

Cellphone Accessory Design

- LEVEL:** Middle School/High School
- NUMBER OF TEAMS:** One (1) team per school can participate at the MESA Day state competition. Three (3) teams can participate at MESA regional events.
- TEAM MEMBERS:** Two (2) to Four (4) Students per Team
- OBJECTIVE:** Students will design a cellphone accessory (cellphone holder, headphone holder, etc.) for their cellphone using a CAD program (TinkerCAD, OnShape, etc.) that is designed to be printed on a 3D printer.
- Teams will submit a technical drawing for judging. Teams may choose to 3D print their design but it is not a requirement.
- Students will give a 3-5 minute presentation to a panel of judges that will include a question and answer period to discuss their design process and testing.
- MATERIALS:** 3D printed object(s) will be made of ABS or PLA plastic. Students must provide the cellphone that the device is designed for.

BACK STORY:

Computer Aided Design (CAD) software is used to design in every engineering field. The software can then export an STL file to a 3D printer for a cheap and easy way to fabricate the part. 3D printing is becoming more and more prevalent in all occupations as printers are more available than ever before.

DESIGN PARAMETERS:

1. Designs will be:
 - a. Designed using a CAD program
 - b. Designed by students.
2. All dimensions must be in millimeters (mm).
3. The maximum size of the design is 150 x 150 x 150 mm.
4. Teams will prepare a 5 minute "sales pitch" to demonstrate of their design, describe why it is needed and answer questions about the design process and how their research and testing informed their decisions.

SPECIFICATION CHECK:

1. Immediately upon submission for competition, designs will receive a specification check to determine whether it conforms to material and design parameters. Any design which fails the specification check will be given a performance score of zero. Designs may not be modified for competition.
2. Designs must be ready for presentation prior to inspection. If designs are disqualified during inspection check, design changes will not be allowed. Only designs passing inspection will be allowed to participate in the presentation.
3. During specification check, teams will check in to the competition area and submit designed accessory item, and Engineering Design notebook for impounding.
 - a. Essential components or scored components of the Engineering Design Notebook will be listed and included in a rubric on the reverse side of the score sheet.

TESTING PARAMETERS:

1. At least two team members are required to be present during the presentation.
2. Teams should arrive at least 10 minutes before their presentation time to retrieve their designs from impound and prepare for their presentation. Designs must be present during the presentation.
3. When the judges are ready, they will ask the teams to begin.
4. When the presentation begins the judges will start the timer and notify students when there is 1 minute remaining and 30 seconds remaining.
5. Teams that go beyond the 5 minute will receive a 5 point deduction.
6. Judges will have the option of asking questions for clarification to assist with scoring.

SCORING CRITERIA:

1. Teams will be judged on:
 - a. Designed Accessory (80 points max)
 - b. “Sales Pitch” presentation of the accessory (60 points max)
 - c. Engineering Notebook (20 points max)
2. The design will be judged on:
 - a. Originality of design
 - b. Complexity of geometry
 - c. Feasibility of design
 - d. Visual appeal
3. Teams will be judged on their presentation of the design, see score sheet for details.
4. Teams will be judged on their Engineering Design Notebook, see score sheet for details.



Event Specifications
Cellphone Accessory Design
MESA Day 2018

School: _____

Student Names: _____

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Specification Check (circle one):

Pass Fail

Team has submitted an Engineering Design Notebook?

Yes No

Design is a maximum of 150 x 150 x 150 mm?

Yes No

Final Score:

Presentation (60 points)	
Design (80 points)	
Engineering Design Notebook (20 points)	
Total (160 points)	

Lead Judge Signature: _____

Student Signature: _____

Comments:

Presentation:

Category	Exceptional (5 points)	Excellent (3-4 points)	Good (2-3 points)	Fair (0-1 points)
Description of the product	A clear and complete description is provided, and thoroughly reviews design features	A clear and almost complete description is provided, and reviews design features well.	An adequate description is provided, and adequately reviews design features	A inadequate description is provided, and inadequately reviews design features
Why people need the product	A clear and complete description of the need is provided	A clear and almost complete description is provided	An adequate description is provided	A inadequate description is provided
Description of Current Solutions	Current solutions are listed and their weaknesses are pointed out	Current solutions are listed and their weaknesses are mentioned	Some current solutions are mentioned but weaknesses are not mentioned	Current solutions are hinted at but not specifically mentioned
Advantages of team's solution	Team clearly describes advantages over other solutions citing specific reasons	Team clearly describes advantages of prototype	Team describes advantages with some degree of clarity.	Team description of advantages of prototype over other solutions is unclear.
Product is functional and easy to use	Fully functional and extremely easy to use	Mostly functional relatively easy to use	Functional but needs explanation to use.	Somewhat functional not easy to use
Presentation	ALL students share equally in presentation. ALL voices heard & understood. Eye contact is distributed across the audience. Engineering Design Notebook well used as a visual aid.	All students share in presentation. Most voices heard & understood. Eye contact is mostly distributed across the audience. Engineering Design Notebook used as a visual aid.	Most students share in presentation. Some voices heard & understood. Eye contact is distributed across the audience. Engineering Design Notebook inadequately used as a visual aid.	Some students share in presentation. Some voices heard & understood. Eye contact is not distributed across the audience. Engineering Design Notebook not used as a visual aid.
Total x 2				

Design:

Category	Exceptional (8-10 points)	Excellent (5-7 points)	Good (2-4 points)	Fair (0-1 points)
Originality of Design	The project is personalized and has a unique application or design	The project has some innovative ideas or improvements on existing designs	The project relies on existing models or ideas and has little innovation	The project is a copy of an already existing idea
Complexity of Design Geometry	The project uses complex geometry in creative ways	The project uses complex geometry.	The project uses simple geometry.	Only one or two geometric figures are evident
Feasibility of Design	The project is easy to use and enhances the use of the phone	The project has one or two improvements needed	The project has three improvements needed	The project has more than three improvements needed
Visual Appeal of Design	The design is visually appealing to all ages	The design is visually appealing to most people.	The design is visually appealing to a small segment of the population	The design is not visually appealing.
Total x 2				

Rubric for Engineering Design Notebooks (EDN).

EDN Goals	3	2	1	0
1. Explore				
1.1 Problem Statement. Accurately describes, in your words, the design objective (includes success criteria, constraints constants and variables)	Specific description of problem, success criteria, constraints, variables and constants	Basic...	Weak...	No.. .
1.2 Depth of Free exploration. Prior knowledge, brainstorming & hands-on exploration documented.	Numerous examples of brainstorming and hands-on exploration observations.	Regular...	Few...	No.. .
1.3 Research in Design: Research ideas about your design that might be useful. Record information using different sources (e.g. books, websites, interviews from experts).	Clear analysis of other design pros/cons.	Basic...	Scant...	No.. .
2. Design				
2.1 Design Plan. Includes reasoning on your design choices (materials used, modifications, etc.). Use data from past trials, research and design considerations.	Clear reasons given (based on data or research) for each design choice.	Basic...	Scant...	No.. .
2.3 Design sketching and/or photos. Prior & during build, team sketches, 2-D or 3-D perspective drawings.	Numerous representations of each design iteration.	Regular...	Scant...	No.. .
3. Test				
3.1 Observation. Data & written observations (tables, graphs, labeled drawings, etc.).	Numerous presentation of quantitative & qualitative data, graphs & charts follow design progression.	Regular...	Scant...	No.. .
3.2 Reflection/Analysis. Assesses pros and cons of design/materials, testing procedure, etc. Apply test results and analysis to pose a theory, recommend and argue for a next step, or draw an insightful conclusion. Restate the purpose in your conclusion.	Detailed reflection shows how design considerations and logic flowing from research, test analysis, etc.	Basic...	Scant...	No.. .
4. EDN Organization				
4.1 Structured. Includes Table of Contents with key elements. Elements of EDN can be used to answer judges questions easily	Clear organization utilizes defined sections.	Basic...	Minimal ...	No.. .
4.2 Labeled. Clearly labeled with School and Team Members names.			Yes	No
Column Totals (for selected categories)				
Subtotal (out of 25)				
Modifier			(S ÷ 25) x 20	
Score (out of 20)				

Comments/Suggestions: