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 elementary-aged students to get in on the action and show the world that they can solve big STEM design problems as well. ITEEA’s Elementary STEM Council is sponsoring the Fourth Global Design Challenge for Elementary 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
Elementary 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, the elementary classroom teacher will document the process with a simple portfolio that describes the problem-solving process, the products developed, results of product testing, as well as the final product presentations. Photos and videos of proposed solutions will be posted on the Elementary STEM Council’s Facebook® page. The design teams will be evaluated and the winning team will be invited to present their solution during the International Technology and Engineering Educators Association Annual Conference in Orlando, Florida on March 9-12, 2022. This team will also be featured in the March 2022 edition of The Elementary STEM Journal.

The Global Design Challenge
One of the original Grand Challenges (NAE, 2008), called for engineers to design systems that helped people live better through the use of technology. You can search online using the phrase “grand challenges” to find more information. The 2022 Global Design Challenge calls on you and your team to develop a product that would assist people in completing a routine task. Many people believe that scientists and engineers have distinct job descriptions. Scientists explore, experiment, and discover; engineers create, design, and build.

But in reality, scientists and engineers both participate in the scientific process of discovery in many ways. Great experiments and new technological development always need engineering expertise to design the tools, instruments, and systems that make it possible to acquire new knowledge. In the century ahead, engineers will continue to be partners with scientists in the great quest for understanding many unanswered questions.

Some of the problems that they will face are common problems that we all face every day.

Challenge:
Can you work as a small group to create a device that can assist small children or those who experience difficulty using their hands to tie their shoes? This device should be simple, portable, and time-efficient.
Standards:
- **STEL 1C**: Recognize that creating can be done by anyone. Using technology and engineering tools and techniques, anyone can design or improve things to enhance their lives. Creation of new knowledge, approaches, and inventions can occur through either individual or collaborative efforts. Even young children can view themselves as creators.
- **STEL 7I**: Apply the technology and engineering design process. Design in technology and engineering may include defining the problem, ideation, conducting research, analysis, modeling and predicting, prototyping, testing/evaluating, refining, decision making, documenting, and communicating. Students identify and engage with this range of actions in technology and engineering design in a nonlinear way, revisiting certain steps as needed, and documenting their actions in their engineering notebooks or portfolios.
- **NGSS 3-5-ETS1-1**: Define a simple design problem reflecting a need or a want.

Big Ideas:
- Tying shoes is a daily task to prevent us from tripping, but not everyone can do this task.
- Some shoe styles that utilize alternative lacing techniques, however, shoe laces are the most common method of securing shoes to the foot.
- There are devices that can make everyday tasks easier for people who are unable to complete them in the traditional manner.
- Some products are designed to help people take care of themselves.
- Many special tools and devices are used to remind people of important things.

Limitations:
1. Develop a product, not a method—many methods are available online.
2. The product should be easy to use, portable, and simple.
3. This product should be universal in use and not require one specific language to use.
4. Test the product in your own classroom and determine its effectiveness.
5. Use low-cost or free materials to develop your prototype that will assist people in tying their shoes.

To the Teacher:
1. Encourage your students to use the engineering design loop and document this with a design journal or portfolio and a final product pitch.
2. Take lots of pictures throughout the design activity and a final video (3 minutes max.) where the teams present their findings and their product.
3. Require the students to present and defend their product in a formal product pitch—an authentic audience would be ideal.
4. For questions about the Global Design Challenge contact Jessica Nyden at jenyden@uark.edu or Michael Daugherty at m kd03@uark.edu.

References

Deadline: December 14, 2021
Submissions can be emailed to: otrober@bgsu.edu and vjones@iteea.org

*Some photos courtesy of Wikimedia Commons.*