Teacher Leadership Program at Georgia Tech

sponsored by Honeywell

Student STEM Challenge Rules & Guidelines

2019 - 2020

Student STEM Challenge Framework

The Challenge

Your project must fulfill both the task and the theme of the challenge listed below:

Task: *Design a technology-based solution to a problem in your home, school or community. The solution you design should be a driver of social good*.

Theme: *Disaster preparedness and response -- How can your project help avert, prepare for, or respond to natural or manmade disasters and crisis?*

A **social good** is something that benefits the largest number of people in the largest possible way, such as clean air, clean water, healthcare, and literacy. Also known as "common good," social good can trace its history to Ancient Greece philosophers and implies a positive impact on individuals or society in general. It also provides the basis for charity or philanthropic work.

Today, social good is about getting people to engage in pro-social actions that benefit society, often by harnessing the power of technology and social media in particular. It is about engagement, shareability and bringing people together to change the world for the better. Gone are the days when governments, multinationals and large non-governmental organizations were the only institutions with the reach and resources to initiative change. Today, that change agent is YOU!

Example areas of social good that can be explored through this challenge are:

- **Home Solutions:** Child safety from accidental injuries; safe homes (burglary, fire, floods, gas leaks, intrusion); assistance for people with physical disabilities; assistance for the elderly; “smart” homes.
- **School Solutions:** Interactive education related to the theme; controlling/monitoring resources (such as water, food or energy); school safety/crisis situations (weather events, situations involving hazardous materials, armed intruder, bomb threat); “smart” schools.
- **Community Solutions:** Access to clean water; environmental monitoring; wearable technology; decreasing hunger; safe cities; using data to target community problems;“smart” cities.

Materials Specifications

Your project must meet the following materials and supplies specifications:

- **Platform:** Students may use any or all supplies found in one micro:bit tinker kit. Any additional supplies count towards the project's spending limit. Projects may also be stand-alone scripts or programs that do not require the use of a micro:bit.
- **Coding language:** Any
- **Spending limit:** $30 per project (excludes micro:bit tinker kit and basic arts/craft supplies provided by the teacher).

Project Submission

Your project submission will consist of the following:

- Expected outcome:
    - A prototype that demonstrates the concept of the solution, crafted using the engineering design process.
- For entry into the challenge, students will be required to submit the following:
    - Documentation of their design process via a **Challenge Log**.
        - Project's title.
        - Project's team members and grades.
        - Project's teacher and school.
        - A brief (~5 sentence) summary or abstract of the project
        - Documentation of the project's engineering design process. The teacher may select which engineering design process model may be used according to his or her school/district expectations. You may edit and use this model log if you do not have a set engineering design process.
        - A clear problem statement the project addresses.
        - A picture or diagram of your final project explaining its capabilities and intended use. This should include what inputs or sensors and outputs are used by your project, any data processing it performs, and how your project meets any design constraints.
        - A breakout of team member responsibilities for the project.
        - References as needed.
        - Materials, receipts, and cost list.
            - If you utilized supplies or equipment from a laboratory, industry, or individual, include an explanation and contact reference for the source.
        - All code used as part of the final design. If using an online editor, then a web-link to the code online will suffice.
    - A **video presentation**, no longer than 10 minutes, overviewing the project uploaded to YouTube. This video should include a/an:

- Introduction of each team member
- Overview of the real-world connections to their project and the problem it solves
- Short overview of their design process
- Short explanation of the project's capabilities & proof of concept clips

Competition Timing

The Competition runs from the beginning of the Fall semester until Thanksgiving break.

- June 26, 2019 -- STEM Challenge announcement.
- September 20, 2019 -- Schools submit estimate number of competing projects to CEISMC
- November 20, 2019 (C.O.B.) -- Final submission of STEM Challenge projects to CEISMC
- December 18, 2019 -- Pool of STEM Challenge finalists announced
- January 29, 2020 -- STEM Challenge finalists attend winners showcase event at GA Tech. Overall winners of STEM Challenge announced.

