MESA UTAH 2017-2018
ARDUINO AWARD CERTIFICATES

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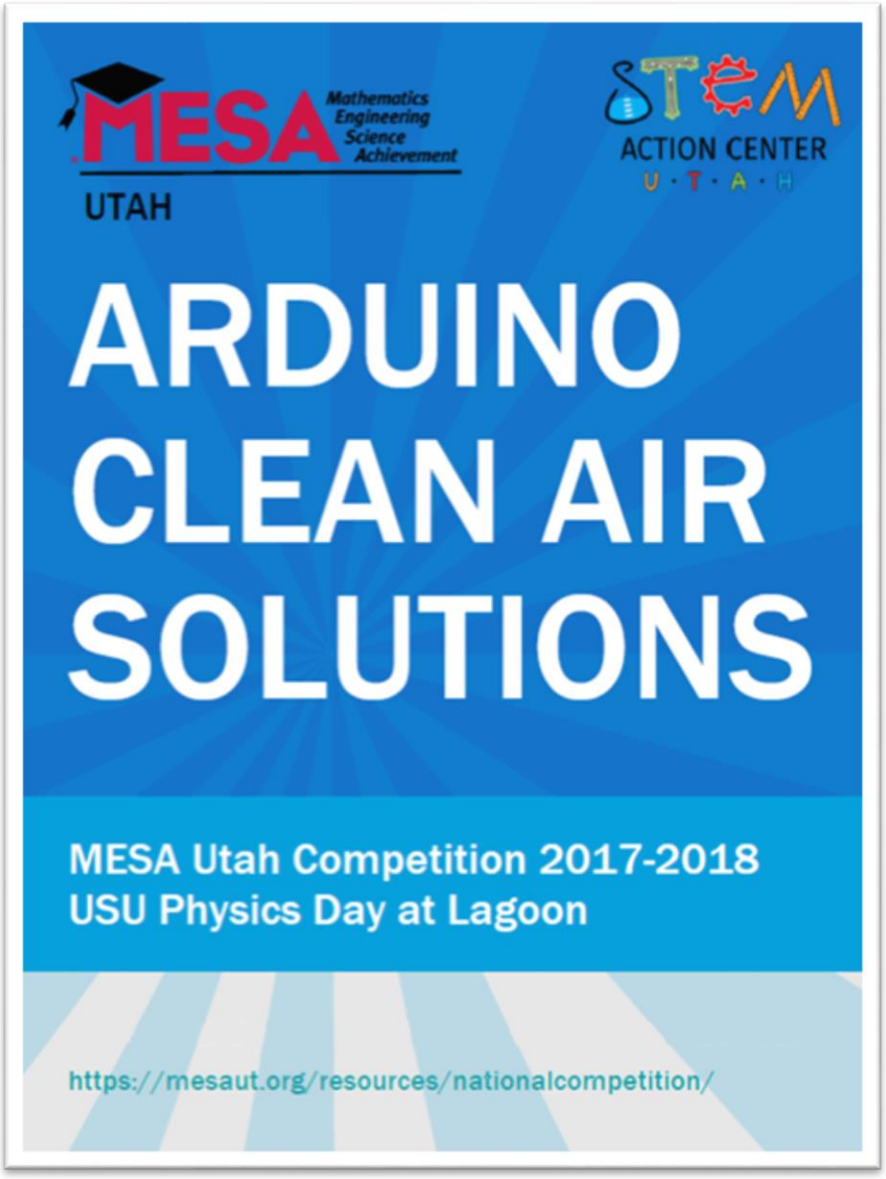

AWARD CETIFICATES

The following award certificates are available for MESA students using Arduino Kits in the 2017-2018 School Year.

