2020-2021 MESA USA
National Engineering Design Competition
Designing for Equity

Arizona Addendum to National Specifications

WITH THE EXCEPTION OF THE FOLLOWING, ALL THE SPECIFICATIONS IN THE DOCUMENT THAT FOLLOWS WILL BE FOLLOWED.

NUMBER OF TEAMS: One (1) team per school can participate at the MESA Day state competition. Up to three (3) teams can participate at MESA Regionals. Subject to change.

TEAM MEMBERS 4 students (at least 2 female students) required

DESIGN BRIEF DEADLINE AND SUBMISSION:

- Teams must use the provided Design Brief Template.
- Design briefs MUST be submitted in Portable Document Format (.PDF). Teams shall ensure the submitted final brief can be read using Adobe Reader (10.0 or newer) and that it matches your original document. A PDF version of the completed design brief template must be e-mailed to: Arizona MESA, Head Judge at azmesa@email.arizona.edu. Check the MESA USA national website at mesausa.org for further information. Design Briefs submitted in a format other than PDF will be assessed at 10-point penalty. No exceptions.
- Design Brief must be submitted via e-mail to Arizona MESA on or before **5:00 pm, Wednesday, April 7, 2021**. The design briefs will be judged and scored prior to MESA Day.
- Design Briefs shall be e-mailed to: Arizona MESA, Head Judge at *azmesa@email.arizona.edu*.
- Design Briefs received after 5:00 pm will be assessed automatic 10 point deduction.

POSTER REQUIREMENTS, DEADLINE AND SUBMISSION:

- Posters must be done as a single PowerPoint Slide with maximum dimensions of 36" x 48".
- A PDF version of the Academic Poster must be submitted via e-mail to Arizona MESA on or before **5:00 pm, Wednesday, April 7, 2021.** Posters will be judged and scored prior to MESA Day.
- Posters shall be e-mailed to: Arizona MESA, Head Judge at *azmesa@email.arizona.edu*.
- Posters received after 5:00 pm will be assessed automatic 10 point deduction.

VIRTUAL PITCHES AND TECHNICAL INTERVIEWS:

- Details for virtual delivery of Pitches and Technical Interviews will be provided in the Spring of 2021.

DUE DATES

- All submissions are due by **5:00 pm on Wednesday, April 7, 2021**. Deadlines are subject to change depending on the ongoing COVID pandemic.
- No submissions will be accepted after **5:00 pm, Friday, April 9, 2021**

COMMITMENT

- By participating in this event all team members are committing to be available for all of the following events.
    - Regional Event – February 2021
    - MESA Day –April 24, 2021
    - MESA USA National Competition – 3rd or 4th week of June 2021
- If a team member feels they cannot commit to participating in these days they should consider leaving the team or having an alternate team member. Teams that are unable to have all 4 members at an event could be disqualified.

MESA USA

NATIONAL ENGINEERING DESIGN COMPETITION (NEDC)

2020-2021

Designing for Equity

Overview:
In order to maximize each team's experience during this event, proper execution of all aspects of the judging process and event administration is very important. Although each MESA state may elect to present this event in different format(s), the MESA USA host site and the corresponding National Event Planning Committee will adhere to the information outlined in this document.

MESA USA Code of Sportsmanship:
At all times during the course of this event, MESA students, staff, advisors, and supporting family members should act in a professional and courteous manner. All judges' decisions are final. Staff, advisors, and parents shall not engage judges during the event.

Contents

Introduction

Simply stated, *Designing for Equity* means designing to minimize or eliminate barriers to opportunities for success.

According to the World Health Organization, equity is the absence of avoidable or remedial differences. Those differences can be defined socially, physically, physiologically, geographically, economically, or demographically. Given the current state of the world, *Designing for Equity* has never been more important.

The Creative Reaction Lab, explains that "Equity-Centered Community Design is a unique creative problem-solving process based on equity, humility-building, integrating history and healing practices, addressing power dynamics, and co-creating with the community. This design process focuses on a community's culture and needs to create a future with equity for all. …Through Equity-Centered Community Design, we are building and supporting an emerging movement of equity designers who take on systems with self- and systemic-awareness of oppression, creativity, and action. These designers—students, activists, organizers, educators, government staff, hospital workers, and beyond—seek to disrupt and dismantle these challenges in, and with, their communities: school, city, family, culture, and so on."

