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ESC 2025

ITEEA's Elementary STEM Council's Sixth Annual Global Design Challenge for Elementary STEM Students

Deadline: December 15, 20255

Bright Bikes, Safe Rides: Young Engineers' Mission

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 inspire students and educators to think about solutions to the big challenges affecting us all. ITEEA's Elementary STEM Council is again sponsoring the Global Design Challenge (GDC) to provide elementary students with a chance to solve a real problem and demonstrate that everyone can help find solutions to these global challenges. Elementary students, let's showcase to the world that even our youngest innovators are capable of tackling big problems with creativity and ingenuity.

Scenario:
In your community of STEMsted, you and your friends love riding bikes to STEMsted Park, visiting friends, or chasing the ice cream truck on summer evenings. But as the sun sets, the streets grow dark, and drivers, joggers, and even other kids can no longer see you clearly on your bike. Last summer, your friend Mia had a frightening close call with a car near the park, and it shook the whole neighborhood. Now parents, teachers, and the STEMsted Bike Club are counting on you, the town's youngest engineers, to step in. Your mission is to design a clever device that makes bikes or bikers glow or shine in the dark, keeping kids safe so everyone can keep pedaling.

Challenge:
Working with an engineering design team, design and build a model of a device or feature that makes a bicycle or cyclist more visible in low-light conditions. Your solution should be affordable, easy to attach to a bike or a cyclist, and effective in ensuring cyclists are visible to others.

Limitations:
1. Create a solution that increases bicycle or cyclist visibility in low-light conditions (dusk, dawn, or after dark).
2. The solution must be attachable to a standard bicycle (handlebars, frame, or wheels), or be comfortably wearable by the cyclist.
3. The solution should be stable and durable enough to stay in place during a bike ride.
4. Test the solution in a simulated low-light environment to demonstrate its effectiveness.

Testing:
Demonstrate how your solution improves bicycle visibility. Set up a test that simulates low-light conditions (a darkened classroom or hallway). It is up to you to test and demonstrate effectiveness, stability, creativity, and resourcefulness. Throughout the testing process, record your observations, measurements, and any adjustments made to your design.

Pontential Ways to Test

- Use a flashlight to mimic car headlights and measure how far away your solution is visible.
- Place your device on a model bike and observe its visibility from different angles (front, side, back) in a dim room.
- Simulate motion by rolling a model bike with your solution attached and check if it remains secure and visible.
- Test durability by lightly shaking the model to simulate bumps on a road.

Evaluation Criteria:
Effectiveness: Does your solution make the bike or cyclist clearly visible in low-light conditions?
Stability: Does the device stay securely attached during simulated motion?
Creativity: Have you used innovative ideas in your design?
Resourcefulness: Have you effectively utilized the materials you selected?
Presentation: Can you clearly explain your design and its function to others?

Teacher Notes:

1. Launch the Global Design Challenge by reading Duck on a Bike by David Shannon or The Bike Ride by Nelson Goose to inspire creativity and discussion about bike safety.
2. Use the engineering design process as students design their solutions from start to finish.
3. Encourage students to interview local cyclists or community members to inform their designs.
4. Take photos and videos throughout the design process to document progress.
5. Create a student-led video (3 minutes maximum) where students share their experiences, present their solution, and defend their design in a formal pitch to an audience. Recording this in front of an authentic, live audience would be ideal.
6. Encourage students to discuss how their solution could be used in their own community.
7. Submit the video link to lrcheek@uark.edu with the subject line “GDC 2025 Video Submission – [School Name].”

Content Information for Teachers:
You may want to equip students with essential content knowledge, ensuring they are well-prepared for problem-solving:

- *Visibility:* The ability of an object to be seen in different lighting conditions.
- *Reflection:* How light bounces off surfaces, making objects like reflective tape visible.
- *Illumination:* Using light sources, like LEDs, to make objects stand out.
- *Safety Engineering:* Designing solutions to protect people from harm.
- *Other concepts for class discussion:* Reflective materials, aerodynamics, potential energy, angular momentum, gyroscopes
- *Incorporating Children’s Literature: Duck on a Bike* by David Shannon; *The Bike Ride* by Nelson Goose

Standards for Technological and Engineering Literacy (STEL) Standards

Standard 1: Nature and Characteristics of Technology and Engineering
Grades PreK-2
A. Compare the natural world and human-made world (e.g., natural vs artificial light)
C. Demonstrate that creating can be done by anyone.

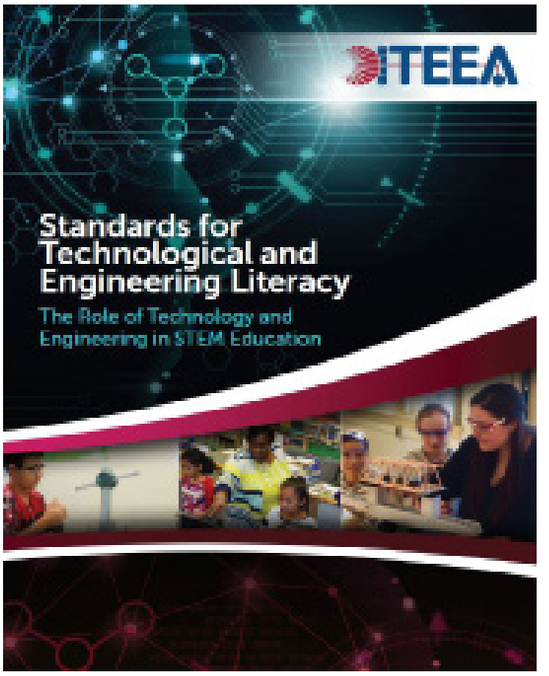
Grades 3-5
E. Compare how things found in nature differ from things that are human-made, noting differences and similarities in how they are produced and used.
H. Design solutions by safely using tools, materials, and skills.

Standard 7: Design in Technology and Engineering Education
Grades PreK-2
B. Demonstrate that designs have requirements.
C. Explain that design is a response to wants and needs.

Grades 3-5
I. Apply the technology and engineering design process.
J. Evaluate designs based on criteria, constraints, and standards.

Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems
Grades PreK-2
A. Analyze how things work.

Grades 3-5
F. Identify why a product or system is not working properly.



Submission:
Submit the video link to lrcheek@uark.edu
Subject line: GDC 2025 Video - Elementary Submission – [School Name]
Deadline: December 15, 2025.

The winning team will receive a free one-year Group Membership for their school, an invitation to be part of ITEEA's 2026 STEM Showcase, and one free hotel night at the Virginia Beach Conference.

For questions about the Global Design Challenge contact
Dr. Leah Cheek at lrcheek@uark.edu