achieving a variety of future missions.

Test of range

Distance	Yes or No
7 ft 6 in	Yes
13 ft 7 in	Yes
15 ft 3 in	Max
17 ft	No

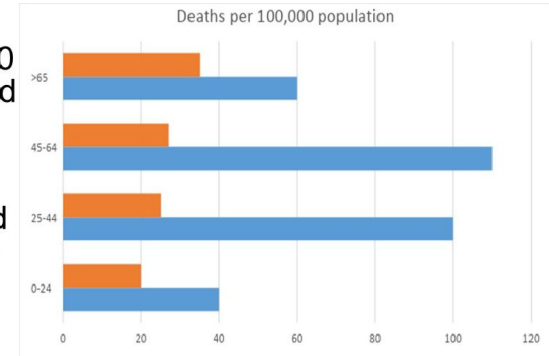
Problem Statement

The team defines the problem that they are trying to solve with their device.

This statement gives a good description of the problem they are addressing. However, it does not address the client or their needs. It is a little wordy. It scored a 2.

Problem

Carbon Monoxide, a colorless gas, has caused more than 5,000 individuals to die. CO is produced from the partial oxidation of carbon-containing compounds. This displaces oxygen in the blood and deprives the heart and other vital organs of oxygen. CO poisoning may occur sooner in young children, elderly people, and so on.



Objective

The team provides a succinct overview of their prototype and its capabilities. The information provided allows the reader to understand the purpose of the prototype, who it was designed for, and what is it designed to do.

Objective/Overview

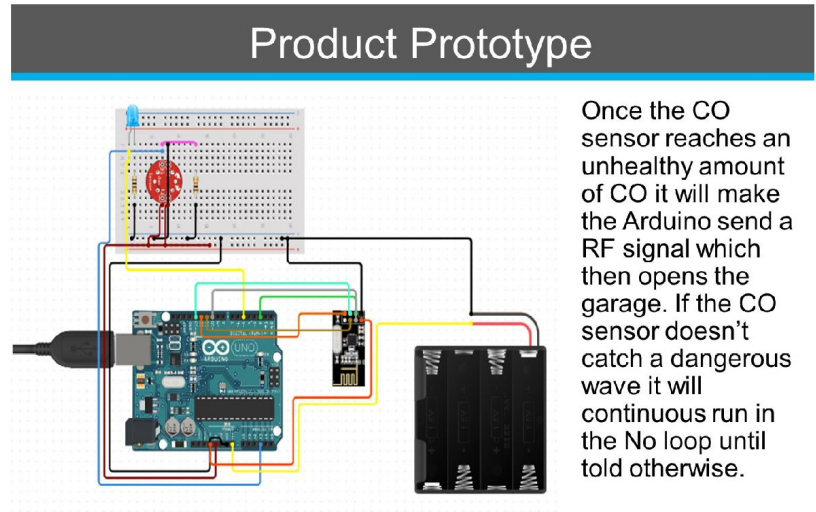
Clients need a CO alarm to detect and warn; our design advances use by acting as a ventilation system also. An RF signal has been added to open the garage door alleviating the air. Our design is a compact, effective and visible one which is contained inside a 3D printed box we designed.

This describes the system they have designed. It meets the criteria of the objective but does not offer any more information. This scores a 3.

Prototype

This is where a picture/technical drawing of the prototype would occur. It would highlight any innovative components and/or important design choices.

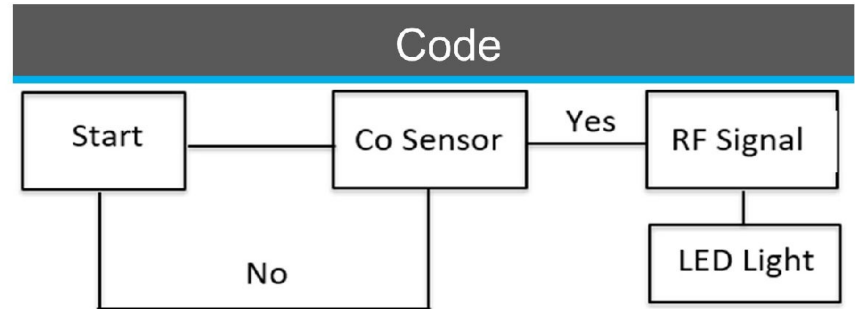
This is a great picture of the prototype. We can clearly see all the components and the description of how it functions it very clear. This scores a 4. If components were labeled it would be a 5.



PseudoCode

The team will provide a copy of their PseudoCode for the Arduino.

This provides a good picture of how the code functions within the system. There is a nice flowchart. The actual code is unnecessary and is not scored. This scores a 4.



Code Excerpt:

```
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long time0;

// Setup the essentials for your circuit to work. It runs first every time your circuit is
powered with electricity.
void setup()
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  // Use the Serial Monitor to view printed messages
  Serial.begin(9600);
  while (!Serial); // wait for serial port to connect. Needed for native USB
  Serial.println("start");
```


Trade Table

The team had provided a comparison between their device and similar devices currently on the market.

Trade Table		
Aspect	Delta CO	Code One Battery Operated Carbon Monoxide Detector
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Features	- Once triggered by a level of CO, the sensors cause the garage door to open - Battery operated	- After detecting dangerous CO levels, alarm goes off - Battery operated

The team has provided a table. It compares their system to one currently on the market. It is a simple comparison between the two products. This scores a 3.

Data

This section is where students will present their data from tests with analysis.

The team has provided information about carbon monoxide, their parts, and support. There is no testing information. This was scored a 2. The team does have more data in a different section, as can be seen on the next screen

Data/Research

Carbon Monoxide

- CO is an order less and colorless gas, known as the "silent killer".
- CO poisoning symptoms are similar to the flu.
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Information of Parts

- Arduino website offers software to download called IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.
- A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position.
- The carbon film resistor is a type of fixed resistor that uses carbon film to restrict the electric current to certain level.

Support

- January 12, 2018- Interview with Smokey's Garage Doors, Mr. Kevin M. Pettiette, affected by CO.
- GCU- meeting with engineering students for wiring and programming basics.

Results/Conclusions

This section is where students will present their results and conclusions on their project.

The team has a conclusion that summarizes their system with alluding to possible upgrades. This scores a 3.

Conclusion

During the production of the design, there has been challenges such as, finding a way to connect the RF signal board to the Arduino Uno and Breadboard. Now, the final design serves as a multipurpose tool for families and has the potential of increasing their protection tremendously. These tools are able to adapt to different areas including various climates. At minimum, the Pengiun-1 is able to successfully complete the first mission required while having the potential and flexibility of achieving a variety of future missions.

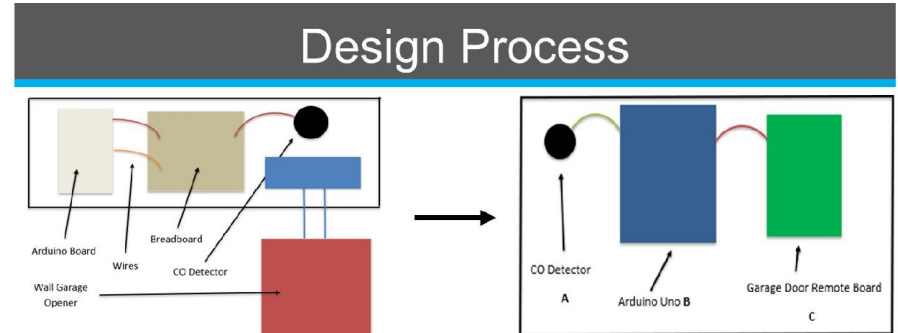
Test of range

Distance	Yes or No
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15 ft 3 In	Max
17 ft	No

Client Requirement List

In this section, teams are to list the non-negotiable systems and/or features that the client wants on their prototype. It should be a bulleted list.

The team chose to instead include their design process rather than client requirements. This would score 0. If a section is left off the poster, the score for that section would score 0. If it is mislabelled, the highest score possible is 4.



Our final idea is to take apart a wireless garage door remote tech that's inside (Bluetooth connection to main operator which sends signal to open the garage door.) and connect that to the Arduino board that has CO detectors connected to it. In simpler terms the signal of unhealthy CO would be sent to Arduino, secondly send signal to garage door opener tech, which lastly sends signal to operator to open the garage door.

Readability

We want the posters to be easily read. Here is where that is taken into account.

Scoring:

- 3** – The poster is about half graphics and all text is concise. No paragraphs
- 2** - The poster is about half text that has a paragraph with some graphics
- 1** – The poster is more than half text.
- 0** - The poster is mostly text

The team has some lengthy text with a lot of graphics. This poster scores a 2.

Title/Tagline

The team should have a title for their project and a tagline at the bottom to help readers remember their product.

Scoring:

- 3** – The title and tagline are creative and easy to remember
- 2** - The title and tagline sufficiently explain the project
- 1** – The title and tagline are summaries of project
- 0** - No title and tagline

The team has a title but no tagline. This scores a 1.

Example of a tagline: “Delta CO2: Relax and Just Breathe”

Size

The poster is between 24" by 36" and 36" by 48"

At MESA Nationals, all posters must be printed. No trifold are allows

Scoring:

1 – Yes, it is between these sizes

0 – No, it is not between these sizes

School Name, Team Members, Logo

The posters need to have the school name, names of all the team members, and the official MESA Logo. Each one is required and worth one point.

Scoring:

1 – Yes, it is included

0 – No, it is not included

Questions?

If you have any questions while scoring, please look back at these slides or reach out to your point of contact.

Thank you for serving as a judge for the National Engineering Design Competition.
We will see you at MESA Day!

Thank you!