Competition Overview

The theme for the 2020-21 MESA USA National Engineering Design Competition is: ***Designing for Equity.***

For this project, student teams will identify an individual or group who experiences some type of inequity (i.e., a user). Using a microprocessor as the key component of the design, teams will employ human-centered design practices to engineer a solution. Teams must use at least one of the following microprocessors as the main component of their design: ***Arduino, Circuit Playground Express, and/or Micro:bit.***

Examples of *Designing for Equity* can be (but are not limited to) projects that address:

- A physical or learning disability;
- Food scarcity;
- Access to healthcare;
- Access to clean water or other resources;
- Access to employment or education; or
- A social inequity.

Each competing team must consist of 2-4 students who are active members of a MESA program affiliated with the MESA USA national organization. Solutions and recommendation(s) for next steps will be presented at the MESA USA National Engineering Design Competition. The first place middle and high school teams from State events will participate in the national competition. This National Competition event will occur in June 2021 in Arizona.

Competition Components

The components listed below will be used to assess the effective implementation of a human-centered design approach in the context of designing for equity, effective implementation of the engineering design process, and the functionality of the prototype.

High school and middle school teams selected to participate in the National Competition will compete in the four components below:

1. **Design Brief** - The objective of the Design Brief is to provide a brief, non-technical overview of the entire project. Students must use the provided Design Brief Template (see Appendix).
2. **Technical Presentation and Interview**- The objective of the Technical Presentation and Interview is to provide an overview of the prototype functionality including a technical explanation of the mechanical operations, software operations, and integration of the two. Students will deliver a short presentation, which includes a demonstration of the functionality of the prototype, followed by a question and answer session with judges.
3. **Poster and Symposium** - The objective of the Poster is to provide an overview of the project, highlight key points of the design process, discuss relevant testing and data collection, present the resulting prototype, and share recommendations for further development. Students will prepare a printed academic poster, which will be used during a public poster symposium to provide an overview of the project and the prototype.
4. **Prototype Pitch -** The objective of the Prototype Pitch is to convince the audience that the design meets the user's needs and has value as a product to address an issue of inequity. Students will prepare a creative, engaging presentation to pitch their prototype to an audience, including a group of judges. The presentation should define the problem; should show how they address the theme of *Designing for Equity*; provide a detailed description of the user and their needs; discuss current solutions to the problem and their weaknesses; and provide a demonstration of their prototype highlighting its advantages.

MESA USA strongly encourages teams to participate in all components at state-level competitions. However, states may opt not to do all components or alter some requirements for their local and state events as needed. Individual states will determine the dates and location of their respective events. Teams participating in the National Competition must compete in all four components described above.

Scoring Summary

At the National Competition, awards will be presented for each component of the competition. Overall ranking will be based on the total score, which is derived by adding the scores for each component. Below is a summary of the point values for each component:

Design Brief	**50 points (15%)**
Poster Symposium	**75 points (23%)**
Technical Presentation & Interview	**100 points (31%)**
Prototype Pitch	**100 points (31%)**
Total	**325 points (100%)**

The guidelines that follow and the scoring sheets at the end of this document provide detailed information about judging criteria.

Continuing Projects

MESA USA recognizes that there is both an interest in and benefit for student teams to continue work on a project started in previous years. However, as this is the start of a new National Engineering Design Competition cycle, all projects must be new and original. Teams cannot continue working on a project started in previous years.

Plagiarism Policy

Academic honesty and personal integrity are essential to ensure future success as college students and STEM professionals. As such, MESA USA expects that the work presented as a part of the National Engineering Design Competition will be solely the work of the students. If the work or ideas of another are used to further students' work, proper credit must be given to the owner. Failure to do so will result in an act of plagiarism. If it is determined that a student committed plagiarism, they will be disqualified from the competition and they will be ineligible to receive any awards. They may also risk further sanctions from MESA USA and/or their MESA state organization.

Design Brief

Objective: The Design Brief provides a brief, non-technical overview of the entire project. The design brief is a short document that can be used alone or as support during the presentations and poster symposium to provide the reader with enough information about the project to:

- understand the target user and the challenges they face that inspired the project;
- state the project goals;
- provide a general idea of the prototype and its key features;
- relay the current status of the project;
- convey the expected impact for the user and how perceived inequities are relieved;
- reflect on the team's experience implementing the Human Centered Design Process.