BEGINNING ARDUINO AWARD CERTIFICATE

To start, you will need an Arduino kit (*the Sunfounder Super Starter Kit V3 is recommended*), an Arduino board, and a computer that has the Arduino IDE installed. The following resources may be helpful for beginners:

- Introduction to the Arduino — http://bit.ly/youtubearduino (Afrotechmods); http://bit.ly/pgavid1 (Progr. Academy)
- Introduction to the IDE — http://bit.ly/pgavid2 (Progr. Academy); http://bit.ly/pgavid3 (Progr. Academy)
- Intro to Arduino Code/Syntax — http://bit.ly/pgavid4 (Progr. Academy)
- Intro to Variables — http://bit.ly/pgavid5 (Progr. Academy)
- Introduction to the Breadboard — http://bit.ly/youtubebreadboard (Science Buddies)

To apply for the certificate, **complete an application by May 1, 2018:**
https://www.surveymonkey.com/r/arduinoaward

COMPLETE AT LEAST 7 OF THE FOLLOWING

https://www.sunfounder.com/learn/category/Super-Kit-V3-0-for-Arduino.html

Your advisor may adjust the Beginning Arduino Award Certificate requirements for your MESA club. Show each completed project to your MESA advisor or to your parent/guardian. Take some photographs of yourself with your projects. If you have the *Sunfounder Super Starter Kit V3*, you already have all the parts you need for these projects. Complete the two surveys and 5 other activities.

Activity	Start Date	Finish Date
0. ***Pre-Survey - REQUIRED*** https://www.surveymonkey.com/r/mesapresurvey		
1. **Blinking LED** http://bit.ly/sfblink		
2. **Controlling an LED by Button** http://bit.ly/sfbutton		
3. **Slide Switch** http://bit.ly/sfslide		
4. **Breathing LED** http://bit.ly/sfbreathingled		
5. **RGB LED** http://bit.ly/sfrgb		

Lesson	Start Date	Finish Date
6. **Serial Monitor** http://bit.ly/sfserial		
7. **Controlling an LED by Potentiometer** http://bit.ly/sfpotentiometer		
8. **Flowing LED Lights** http://bit.ly/sfflowing		
9. **Relay** http://bit.ly/sunfrelay		
10. **4N35** http://bit.ly/sunf4n35		
11. **DC Motor Control** http://bit.ly/sunfmotor		
12. **LCD1602** http://bit.ly/sunflcd		
13. ***Post- Survey – REQUIRED*** https://www.surveymonkey.com/r/arduinoaward		

ARDUINO ENGINEERING DESIGN PROCESS AWARD CERTIFICATE

Once you are familiar with the Arduino, form a group of 2-4 people and begin work on your Arduino Clean Air Solutions project (see rules on page 8). Document your process in working through the following steps. Put all of your notes in a binder or keep them in a Google Drive folder. Your project must include an Arduino and relate to the "Clean Air Solutions" theme.

To apply for the certificate, **complete an application by May 1, 2018**:
https://www.surveymonkey.com/r/engineeringdp

Before you get started, consider the following:

Clean air is essential to human health and to all life on earth. We each breathe air into our lungs about 17,000 times daily. Our lungs collect oxygen from the air and transfer it to our red blood cells. Unfortunately, our lungs also transfer dangerous toxins from the air into our bodies.

According to the World Health Organization (WHO), breathing polluted air is the world's largest preventable health risk. The WHO estimates that seven million people die annually of diseases related to exposure to polluted air.

In Winter, parts of Utah often become home to the dirtiest air in the United States. But we aren't just exposed to toxic air pollutants when we go outside into the smog; we are also exposed inside our cars, homes, schools, and public buildings.

Identify an air pollution problem that your group will attempt to solve. Do not try to solve the broad problem of all types of air pollution in all places. Focus, instead, on a narrow air pollution problem.

Think about who the specific people are that this specific problem most effects. These will be your clients. You will design an Arduino-based solution to help your clients. Your device must be cost-efficient and your group will need to be prepared to justify all expenses.

Your device must either:

A. help your clients cope with negative effects of polluted air,
B. help your clients clean polluted air, or
C. help your clients reduce production of air pollution.

For resources, see: https://mesaut.org/resources/nationalcompetition/

Complete steps 1 through 11:

1. **Take the Pre-Survey:** https://www.surveymonkey.com/r/mesapresurvey

2. **Write a problem statement.** Start with a rough draft. Revise your problem statement after doing research (#3 and #4). As you run into limitations (in steps #5 through #10), list them in your problem statement. (For example: cost will limit the kinds of materials

you can use in your design.) Your final problem statement should meet the following criteria:

- *The problem is clearly articulated with well-defined parameters.*
- *The needs of the client have been carefully weighed to design a solution.*
- *All limitations are clearly identified.*

3. **Inspiration: Research.** Conduct research on your problem. What published information is available? How have others tried to solve this problem? Conduct interviews with potential "clients," the people who will eventually use your design solution. Take notes on all of your research and add your notes to your binder or Google Drive.

