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NEW MEXICO GOVERNOR'S STEM CHALLENGE

2019 - 2020

PURPOSE:

- To encourage New Mexico (NM) students and teachers to incorporate and utilize Next Generation Science Standards (NGSS) in everyday classroom activities.
- To recognize student skills in Science, Technology, Engineering, and Math (STEM) statewide
- To emphasize local job potential with NM STEM employers
- To encourage diverse student participants from underrepresented populations in STEM including minorities and girls.

CHALLENGE DESIGN:

- Student teams from NM high schools statewide will imagine, design, and develop a model to address a STEM question formulated by Los Alamos National Laboratory (LANL):
 - **2019-20 CHALLENGE THEME: KEEPING THE WORLD SAFER USING TECHNOLOGY**
- Schools accepting the Challenge will use the goal of answering the Challenge question as a co-curricular learning tool and case study in their everyday STEM class curricula.
- Teams will create and submit a proposal packet by November 22, followed by presenting their prototype model at a Statewide Showcase in Los Lunas, NM, on December 7.
- Participating NM STEM industry employers will judge teams based on quality, and degree to which answers reflect skills required for careers with NM STEM businesses.
- NM STEM employers will award winning teams \$5,000 (\$500/student), and participating students will also be awarded a varsity letter in STEM recognized by the New Mexico Activities Association.
- Schools may elect to host a school showcase for students to present their work and engage the local community, with the recommendation of hosting it at a venue that relates to the theme.

PARTICIPANT ELIGIBILITY:

- All students grades 9-12 from NM high schools including public, charter, and private schools
 - Home schools can participate by joining a public school team
- Though all students in STEM high school classrooms may participate, schools will select a team of up to **10** students and **2** teacher mentors to represent the school and submit a proposed solution

IMPORTANT DATES:

- **August 30th, 2019:** Schools must register teams via bit.ly/2YBNrxX
 - School principal must approve team application
- **November 22nd, 2019:** Teams must submit prototypes/plans to the LANL Statewide STEM Showcase Coordinator Anjeli Doty at adoty@lanl.gov by 11:59 p.m.
- **December 7th, 2019:** Statewide STEM Showcase held in Los Lunas, NM

STUDENT BENEFITS:

- Teams will present at Statewide STEM Showcase before all companies, alliance participants, and other school teams, and winning teams chosen by NM STEM employers win a \$5,000 award (\$500/student).
- Each of the 10 students participating on a team will receive a varsity award letter in STEM recognized by the New Mexico Activities Association for college admissions.
- Students will use and learn: teamwork, problem solving, innovation, breakthrough technologies, STEM development, and presentation skills.

MENTOR TEACHER RESOURCES

- Two-day weekend workshop in September focusing on the STEM Showcase criteria, and how to incorporate the required NM STEM Ready! Science Standards
- In addition to teacher mentor(s), teams will receive support from Subject Matter Expert mentors coordinated through NM State University partnered with Northern NM College
- Professional development and supplies/materials through the NM Public Education Department
- Co-curricular resources to use Challenge question in STEM classrooms as problem-solving tool
- \$500 stipend for teacher mentors and weekly virtual support

STUDENT DELIVERABLES:

Each team will develop: 1) a prototype/rough model of their solution, and 2) a plan related to the given question.

- The judging system/rubric for the STEM Challenge will be made available so that participants understand how teams will be evaluated and what it takes to be competitive

PROTOTYPE SPECIFICATIONS

- Must be in the form of a physical or digital model or software/computational simulation.
- Must be a tangible representation of group's solution.
- Students are not required to produce prototypes in a fab-lab or maker-space; teams may create prototypes at school or home, with household objects or scrap materials.
- Does not have to be a working model, but students need to be able to explain how it would work.
 - If it can be operational, it should be.
- Must be able to be transported in a vehicle (i.e. to the Statewide STEM Showcase).
- **PROHIBITED MATERIALS INCLUDE:**
 - Open flames or open heat source (lighters, matches, candles)
 - Anything material or liquid considered combustible
 - Bio-hazards and potentially dangerous materials
 - Guns, replica guns, and electric stun guns
 - Martial arts weapons
 - Ammunition
 - Fireworks
 - Knives of any size, box cutters, and razors
 - Mace and pepper spray
 - Balloons
- Demonstrations/presentations may not include human beings or living creatures.
- The prototype *cannot* exceed a cost of more than \$500.

PLAN SPECIFICATIONS

Students will prepare and submit online to the Statewide STEM Showcase Coordinator:

1. A one-page executive summary
2. A written plan (10 pages maximum) **and** presentation (a slide deck/pitch stack around 10 minutes long were it presented in person) on their solution that to the greatest extent possible addresses the following:
 - a. **Identifying the Problem**
 - i. Demonstrated research and background of the problem
 - ii. Defined the problem (constraints are clarified and discussed)
 - iii. Work and research others have done to solve the problem
 - b. **Brainstorming**
 - i. Communicate the ideas considered to solve the problem (sketches, rough drafts, etc.)
 - c. **Build Model or Prototype**
 - i. List of materials used (including cost)
 - ii. Identify the safety rules that were observed and followed
 - d. **Test Model and Evaluate**
 - i. Strengths and weaknesses of design
 - ii. Modifications or refinements made to improve or adjust the design
 - iii. Test results shared
 - iv. Explain if/how the design effectively addresses the problem
 - e. **Collaboration**
 - i. Communicate how each team member contributed to the solution

CURRICULUM GUIDELINES

NEXT GENERATION SCIENCE STANDARDS (NGSS) REQUIREMENTS

Teachers mentoring teams for the STEM Challenge and Statewide Showcase project must incorporate:

1. The *HS-ETS1-1 Engineering Design* science standard,

HS-ETS1-1 Engineering Design	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
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2. And at least **one** of these high school NM STEM Ready! Science Standards:
 - HS-ESS3-3 Earth and Human Activity (Biology, Integrated Science I)
 - HS-ESS2-4 Earth's Systems (Biology, Integrated Science I, Chemistry)
 - HS-LS1-2 From Molecules to Organisms: Structures and Processes (Biology, Integrated Science II)
 - HS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics (Biology, Integrated Science I)
 - HS-PS3-3 Energy (Physics, Chemistry, Integrated Science I)
 - HS-PS4-2 Waves and Their Applications in Technologies for Information Transfer (Physics, Integrated Science II)

For more information, please contact the **Math and Science Bureau** at the NM Public Education Department.

LANL CHALLENGE THEME & PROPOSED TOPICS

Scientific research and technology at Los Alamos National Laboratory is dedicated to protecting the security of our country and keeping its citizens safe. The following topics are areas where the Laboratory works to find solutions to challenging national problems. In the 2019-20 NM Governor's STEM Challenge, LANL invites students to help identify new national security solutions aligned with the goal of **Keeping the World Safer Using Technology**.



ADDITIONAL RESOURCES:

Developing solutions for national security can take many different approaches, including addressing issues related to climate change, health care, food insecurity, violence, homelessness, sustainability, and education.

Recommended article: [7 Real-World Issues That Can Allow Students to Tackle Big Challenges](#)

For additional information on LANL researchers working in the areas of national security, see supplementary document *2019-20 NM Governor's STEM Challenge: Challenge Question Resources*.

SAMPLE DESIGN PROCESS:

