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International Technology and Engineering Educators Association
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SSC
Secondary STEM Council

ITEEA's Secondary STEM Council's Annual Global Design Challenge for Secondary STEM Students

Deadline: December 15, 2023

FIRST-EVER Global Design Challenge for Secondary STEM Students

In 2008, the U.S. National Academy of Engineering (NAE) identified 14 Grand Challenges for Engineering in the 21st Century. The Grand Challenges were designed to cause students and educators to think about solutions to the big challenges affecting all of our lives. It's now time for secondary students to get in on the action and show the world that they can solve big STEM design problems as well. The Secondary STEM Council is sponsoring the Global Design Challenge for Secondary STEM (GDC) to provide students with a chance to solve a real problem, and show the world that everyone can help find solutions to these global challenges.

The Process: Secondary STEM students from around the world will work in small design teams to solve the GDC outlined below. As students attempt to solve the GDC, they will be required to document the process with a simple portfolio that describes the problem-solving processes undertaken, the products developed, results of product testing, as well as the final product presentation. Photos and descriptions of proposed solutions will be posted on ITEEA social media accounts and ultimately, the team with the most elegant solution to the GDC will be provided an opportunity to present their solution during the International Technology and Engineering Educators Association Annual Conference in Memphis, TN at the STEM Showcase on Friday, March 8, 2024. This team will also be featured in the May 2023 issue of this journal.

Challenge: Can you work as a member of a small design team to develop a better product or tool that can be used to accomplish a task while using only solar power to generate the required electricity? Select a tool or product that has not traditionally been powered with solar energy—one that most designers would consider impossible.

Go to https://tinyurl.com/ITEEAGDCSS2023
For questions about the Global Design Challenge contact
Jessica Nyden at jenyden@uark.edu or Michael Daugherty at mkd03@uark.edu.

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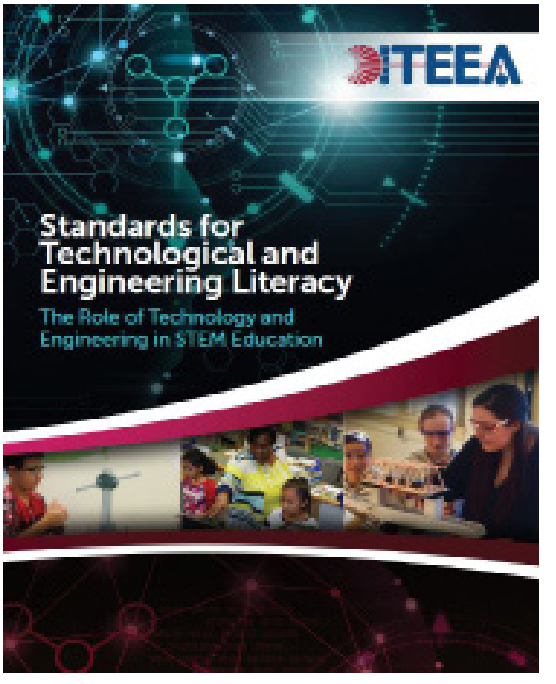
The Global Design Challenge: Two of the original Grand Challenges (NAE, 2008), called for engineers to 1) engineer new tools for scientific discovery; and, 2) make solar energy economical. Just type the words “grand challenges” into your Internet browser for more information about these challenges. This Global Design Challenge calls on you and your team to develop a product that might partially solve both of these grand challenges.



Solar power, sometimes referred to as photovoltaic (PV) power, uses solar cells to collect and convert sunlight into electricity for power. Solar power can achieve around 20% solar efficiency, meaning that it can convert 20% of the sunlight it collects into usable electricity. The biggest advantage of solar power is the fact that it is clean and carbon free, and it’s renewable. However, solar power can be somewhat weather dependent and compared to coal, natural gas and nuclear energy, solar is somewhat inefficient and produces too little power to be readily viable on solar. For this reason, designers have traditionally avoided the development of solar powered tools like ovens, cookers, blow dryers, water heaters, power tools, welders, charging systems, and other tools that traditionally require high wattage electrical power systems.

Standards:
- STEL-2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste, while solving problems.
- STEL-7DD. Apply a broad range of making skills to their design process.
- STEL-4R. Assess a technology that minimizes resource use and resulting waste to achieve a goal.
- STEL-4S. Develop a solution to a technological problem that has the least negative environmental and social impact.

Parameters:
1. Develop a product or tool, not an accessory—many accessories are available on-line
2. Use low-cost or free materials to develop your prototype
3. Make sure that the product does not require a common language—could be used anywhere
4. Test your product to make sure that is functions effectively and safety.

To the Teacher:
1. Require students to use the engineering design loop and document this with a design journal.
2. Ask teams to take lots of pictures throughout the design activity and include them in the design journal.
3. Ask teams to present and defend the final product in a formal presentation in front of an audience.
4. Submit the results, including a video of the final product presentation and the design journal to ssc@iteea.org.

References
U.S. National Academy of Engineering. Grand Challenges. www.engineeringchallenges.org/GrandChallengeScholarsProgram.aspx. Downloaded on August 2, 2023.