Format: Teams must use the Design Brief Template (see Appendix).

Required Elements

1. Problem Statement: Describe the people who will benefit from the project and the challenges they face. Discuss the issues of inequity that the project hopes to address. 100 word maximum
2. User Research: Discuss key information about the users gathered through your research, interviews, and ongoing discussion with the user throughout the project. The information shared here should be directly related to the user's needs, insight, goals, and prototype. 200 word maximum
3. User Insight: Discuss your team's understanding of the experiences, emotions, and motivations of the users. This insight should inform the rest of the project and help the reader have a deeper understanding of the inequity of the user. 200 word maximum

4. User Needs: Develop a specific list of the user's needs produced from the user insight. The needs should be reflected in the project goals. 100 word maximum
5. Project Goals: List project goals and describe how they are linked to and will adequately meet the user's needs and address inequities and/or barriers faced by the user. Meeting these goals should be reflected in the key features and graphic(s) provided. 100 word maximum
6. Key Features of Design: List key features, illustrating that the design will adequately meet project goals. 200 word maximum
7. Prototype Graphic: Include a graphic that is easy to understand with key features that are adequately labeled. The reader should have a general understanding of how the prototype functions by looking at the graphic.
8. Status of Project: Describe the current status of the project and discuss potential next steps. 200 word maximum
9. Impact: Discuss how design addresses inequities for the user and/or removes barriers. This impact should reflect how the team met the project goals. 200 word maximum
10. Reflection: Show that the team has an increased understanding of human-centered design. Examples of personal growth and insights gained about designing for others and helping them overcome challenges should also be included. 200 word maximum

Deadline for Design Brief:

- *Local/State competitions:* Check with your local MESA office about the procedure for submitting the design brief to local/state competitions.
- *National Competition.* For teams advancing to the national competition, the design brief must be submitted via e-mail to Arizona MESA on or before 4:00 pm in your local time zone, on **June 4, 2021** (subject to change)**.** Briefs should be submitted by a student team member. The briefs will be judged and scored prior to the National Competition. Late submissions will be assessed a 10-point deduction. No submissions will be accepted after **June 7, 2021** (subject to change)**.**
- Design briefs **MUST** be submitted in Portable Document Format (.PDF). Teams shall ensure the submitted final brief can be read using Adobe Reader (10.0 or newer) and that it matches your original document. A PDF version of the completed design brief template must be e-mailed to: Arizona MESA, Head Judge at azmesa@email.arizona.edu. Check the MESA USA national website at mesausa.org for further information. Reports submitted in a format other than PDF will be assessed at 10-point penalty. No exceptions.
- ***Please note that the host and Head Judge are not responsible for any internet service delays or misdirected submissions. It is the responsibility of the student team members to ensure that the brief is delivered successfully in the proper format and proper size prior to the deadline. Therefore, submission of materials in advance of the above-listed deadline is strongly recommended.***

Technical Presentation and Interview

Objective: The Technical Presentation and Interview allows judges the opportunity to determine student knowledge of their project, gain information about the design process the students used during the project, and determine the viability of the design for the user. A technical presentation has a different focus than a pitch, and therefore, this presentation should be different from the Prototype Pitch component of the National Engineering Design Competition.

Students will organize and deliver a focused, coherent presentation to provide an overview of the development of their design (including research, experimentation, iterations, and conclusions), the technical components of their design, and the functionality of the prototype. The presentation should provide an overview and demonstration of the prototype functionality as well as include an explanation of the mechanical operations, software operations, and the integration of hardware and software. After students present, judges will follow up with a Technical Interview.

Students can use their choice of support materials including, but not limited to, their design brief, poster, prototype, and other relevant materials as support during the Technical Presentation and Interview session. Displays and speeches must be the original work of the students.

Required Elements:
The technical presentation is a summary of the technical aspects of the project and the interview is a discussion with the judge panel. Together, they should address:

1. Background Information:
    a. Who is the user and what are the user's needs?
    b. How does this project fulfill the user's needs?
    c. How does the design address an issue of inequity?
2. Engineering Design Process:
    a. What was your team's methodology and process?
    b. What were any major challenges and any correlating solutions?
    c. What were the major design choices and how were they influenced by the user?
    d. How did the results of testing inform iterations of the design?
    e. How did the iterations of the design evolve during the project?
3. Description of Design:
    a. How does the design function mechanically?
    b. How is the selected microprocessor integrated into the design?
    c. How does the software function?
    d. How does the device receive input and produce output?
    e. What is the rationale for selected materials and technology?
4. Conclusion and Recommendations:
    a. What is your final assessment/evaluation of your prototype?
    b. What is the potential impact of the product on the user's life?
    c. What are the next steps for the implementation of your project?
    d. Are there any suggestions for improvement and/or redesign?
5. Prototype Demonstration:
    a. Teams must have a working prototype. If not, some areas will not be able to be scored.
    b. Teams must be able to adequately discuss their prototype design, including unique features of the design, and demonstrate the function of the device.
    c. Teams should demonstrate the usability of the prototype and how it meets the needs of the user.

Technical Presentation and Interview Rules:

1. Teams will be randomly selected to determine order. Students must conduct presentations and interviews in the order drawn. No exceptions or late arrivals are allowed.
2. The Technical Presentation and Interview session will last a maximum of 20 minutes. Teams will have up to 10 minutes to deliver a technical presentation and demonstrate the prototype (presentation time). The remaining time will be used for a technical interview (interview time) with the panel of judges.
    a. Judges will notify teams when they have 1 minute remaining in the presentation time (at 9 minutes). At 10 minutes the presentation will be stopped. Teams are allowed to incorporate time for judges to interact with their prototype, but the interaction must be concluded within the time allotted for the presentation.
    b. If the team is finished with their presentation before 10 minutes, the team will give an indication to judges that they are ready for the interview portion of the session to begin.
    c. Judges will announce when there are 3 minutes, and 1 minute remaining in TOTAL time (at 17 minutes and 19 minutes).
3. Teams are to use support material during the technical presentation and interview.
    a. Teams are strongly encouraged to use support materials such as their design brief, poster, engineering notebook, code, or other visual aids as needed to supplement their technical presentation and interview.
    b. Teams are not allowed to use electronic presentations during their technical interview.
4. Judges will be given a set of prompting questions to use during the technical interview. Questions will typically focus on gaining clarification about the team's project, gathering specific details about information the team presents, or will be in alignment with the major content areas of: Usability, Team Objective, Engineering Design Process, Materials and Technology, Data, Conclusions and Recommendations, and Support Materials.

Materials Provided:

- Easel or ample wall space for poster.
- Table for display and/or demonstration.
- Electricity will be available for the Technical Presentation and Interview.
- Wireless internet may be available, but is not guaranteed.

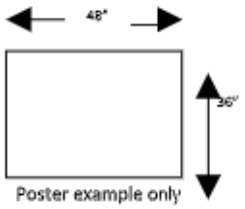
Poster and Symposium

Objective: The objective of the poster is to provide an overview of the project, highlight key points of the design process, discuss relevant testing and data collection, present the resulting prototype, and share recommendations for further development. Students will participate in a poster symposium at the National Competition. Teams will display their posters and prototypes and be available to discuss their designs and answer any questions. This event will be open to all event attendees and will provide an opportunity for student teams to interact with one another and learn more about each other's projects.

The team's Design Brief, Engineering Design Notebook, prototype, and other support materials should be available during the Poster Symposium. Electronic media is not allowed.

Required Elements:
All sections should use as few words as possible to adequately present the information. Any section requiring written explanation should be succinct. Generally, it is encouraged to use bullet pointed lists instead of text in paragraph form.

1. Size and Type: Teams must design and print a single poster for the National Competition. The maximum size of the poster is 36" by 48". The minimum size is 24" by 36".
   a. State and local events may opt to allow tri-fold presentation boards with maximum dimensions of 36" x 48". Tri-folds brought to the National Competition will receive zero points for their poster.
2. Title: Posters should include a title at the top. This section could include:
   a. A take away for people who read the poster.
   b. An identifier for the project.
3. Team Section: Must be present and include the following:
   a. School name.
   b. Grade level (Middle School or High School).
   c. State (optional at state and local events).
   d. Team members' names.



