



Annual Student Technology Challenges

Welding, Woodworking, Graphic Design, and 3D Printing Challenges

Announcing a new and exciting opportunity for Illinois Technology/STEM education students and teachers: **“Hands-On, Minds-On” Competitive Challenges.**

The Technology Education Association of Illinois (TEAI) and the Illinois Technology Student Association (IL-TSA) want to provide an avenue for innovation through challenges completed at the school-level. Place winners will receive a plaque, recognition on TEAI and TSA websites, and prize money.

The challenges for 2019-2020 are focused on: Woodworking, Metalworking, Graphic Design, and Polymers (3D Printing). Each submission is:

- Open to any middle or high school student in a technology and engineering education class.
- There are two levels of competition: Students in grades 5-8 and 9-12. Included within the solution, the participant should clearly indicate their name, what grade he/she is/was during the time the solution was made, school name, and teacher's name.
- The solution must be contained within a shipping box with inside dimensions (ID) not larger than 12" x 12" x 5 1/2". Maximum of 70 lbs. Teachers may submit more than one project per box as able. Any solution larger than the ID of this box size will be disqualified.
- The solution must be original work, e.g., no pre-purchased kits, downloaded files/parts, etc.
- A one-page - front and back - (maximum), word-processed document, may be included in the shipping box to describe the device, its purpose, originality, construction, process used, etc.
- Pictures of the creation process are recommended.

The solution must be postmarked no later than April 1, 2020.

The solution must be sent to:

Dr. Chris Merrill, Illinois State University, 215 Turner Hall, Normal, IL 61790-5100.

Students will be scored using a provided rubric outlining the required constraints of the project.

Any questions can be sent to Kyle Thomas, kyltho@d219.org.



Metal Welding Fabrication Project	Wood Fabrication Project
Graphic Communication Project	Polymer Project
Grade Level - Circle the grade level you are submitting materials for: Middle School High School	
Student Name:	
Student Address:	
Student Contact Information - Email and phone number:	
School Name:	
Teacher Name:	
Teacher Contact Information - Email and phone number:	
Teacher Signature verifying authenticity of project:	
Student ID Number - (create an individual number to identify your project):	

Over All Project Information and Knowledge to defend project authenticity:

Description of Design:

Description of Fabrication:

Description of Materials:

Description of Processes:

* Feel free to recreate this document, word process or hand-written. Include as much information as needed to defend your project authenticity. Include all information to describe the projects design, fabrication, materials and processes used.



Metal Welding Fabrication Project

Student Technology Challenge

Contest Description

Students are given an open-ended opportunity to design and weld a metal project of any type; there is no set criteria on what the purpose of the project is, but rather left to the design of the student. For example, some students might decide to design and weld a metal human figure statue or animal related figurine. While others may focus on transportation, architectural, or industrial designs with moving parts. The purpose of the contest is to reinforce that technology and engineering education is based on hands-on, minds-on solutions – that students use tools and develop craftsmanship.

Contest Rules & Submission Guidelines

- Open to any middle or high school student in a technology and engineering education class.
- There are two levels of competition: Students in grades 5-8 and 9-12. Included within the solution, the participant should clearly indicate their name, what grade he/she is/was during the time the solution was made, the school name and signature of verifying teacher.
- **The solution must be contained within a shipping box with inside dimensions (ID) not larger than 12" x 12" x 5 1/2". Maximum of 70 lbs. Teachers may submit more than one project per box as able. Any solution larger than the ID of this box size will be disqualified.**
- The solution must be original work, **no pre-purchased kits.** (e.g. no steam engine kits)
- Standard pre-manufactured materials may be used in your design as recycled materials. e.g., cams, chains, bolts, nuts, spark plugs, eating utensils, metal scrap machine parts, metal car parts...
- Joining methods may include one or more of the following processes: SMAW, GMAW, GTAW, Oxy/fuel Welding, Oxy/fuel Brazing, ect.
- Material type may include one or more of the following: mild steel, aluminum, stainless steel, additional alloy metals, ect.
- A finishing material, such as: clear coat or paint must be used to protect the design from rust.
- A one-page (maximum), word-processed document, must be included in the shipping box to describe the welded project, its purpose, originality, process used, etc.
- The solution must be postmarked no later than April 1, 2020.

- The solution must be sent to:
Dr. Chris Merrill, Illinois State University, 215 Turner Hall, Normal, IL 61790-5100.

Metal Welding Fabrication Student Challenge Rubric

Criteria	Description	Points (26)
Use of materials	Multiple metals, scrap, reused, recycled artifacts, selection. Originality	Maximum of 4 Points
Seperating Technique	Types of cuts, miters, bevels, copes, lack of mill scale, slag, burs, shapes, radius	Maximum of 4 Points
Fabrication techniques	Selection of tooling, variety of weld processes, bends, angles, radius	Maximum of 4 Points
Weld / braze quality	No slag, evenness, bead pattern, penetration, fusibility, start and stops, arc strikes, porosity.	Maximum of 4 Points
Finish	Clear coat or paint is of high-quality and durable for the purposes of the metal project.	Maximum of 4 Points
Originality, Aesthetics, and Craftsmanship	The complexity of the solution was appropriate for the level of student; attention to detail is evident; the project is of high-quality..	Maximum of 3 Points
Student Information Project Write-Up Sheet	Write up sheet completed with all of the necessary information.	Maximum of 3 Points

Note 1: The same rubric will be used for middle and high school students; students only compete against the same level of students.

Note 2: Each student will be given written feedback on their submitted solution, including the scoring decisions.

Note 3: All submitted metal fabrication projects will be returned to the school after the conclusion of the competition.

Note 4: Any questions can be sent to Kyle Thomas, kyltho@d219.org.



Wood Fabrication Project

Student Technology Challenge

Contest Description

Students are given an open-ended opportunity to design and build a wooden box of any style; there is no set criteria on what the purpose of the box is, but rather left to the design of the student. For example, some students might decide to design and build an ornamental box, while others may focus on carving, laser engraving designs, others may choose lids or drawers...the solution is truly open-ended. The purpose of the contest is to reinforce that technology and engineering education is based on hands-on, minds-on solutions – that students use tools and develop craftsmanship.

Contest Rules & Submission Guidelines

- Open to any middle or high school student in a technology and engineering education class.
- There are two levels of competition: Students in grades 5-8 and 9-12. Included within the solution, the participant should clearly indicate their name, what grade he/she is/was during the time the solution was made, and the school name.
- **The solution must be contained within a shipping box with inside dimensions (ID) not larger than 12" x 12" x 5 1/2". Maximum of 70 lbs. Teachers may submit more than one project per box as able. Any solution larger than the ID of this box size will be disqualified.**
- The solution must be original work, e.g., **no pre-purchased kits.**
- Hardware (hinges, pulls, etc.) may be used.
- A one-page (maximum), word-processed document, may be included in the shipping box to describe the wooden box, its purpose, originality, process used, etc.
- The solution must be postmarked no later than April 1, 2020.
- The solution must be sent to:

Dr. Chris Merrill, Illinois State University, 215 Turner Hall, Normal, IL 61790-5100.

Wood Fabrication Student Challenge Rubric

Criteria	Description	Points (18)
Joinery	The joinery to construct any or all aspects of the box was based on standard practices, e.g., lap, dado, finger, dovetail, miter, etc., and was not simply nailed or screwed together.	Maximum of 4 Points
Finish	The finish, whether stain, lacquer, paint, etc., was high-quality and durable for the purposes of the box.	Maximum of 4 Points
Functionality	The box and all its parts function appropriately, e.g., drawers open and close, lids open and close, etc.	Maximum of 4 Points
Originality, Aesthetics, and Craftsmanship	The complexity of the solution was appropriate for the level of student; attention to detail was evident; the wooden box was of high-quality.	Maximum of 3 Points
Student Information Project Write-Up Sheet	Write up sheet completed with all of the necessary information.	Maximum of 3 Points

Note 1: The same rubric will be used for middle and high school students; students only compete against the same level of students.

Note 2: Each student will be given written feedback on their submitted solution, including the scoring decisions.

Note 3: All submitted wooden boxes will be returned to the school after the conclusion of the competition.

Note 4: Any questions can be sent to Kyle Thomas, kyltho@d219.org.



Graphic Communication Project

Student Technology Challenge

Contest Description

Students are given an open-ended opportunity to design and create a graphic communication projects that consists of a t-shirt and an event poster for a non-profit organization/event. For example, nonprofits like your Engineering Club, Boys and Girls Club, Best Buddies, local 5k events. The purpose of the contest is to reinforce that technology and engineering education is based on hands-on, minds-on solutions – that students use tools and develop craftsmanship.

Contest Rules & Submission Guidelines

- Open to any middle or high school student in a technology and engineering education class.
- There are two levels of competition: Students in grades 5-8 and 9-12. Included within the solution, the participant should clearly indicate their name, what grade he/she is/was during the time the solution was made, and the school name.
- Each submission must include a written document including the following:
 - Design Brief
 - Client (contact information of nonprofit)
 - Target (end user of product)
 - Problem Statement (need for product)
 - Design Statement (how need was solved)
 - Criteria (based on client needs)
 - Constraint (based on client needs)
 - Pre-Concept Sketches
 - Hand Drawn Designs/Sketches
 - T-Shirt Design
 - 1 Printed Sample T-Shirt
 - Poster Design
 - 11" x 17" Printed Poster
 - Manufacturing Plan of 100 Items (T-Shirt & Poster)
 - Mass Production Analysis
 - Cost Analysis
- The solution must be original work, e.g., **no pre-purchased kits**.
- The solution must be postmarked no later than April 1, 2020.

- The solution must be sent to:
Dr. Chris Merrill, Illinois State University, 215 Turner Hall, Normal, IL 61790-5100.

Graphic Comm Student Challenge Rubric

Criteria	Description	Points (26)
Design Brief	Includes thorough documentation of each component. Criteria and constraints reflect client wants and needs	Maximum of 4 Points
Pre Concept Sketches	Includes thorough documentation of preliminary design, evidence of research and applications of design brief	Maximum of 4 Points
T-Shirt Design	Includes one production sample that reflects proper use of vector images purpose of client and problem, clarity of logos, text / message and other imagery. e.g. 1-4 colors, cost per color.	Maximum of 4 Points
Poster Design	Includes one printed sample that reflects proper use of bitmap images purpose of client and problem, clarity of logos, text / message and other imagery (event/organization specific).	Maximum of 4 Points
Manufacturing Plan	Includes thorough documentation of the process of mass production for final product. Detailed mass production analysis and cost analysis. Include equipment, materials, and/or outsourcing.	Maximum of 4 Points
Originality, Aesthetics, and Craftsmanship	The complexity of the solution was appropriate for the level of student; attention to detail was evident; includes all original student work, produced high-quality projects.	Maximum of 3 Points
Student Information Project Write-Up Sheet	Write up sheet completed with all of the necessary information.	Maximum of 3 Points

Note 1: The same rubric will be used for middle and high school students; students only compete against the same level of students.

Note 2: Each student will be given written feedback on their submitted solution, including the scoring decisions.

Note 3: All submitted t-shirts, posters, documents will be returned to the school after the conclusion of the competition.

Note 4: Any questions can be sent to Kyle Thomas, kyltho@d219.org.



Polymer Student Technology Challenge

Contest Description

Students are given an open-ended opportunity to design and build a device that demonstrates a mechanical principle, such as a simple machine; there is no set criteria on what purpose the polymer device serves or how it is manufactured, but rather left to the design of the student. For example, some students might decide to design and build a device that demonstrates the screw as a simple machine, while others may build a compound machine or device that solves a perceived problem...the solution is truly open-ended. The purpose of the contest is to reinforce that technology and engineering education is based on hands-on, minds-on solutions – that students use tools and develop craftsmanship utilizing polymers as a material and a technology.

Contest Rules & Submission Guidelines

- Open to any middle or high school student in a technology and engineering education class.
- There are two levels of competition: Students in grades 5-8 and 9-12. Included within the solution, the participant should clearly indicate their name, what grade he/she is/was during the time the solution was made, and the school name.
- **The solution must be contained within a shipping box with inside dimensions (ID) not larger than 12" x 12" x 5 1/2". Maximum of 70 lbs. Teachers may submit more than one project per box as able. Any solution larger than the ID of this box size will be disqualified.**
- The solution must be original work, e.g., **no pre-purchased kits, downloaded files/parts, etc.**
- Hardware (hinges, pulls, fasteners, etc.) may be used.
- A one-page - front and back - (maximum), word-processed document, may be included in the shipping box to describe the device, its purpose, originality, construction, process used, etc.
 - - Pictures of the manufacture are recommended
- The solution must be postmarked no later than **April 1, 2020**.
- The solution must be sent to:

Dr. Chris Merrill, Illinois State University, 215 Turner Hall, Normal, IL 61790-5100.

Polymer Student Challenge Rubric

Criteria	Description	Points (18)
Design	Construction of all aspects of the device were based on a well laid out design plan. Standard practices of assembly or manufacture were used during construction especially where outside hardware was required.	Maximum of 4 Points
Description	Ability to explain decisions made in the design/materials/manufacture and utilization of the final device	Maximum of 4 Points
Functionality	The device and all its parts function appropriately, as described by the student in the one-page document provided	Maximum of 4 Points
Originality, Aesthetics, and Craftsmanship	The complexity of the solution was appropriate for the level of student; attention to detail was evident; the device/object was of high-quality.	Maximum of 3 Points
Student Information Project Write-Up Sheet	Write up sheet completed with all of the necessary information.	Maximum of 3 Points

Note 1: The same rubric will be used for middle and high school students; students only compete against the same level of students.

Note 2: Each student will be given written feedback on their submitted solution, including the scoring decisions.

Note 3: All submitted polymer devices will be returned to the school after the conclusion of the competition.

Note 4: Any questions can be sent to Kyle Thomas, kyltho@d219.org.