   - *The prior knowledge, research, and interviews with client(s) is clearly articulated.*

4. **Inspiration: Clients' Needs.** Make a list of the needs your client has for your device. What does your client need your device to do. Be sure you remember your client's needs as you continue working on the design process.

   - *The client's needs are clearly accounted for during the Inspiration process.*
   - *The needs of the client have been carefully weighed to design a solution.*

5. **Ideation: Design & Link to Inspiration.** Design a prototype. Keep drawings or schematics of your designs. Keep copies of each version or draft of your Arduino code, so you can document your progress. Make sure your prototype addresses your client's needs. If your prototype doesn't work at first, fix it, and document how and why you changed it.

   - *A clear path leads from Inspiration to Ideation.*
   - *Designs are clearly articulated with reference to knowledge gained.*
   - *The design process is clearly iterative and clearly shown to have been repeated with multiple iterations. (Iterative simply means doing something again and again in order to improve it. An iteration is a version.)*

6. **Ideation: Math and Science Concepts.** Make a list of all the math and science concepts that are relevant to your project.
   - *Math and Science concepts are clearly articulated as part of the design.*

7. **Implementation: Data & Analysis.** Test your prototype. Collect data on how it functions. Graph your data. Document your testing process (write an explanation) and your data (keep your notes, charts, and graphs.)

   - *Data is recorded and shown as part of tests in graphical form. The data is relevant and useful.*
   - *Data is clearly used to determine strengths and/or weaknesses.*

8. **Iteration: Update your Design**. Based on your testing, what change(s) does your design (or code) need? Make the change(s) and test your design again. Make sure to document all changes, tests, and data.

   - *Data is used to inspire new ideas.*
   - *Data is clearly used to return to the Inspiration phase to improve the design.*
   - *The design process is clearly iterative and clearly shown to have been repeated with multiple iterations.*

9. **Iteration: More Updates to your Design.** Repeat step 8 as many times as needed.

10. **Project Interview.** Show your project and all of your notes and data to your MESA advisor. Talk to your advisor about what you learned.

11. **Complete the Post-Survey (Award Certificate Application):** https://www.surveymonkey.com/r/engineeringdp

ARDUINO ENGINEERING DESIGN COMPETITION PARTICIPATION CERTIFICATE

If you compete in the state competition, you will receive a certificate of participation. You may also win the opportunity to represent Utah at the MESA National Engineering Design Competition in Philadelphia.

The state competition will be held at Lagoon on Friday, May 18, 2018.

Rules and Rubrics for the competition events are available at:
https://mesaut.org/resources/nationalcompetition/

You will need to be prepared to compete in the following:

- Project Report (5 to 10 Pages)
- Prototype Pitch (10 Minutes)
- Technical Interview
    - Prototype Demonstration
    - Technical Poster

Please Note:
The length of prototype pitch presentation has been reduced from 20 minutes to 10 minutes.

Additional Rules for the Utah Competition

1. Your device must relate to solving problems associated with air pollution.
2. Each team must consist of at least 50% female and/or ethnic minority students.
3. Your team will use an engineering design notebook as you are designing your device. Teams must bring their notebooks on the day of the competition.
4. Follow the rules and guidelines outlined in the MESA Arduino STEM Solutions 2017-2018 rules packet (link above).
5. Projects that include human subjects, vertebrate animal subjects, or hazardous substances, will need to (A) follow school and district rules and (B) gain SRC/IRB approval: https://slvsef.org/faq#src. (The purpose of this rule to keep you safe. Ask your advisor for advice if you have questions.)
6. Registrations for the state competition are due by **April 16, 2018**. Register using this form: https://www.surveymonkey.com/r/mesaair18. *(Note: This date was originally posted as April 6, but additional time has been granted.)*
7. Project reports are due by **April 30, 2018**. Email project reports in PDF format to mesautah@graniteschools.org. *(Note: This date was originally posted as April 16, but additional time has been granted.)*
8. The requirement to wear matching event T-shirts is waived for the Utah competition.