4. Logo: An Official MESA logo must be included (contact your state office for an official logo).
5. Problem Statement: This defines the problem to be addressed. This section could include:
   a. Description of problem(s) addressed by prototype.
   b. Description of users for whom the prototype is designed.
   c. Scope of the project and any priorities in design.
6. Objective: This defines how the problem is being addressed. This section could include:
   a. Primary objectives being addressed.
   b. Any secondary objectives being addressed.
7. User Requirements: This section describes the needs of the user and how your prototype meets those needs. This section could include:
   a. Graphic explaining requirements.
   b. Bullet point list of requirements.
   c. **High School Teams Only:** Address any implicit requirements. For example, if your client wants to live in Alaska the entire year, an implicit requirement is that it needs to work in below freezing temperatures.

8. Prototype: A picture/schematic of the prototype. This section could include:
   a. Short descriptions of important pieces of the prototype using callouts or short lists.
   b. Highlights of the device and labeling of main parts.
   c. Unique elements of prototype.
9. Design Process: A graphic that shows the team's design process, including specifics. A general Engineering Design Process is NOT allowed. It must be specific to your team's design process. This section could include:
   a. Flow chart with steps for the team's iterative process.
   b. Engineering Design Process with specific steps outlined.
10. Design Iteration: A graphic or list that shows multiple iterations of the design process with changes made in each adaptation of the prototype. This section could include:
   a. Flow chart that shows changes for iterations of the prototype after testing.
   b. Bullet pointed list that shows changes for iterations of the prototype after testing.
11. Testing Process: A graphic or list that describes how the team tested the prototypes. This section could include:
   a. Specific tests used.
   b. Tests with users.
   c. User feedback.
12. Visual Data (Minimum of 2): The relevant data that helped drive the prototype. This section could include:
   a. Line graphs.
   b. Circle graphs.
   c. Bar graphs.
   d. Tables.
   e. Descriptions of successes and failures of prototype.
13. Visual Element: A graphic that describes any other important factors/elements in your prototype. This section could include:
   a. Decision tree.
   b. Design matrix.
   c. Key elements not addressed in other sections.
14. Results: The end result of the prototype. This section could include:
   a. Summary of results.
   b. How the prototype improves the user's capabilities because of the prototype.
   c. Changes to the user's experience in the world.
15. Conclusions: Description of the final takeaways for the user. This section could include:
   a. Success and/or failure to meet primary and secondary objectives.
   b. Next steps for project.

Materials Provided:

- Easel, ample wall space, or cafeteria-style table (approximately 30" x 72" x 29"). If a table is provided, teams will need to supply their own poster stand.

Prototype Pitch

Objective: The objective of the Prototype Pitch is to convince the audience that the design meets the user's needs and is equitable in its design. Students will prepare a creative, engaging presentation to pitch their prototype to an audience, including a group of judges. The presentation should define the problem; provide a detailed description of their user and their needs; discuss how their product is innovative; and provide a demonstration of their prototype including highlighting its advantages. The pitch should differ from the Technical Presentation and be a complete presentation as questions will not be allowed.

Required Elements:

1. User Introduction and Problem Addressed:
   a. Describes the user.
   b. Describes the problem the team is solving and its impact on the user.
   c. Describes how design requirements keep target users in mind.
   d. Discusses how user input supported design choices.
   e. Discusses how user feedback supported design changes.
2. Product:
   a. Defines the proposed solution through the prototype.
   b. Describes how the solution promotes equity in the user's lives.
   c. Explains the originality and innovativeness of their design.
   d. Presents the advantages of the prototype.
3. Demonstration of the Prototype:
   a. Explains key features and functions.
   b. Explains how design meets user's criteria for look, feel, and functionality.
   c. Explains how a microprocessor is integrated using non-technical terms.
4. Overall Quality of the Presentation:
   a. Effectiveness of speech organization and delivery.
   b. Audience engagement – ability to hold audience's attention.
   c. Presentation skills – the team is prepared and their voices can be clearly heard.
   d. Introduction and participation of team members.
   e. Team's interest – explanation of why the team choose this project and why is it important to them personally.
   f. Closing statement - the speech ends with a final statement that summarizes the user, problem, and solution in a memorable manner.