Participation

- Limited to current and former STLP teachers and their students.
- Limit of 15 projects per STLP teacher.
- Projects must be team projects comprised of 2 - 4 students.
- Projects are entered into either the Junior (5th - 8th) or Senior (9th - 12th) divisions, which are judged separately.
- Students may participant as part of a mandatory class project, part of an extracurricular club activity, or on their own initiative at the discretion of the STLP teacher.

Registration

Preliminary registration will be through google forms as an initial maximum estimate of the number of projects each school might submit. This is to ensure we have the appropriate number of judges for the competition and is due September 20, 2019 via this google form. The final project submission will be due November 20, 2019 (C.O.B.). The method of final project submission will be sent at a later date.

Challenge Winners

STEM Challenge winners will be determined, first, as the initial group of finalists selected in December and, second, as the final overall winners selected at the winners' showcase in January. The following are the intended winner break-outs. Please note, however, these are subject to change throughout the year according to funding and logistics needs:

- Initial Finalists Pool (25 finalists)
    - Top 20 projects from each district by proportion of STLP teachers from all cohorts:
        - APS: 7 projects
        - Clayton: 3 projects
        - Cobb: 2 projects
        - DeKalb: 4 projects
        - Fulton: 2 projects
        - Gwinnett: 2 projects
    - Top 5 projects overall (who are not from the above district pool)
- Final Overall Winners (evaluated from finalists pool at winners showcase)
    - Top 3 Best Overall by Division (plaques and medals)
        - 1st, 2nd and 3rd Junior Division
        - 1st, 2nd and 3rd Senior Division
        - *The top winner overall will be eligible to submit their project in the state finals for The K-12 InVenture Prize at Georgia Tech!
    - Special Awards
        - Innovation Award -- For the project demonstrating a novel or exceptionally creative solution within the Honeywell STEM Challenge.
        - Impact Award -- For the project demonstrating an exceptional and realistic impact for social good in one's home, school, or community.

Judging

Initial judging to determine the STEM Challenge finalists will be virtual and primarily based on project quality. Judging for the overall winners in January will be based on in-person presentations with a modified rubric to include scoring for the presentation component.

Judging will be evaluated by score based on a rubric provided by CEISMC. The rubric will review the following broad-based concepts:

- Students documenting and using design-based thinking
    - Clearly defining the problem and related constraints
    - Planning and brainstorming possible solutions
    - Testing student prototype(s) and iterating as needed
- Student understanding of the project and the computer science principles implemented
- Practicality of the solution and real world connections
- Practicality of the computer code (it must work)
- Depth of the solution compared to the challenge goals
- Creativity of the solution
- Clear and effective communication
- Effective teamwork
- Use of materials

Further specifics will be added in the judge's rubric. The final, in-person judging rubric will be provided at a later time.

Other Challenge Constraints

Students and teachers may view the challenge prompt as the "sum total" of the rules for the project, with the exception of any further constraints listed here. Unless otherwise specified in the challenge, projects may be built from whatever materials are available to the student; however, judges may award additional points to students implementing creative, low-cost solutions. Any further constraints follow:

- Additional materials used for both prototyping and final design, must not exceed $30 per project (as explained in the "Specifications" section). You will be asked to submit a materials list in your Challenge Log that must include pictures of receipts and the total amount spent as part of your design process submittable. Teams exceeding this spending limit will lose points or, in extreme cases, be disqualified.
- Only one challenge submission per team is allowed.
- All code must be submittable as either text or a web-link.
- If you copy a section of code from another appropriate source, the section you copied must be identified in your project and the source must be identified in writing.

- If you use supplies or equipment from an industry, laboratory, or individual otherwise not accessible from a classroom setting, you must note what they were and how they were used in the project. You must also provide a contact reference to the individual you worked with to utilize these items.

Questions/Contact

If there are any questions regarding the Student STEM Challenge, please contact CEISMC's STLP Program Director, Tiarra Moore, at tiarra.moore@ceismc.gatech.edu or Educational Outreach Coordinator, Josh King, at joshua.king@ceismc.gatech.edu.