Pitch Rules:

1. Teams will have 5-7 minutes to present. A 5-point deduction will be assessed for being either under or over the allotted time. Judges will provide time signals to presenters at 1 minute before the 7-minute limit and every minute thereafter. After +2 minutes (a total of 9 minutes), judges will stop the presentation.
2. The pitch will be open to the public. States may opt for private sessions at state and local events.
3. Teams will present a prototype pitch to the audience, which will include a group of judges.
4. Teams are encouraged to bring additional audio and visual aids to enhance their presentation.
5. Teams will be randomly selected to determine the order of presentations. Teams must give their pitches in the order drawn. No exceptions or late arrivals.

Materials Provided:

- A projector and laptop with PowerPoint and internet access.
- Wireless presentation remote.
- Access to electricity.
- Cafeteria-style table (approximately 30” x 72” x 29”).
- Special requests for other materials will be considered, but are not guaranteed.

School:_____ **MS** **HS** **State/Center:**_____

Design Brief 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: Adequately describes the people who will benefit from the project and the challenges they face. Defines the issue of inequity addressed.						
User Research: Adequately discusses key information about users gathered through research, interviews, and ongoing discussion throughout the project.						
User Insight: Demonstrates a good understanding of the experiences, emotions, and motivations of the users.						
User Needs: A specific list of user needs produced from the user insight is provided. The team adequately identifies the user needs.						
Project Goals: Goals of the project are linked to and will adequately meet the user's needs.						
Key Features of Design: The list of the key features illustrates that design adequately meets project goals.						
Prototype Graphic: Included graphic is easy to understand and key features are adequately labeled.						
Status of Project: Adequately examines the current status of the project and discusses potential next steps.						
Impact: Discussion adequately describes how the design addresses inequities for the user and/or removes barriers.						
Reflection: Demonstrates an increased understanding of human-centered design. Discusses personal growth and insights about designing for others and helping users overcome challenges.						
COLUMN TOTALS:						
TOTAL:						

Judge Name: _____

School:_____ **MS** **HS** **State/Center:**

Technical Presentation and Interview Rubric: Pg. 1	**LEVEL OF MASTERY**					
	Exceptional (5 points):	Excellent (4 points)	Met Criteria (3 points)	Fair (2 points)	Poor (1 point)	Not Present (0 points)
Design Overview: The team adequately articulates how their design addresses an issue of inequity. The team includes a general overview of the issue their product addresses, as well as, specific information detailing how their design provides a solution to the issue.						
Design Knowledge: The team demonstrates adequate knowledge of project. All design elements are intentional and thought out.						
Usability: The team can adequately articulate prototype instructions and purpose. Judges can understand how the prototype is used by the user.						
Prototype Demonstration: During the presentation time, the prototype is working and can be demonstrated effectively with ease.						
Project Impact: The presentation, without additional clarifying questions, highlights the importance of the project and future impact as it relates to the user.						
Materials: All materials are appropriate for design and for use by the user. Team is logical in material usage and budget consideration. Team can articulate and is knowledgeable about the rationale and purpose for materials used.						
Mechanical Design: The team can articulate and is knowledgeable about details, reasoning, and purpose for the mechanical components of the design.						
Technology Usage: Sensors, Wiring, Breadboard, Applications, 3D Modeling/Printing, Etc.: All technology is appropriate for the design. The team can articulate and is knowledgeable about all technology used. Rationale for selection of hardware components used is conveyed adequately.						
Hardware: The use and integration of chosen microprocessor hardware (i.e., Arduino, Circuit Playground Express, or Micro:bit) and sensors are innovative, effective, and relevant to the project. The input and output functions are specifically designed and appropriately utilized to meet the user's needs.						
Software, Programming Logic Flow: The team's code is logical. The team can explain, with adequate detail, their programming logic, their coding choices, and any modifications they made to existing code.						
Data Collection, Input: The selected microprocessor hardware (i.e., Arduino, Circuit Playground Express, or Micro:bit) and/or sensors efficiently and effectively collect input data. The prototype is able to process input data appropriately. The team can convey what data the device collects and/or what variables are used to result in an output. This includes knowledge of code and hardware.						
Data Response. Output: The selected hardware (i.e., Arduino, Circuit Playground Express, or Micro:bit) and/or sensors respond to data efficiently and effectively. Output is appropriate. The team can convey the output process and what happens during use of the prototype. This includes knowledge of output code and hardware.						

Technical Presentation and Interview Rubric: Pg. 2	LEVEL OF MASTERY					
	Exceptional (5 points):	Excellent (4 points)	Met Criteria (3 points)	Fair (2 points)	Poor (1 point)	Not Present (0 points)
Engineering Design Process: The team adequately conveys their methodology and process, including the research, planning, creation, testing, and improvement phases.						
Challenges and Solutions: The team adequately conveys their project challenges and correlates solutions through presentation or interview. The team is able to incorporate how the Engineering Design Process informed their solutions						
Testing and Design Choices/Iterations: Multiple tests were conducted, documented, and used to improve the design. The team is able to convey testing conditions, variables, and results of most tests. All testing was appropriate for their project. The team can convey how the tests helped to inform their design choice(s).						
Conclusions and Recommendations: The team is able to effectively present their final product and discuss conclusive findings, limitations, next steps, and recommendations for further development through presentation or interview. The team is able to incorporate how their tests resulted in their conclusions and discuss the future impact of their project.						
Presentation Skills: The team displays relaxed, self-confident nature and is mostly free of fidgeting and/or nervous movement. Body language was appropriate and did not detract from presentation. The team uses direct eye contact and holds the audience's attention. The team shows enthusiasm and can verbally convey knowledge about the topic during the presentation and interview session. Team members speak in clear voices and use technical terms correctly.						
Support Material: The team is able to effectively use support materials (e.g., poster, logic diagrams, engineering notebook, etc.) to increase the audience's understanding of the project.						
Response to Questions: The team's responses to technical questions demonstrate adequate technical knowledge of the concepts and processes used in the project.						
Team Contribution: All members contribute equally to the presentation and to answering questions. The team has shown that all members have contributed to the overall project equally by showing adequate skill and knowledge.						
COLUMN TOTALS:						
TOTAL:						

Judge Name: _____

School:_____ **MS** **HS** **State/Center:** _____

Poster Rubric: Pg. 1	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 identifies the user and defines the problem being addressed in 30 words or fewer.						
Objective: The team provides a bulleted list of the primary objectives and any secondary objectives of the project, including all factors being addressed.						
User Requirement: A graphic or list adequately shows requirements identified by the user. Middle school teams need to address explicit requirements. High school teams need to address explicit and implicit requirements.						
Prototype: A graphic of the prototype is present and adequately highlights innovations and/or important components of the design.						
Prototype Detail: Main components are labeled and functionality is clear. Titles and descriptions are included. If needed, a scale is present.						
Design Process: A graphic display adequately describes the team's design process.						
Design Iteration – A visual representation of multiple prototype iterations adequately details key changes that led to the final design.						
Testing Process: An adequate description of the testing processes/procedures is included.						
Visual Data 1: A graph and/or table adequately presents relevant information from the results of testing and increases the observer's understanding of the project.						
Visual Data 2: A graph and/or table adequately presents relevant information from the results of testing and increases the observer's understanding of the project.						
Visual Elements: Visual material included on the poster enhances the observer's understanding of the project.						
Results: The team adequately describes how the prototype works to achieve equity for the user.						
Conclusions: The team includes an adequate assessment of how well their project meets the user requirements. The team adequately describes improvements they would make if continuing this project.						
Readability: The poster is easy to read and has a balanced amount of graphics and text.			**Graphics:** About half **Text:** Concise	**Graphics:** Some **Text:** About half	**Graphics:** A few **Text:** More than half.	Mostly text
Title: A title is included.			Creative & Memorable	Sufficiently Explanatory	Simple Summarization	None
COLUMN TOTALS:						
PART 1 TOTAL:						

Poster Rubric: Pg. 2	
PART 2: BASIC REQUIREMENTS – 1 POINT EACH IF PRESENT	
Size: No more than 36” x 48” and no less 24” x 36”	
School Name included	
Team Member's Names included	
Official MESA logo included	
PART 2 TOTAL:	
TOTAL (PART 1 + PART 2):	

Judge Name: _____

School:_____ **MS HS** **State/Center:** _____

Prototype Pitch Rubric:	LEVEL OF MASTERY					
	Exceptional (5 points):	Excellent (4 points)	Met Criteria (3 points)	Fair (2 points)	Poor (1 point)	Not Present (0 points)
Intro of Team: Team introduces themselves.						
Problem Being Addressed: Team explains problem and their presentation increases judges' understanding of the user(s) need(s) and the solutions.						
User Description: User is identified and an adequate profile is provided, including information on population size and geographic area.						
User Impact: Team explains the potential impact of their product to the user. **(x2 points)**	*10*	*8*	*6*	*4*	*2*	
User Input: Team adequately describes how user input supported *initial* design choices.						
Product Description: Team explains how their prototype meets the user's needs in terms of aesthetics, functionality, ease of use, cost, or other needs.						
Innovation: Team explains how their solution is innovative or original and explains how their solution was designed.						
Key Features of Design: Team explains key features of their design and how those features address the problem.						
Equity in Design: Team explains how their solution promotes equity in the user's life. **(x2 points)**	*10*	*8*	*6*	*4*	*2*	
User Needs: Team describes how their device fulfills the user's physiological, safety, or psychological needs.						
User Feedback: Team describes the user involved in prototype testing and user feedback which informs design modifications.						
Demo: Team demonstrates the prototype and how it will be used by the user (live, simulation, video with client, etc.).						
User Reaction: Team describes or illustrates user's reaction to prototype (testimonial, video, etc.).						
Closing Statement: Team ends presentation with a memorable closing statement.						
Delivery & Organization: Team delivers ideas and information effectively and includes an introduction, body, and conclusion.						
Audience Engagement: Team delivers an engaging presentation.						
Presentation Skills: Team appears prepared and voices can be heard.						
Participation: All team members participate appropriately.				Yes		No
Team's Interest: Team explains why they care about solving this problem for their user.			Good	Average	OK	No
COLUMN TOTALS:						
Time Penalty: Team's presentation was under 5 minutes or over 7-minute time limit. (-5 points)						
FINAL TOTAL:						

Judge Name: _____

School:_____ **MS HS** **State/Center:** _____

OVERALL SCORE
DESIGN BRIEF SCORE (x/50 points): _____ /50
POSTER (x/75 points): _____ /75
TECHNICAL PRESENTATION AND INTERVIEW (x/100 points): _____ /100
PROTOTYPE PITCH (x/100 points): _____ /100
OVERALL SCORE (x/325 points): _____ /325

Judge (1) Name: _____

Judge (2) Name: _____

School:_____ **MS** **HS** **State/Center:** _____

Judge's Feedback: (check all that apply)

- ☐ **Design Brief**
- ☐ **Poster**
- ☐ **Technical Presentation and Interview**
- ☐ **Prototype Pitch**

Judge Name: _____

Appendix

Design Brief Template Sample: Part 1

(NOTE: Completion is required via template, this is for reference)

School: _____

State: _____

Division: **Middle School** **High School**

Team Members:

Problem Statement: Briefly describe the people who will benefit from the project and the challenges they face. Include any inequity that the project hopes to address. *(100 Words Maximum)*
User Research: Discuss key information about the users gathered through your research, interviews, and ongoing discussion with the users throughout the project. *(200 Words Maximum)*
User Insight: Discuss your team's understanding of the experiences, emotions, and motivations of the users. *(200 Words Maximum)*
User Needs: Provide a list of specific user needs produced from the user insight. *(100 Words Maximum)*
Project Goals: List project goals and shows how they are linked to and will adequately meet the user's needs. *(100 Words Maximum)*

Design Brief Template Sample: Part 2 (NOTE: Completion is required via template, this is for reference)
Key Features of Design: List key features of the design and show how they adequately meet project goals. *(200 Words Maximum)*
Prototype Graphic: Include a graphic is easy to understand. All key parts of prototype should be labeled.
Status of Project: Describe the current status of the project and discuss potential next steps. *(200 Words Maximum)*
Impact: Discuss how design may improve inequity and/or remove barriers for the user. *(200 Words Maximum)*
Reflection: Discusses personal growth and insights about designing for others and helping them overcome challenges. Also, include discussion of any increased understanding of Human Centered Design. *(200 Words Maximum)*