ECybermission Competition

Content Area: **Science**
Course(s): **TAG 8**
Time Period: **October**
Length: **Approximately 16 weeks**
Status: **Published**

Unit Overview

E-Cybermission is a national STEM(Science, Technology, Engineering, Math) competition sponsored by the United States Army for students in Grades 6-9. It challenges students to think about real-world applications of STEM by working in teams to identify a problem in their community and use the scientific method, scientific inquiry, or engineering design process to find a solution. Teams submit a Mission Folder via the E-Cybermission website.

Essential Questions

- What qualities should individuals possess in order to work well in a team environment?
- What do you think are some problems facing your community?
- What are some ways that you think you could solve those problems?
- How do you recognize a credible and reliable source vs. one that is not?
- How do your experiments help solve the problem or show the potential to solve the problem?
- How does your data support that there is a significant benefit to your community?
- How could you actually implement your solution in the future?
- What businesses or companies could help you with implemenatation or advancing the research you have done?
- What organizations could help you at the community, state, or national level?

Content

- To identify behaviors that help teams function more effectively
- To identify behaviors that hamper team effectiveness
- Learn how to work in groups and perform as a team
- To create a concept map/web with illustrations for each of the Mission Challenges
- Gain an understanding of the various Mission Challenges
- Divide tasks so that all members of the team have an equal opportunity to contribute
- Identify a problem and formulate probing scientific questions regarding the problem
- Generate several hypotheses around the problem selected
- List 2 or 3 experiments they could conduct for each hypothesis
- Locate reliable and unreliable resources on the internet and identify the characteristics of each type of site
- Generate multiple testable hypotheses for a single problem

- Write the multiple testable hypotheses for the E-Cybermission problem they have chosen to investigate
- Decide what data to gather and what tools are needed to gather the data
- Determine how to measure and record the data
- Decide how much is needed to produce reliable results
- Consider limitations on the precision of the data
- Identify variables and controls in the experiment
- Organize data in a data table
- Create a labeled graph of the data
- Draw conclusions from a data graph
- Work through the scientific process to create tables and graphs and formulate conclusions
- Answer questions about the benefit of their research, which will be entered into their Mission Folder

Skills

- Apply
- Compare
- Compose
- Consider
- Construct
- Describe
- Design
- Develop
- Differentiate
- Distinguish
- Evaluate
- Explain
- Express
- Give Examples
- Hypothesize
- Identify
- Organize
- Plan
- Prepare
- Produce
- Recognize
- Solve
- Summarize
- Support

Assessments

- Answer the following questions: What is one specific behavior you could improve to help your team work well together on your E-Cybermission project?; List 3 ways your team could communicate about your E-Cybermission project in class and out of class
- Student teams have 2 minutes to present their Mission Challenge concept map to the class and add it to the classroom map/web
- Teams will submit a written problem statement on the Problem Approval Form
- Students will enter their problem and question into the E-Cybermission website by the assigned date
- Check the homework of the students to see if they could find both credible and non-credible sources
- Discuss why students thought non-credible sources were actually credible
- Assist students in distinguishing between the different types of sites
- Students teams submit at least 3 testable hypoteheses that can be used to complete the E-Cybermission project
- Student resource worksheet 8-7
- Investigation Plan
- Formative Assessment: observation and monitoring as students practice
- Summative Assessment: Resource Worksheet 8-9: Forest A, Forest B
- Students self-evaluate the work they did on each of the 5 problems and circle the problem they think represents their best work
- Teacher provides assessment and feedback that will help them better address the E-Cybermission Mission Folder conclusion criteria
- Student teams submit their worksheet 8-11 for teacher feedback and then enter their responses into the Mission Folder

Lessons/Learning Scenarios

Lesson 1: Teambuilding Exercise: Students split into 2 lines and stand shoulder to shoulder. Everyone's index finger must remain in contact with the stick at all times and the stick must rest on top of their fingers at all times. Teacher will lay the stick across the group's fingers which are waist level. The group must then work together to lower the stick to the ground. The stick will most likely rise up instantly caused by the small ripples of upward pressure as students each try to stay in contact with the stick. They will be given other opportunities to problem-solve in order to successfully work together to achieve the challenge. Teacher will follow-up with discussion/reflection questions.

Lessons 2 & 3: Introducing and Understanding E-Cybermission: Teacher will have enough laptops already set up and opened to a specific Mission Challenge. Students will work with their teams and have 3 minutes to create a plan of how each team member will participate and what role they will play. Each team will then have 5 minutes at each station and record the topics and other information related to the stations' Mission Challenge. Teams then select 1 of the Mission Challenges and build a map/web for that specific Mission Challenge and then combine theirs with a large E-Cybermission web for the class.

Lessons 4 & 5: Each student writes one possible community problem. Students will stand in a circle around the room and crumple up their one idea and throw it into the middle of the circle. Then students will pick up an "idea snowball" and will have one minute to write down any ideas that come to mind based on the idea

written on the paper. Repeat this process several times. This is a terrific brainstorming activity that can help ideas expand into many different directions. Students will share the community problems listed on their paper for the teacher to record on a classroom display. Students will conduct internet research to further understand one or more of the problems that were generated during the "snowball" activity and develop their question for investigation. As teams select the problem they would like to focus on, teacher will cross them off classroom display. Teacher explains to students that they should be able to generate several hypotheses around the problem chosen and they should be able to list 2 or 3 experiments they could conduct for each hypothesis.

Lesson 6: Teacher will reference worksheet 8-3:How Do You Research? and shows students some sites on the internet and discusses with them whether they like the "looks" of this site, does it look professional, etc... Teacher will then talk to the students about the CRAAP Test (worksheet 8-4) which can be used to help determine whether or not a website is presenting valid and usable information. Students are given homework assignment where they must turn in 3-5 creditable sources for his or her E-Cybermission topic.

Lesson 7: Teacher will give students various different sizes of paper and ask them to make a paper airplane. Teacher will ask students to line up in back of classroom and have them one-by-one fly their planes. Teacher will pick up 4 "good" airplanes that flew the furthest and 4 "bad" airplanes that flew the shortest distance. The students will brainstorm for 2 minutes why they think the good ones flew better than the bad ones. On the board, the teacher will write "Distance Flown" in the center of a web and will tell students this is the dependent variable, it is what we are measuring. Around the web, the teacher will elicit responses from students as to why the planes flew "good"...these are independent variables. Have the students pick one variable they think is important to flight. Now that they have picked an independent and dependent variable, they can develop a hypothesis. In order to test the hypothesis, they need to try to keep most other indpendent variables the same and will discuss how to stabilize these. Students and teacher will read together "How to Correctly Write a Hypothesis". Students will then write a hypothesis for the plane experiment based on the data observed. Students will practice their writing hypothesis skills by completing worksheet 8-5. Students can share their hypotheses. They can conclude lesson by writing their hypothesis and adding it to the E-Cybermission Mission Folder using worksheet 8-6:Writing Your Hypothesis.

Lessons 8-10: The teacher will present the students with the question, "How many drops of water do you think can fit on one side of a penney?" and direct them to website to perform initial testing and collection of data. The teacher will also lead a discussion. The students will be given worksheet 8-7: Independent Investigation Guidelines and will brainstorm various "treatments" or things they could change and test about the Penny Lab. Students will select an independent and dependent variable. They will then generate their own hypothesis and procedure using worksheet 8-7: Independent Investigation Guidelines. Remind students that the test must be safe and are limited to common household products. Students submit their investigation plan. Students set up the invesitigation after reviewing teacher comments and if any changes need to be made first. They then collect data and complete their Independent Student Form Assessment.

Lessons 11-12: Review with students the basic types of graphs, how they are similar and different, and when it is appropriate to use each. Teacher will show students video clip to build background knowledge. Students work together to study their slice of a tree. Students will complete worksheet 8-8: Tree Ring Data Sheet after studying their tree sample.

Lessons 13-14: Teacher will review the scientific practices with the students. Teacher will point out to the students that the ability to draw good conclusions involves an understanding of all the parts of the investigative process. Students are give worksheet 8-10: Scientific Investigation Practice Problems (These practice problems include data sets that should be represented with a line graph, bar graph, and circle graph. They also are asked to draw conclusions and propose related investigations)

Lessons 15-16: Worksheet 8-11: Benefit to the Community Worksheet. Teams access their data tables, graphs, and conclusions either online or as printed hard copies. Teams review worksheet 8-11. Two teams

merge to brainstorm and identify additional benefits. Students contact companies and organizations that extend their view of the problem and solution.

Standards

LA.8.CCSS.ELA-Literacy.CCRA.R.8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
LA.8.CCSS.ELA-Literacy.CCRA.W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.8.CCSS.ELA-Literacy.CCRA.W.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
SCI.7-8.5.1.8.A.a	Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.
SCI.7-8.5.1.8.A.b	Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
SCI.7-8.5.1.8.A.c	Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
SCI.7-8.5.1.8.B.a	Evidence is generated and evaluated as part of building and refining models and explanations.
SCI.7-8.5.1.8.B.b	Mathematics and technology are used to gather, analyze, and communicate results.
SCI.7-8.5.1.8.B.c	Carefully collected evidence is used to construct and defend arguments.
SCI.7-8.5.1.8.B.d	Scientific reasoning is used to support scientific conclusions.
SCI.7-8.5.1.8.C.a	Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.
SCI.7-8.5.1.8.C.b	Predictions and explanations are revised to account more completely for available evidence.
SCI.7-8.5.1.8.C.c	Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
SCI.7-8.5.1.8.D.a	Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.
SCI.7-8.5.1.8.D.b	In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
SCI.7-8.5.1.8.D.c	Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.
SCI.7-8.5.1.8.D.d	Organisms are treated humanely, responsibly, and ethically.
CCSS.Math.Content.8.F.B.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
CCSS.Math.Content.8.F.B.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a

	graph that exhibits the qualitative features of a function that has been described verbally.
CCSS.ELA-Literacy.W.8.1.a	Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
CCSS.ELA-Literacy.W.8.1.b	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
CCSS.ELA-Literacy.W.8.1.c	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
CCSS.ELA-Literacy.W.8.1.d	Establish and maintain a formal style.
CCSS.ELA-Literacy.W.8.1.e	Provide a concluding statement or section that follows from and supports the argument presented.
CCSS.ELA-Literacy.W.8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
CCSS.ELA-Literacy.RI.8.9	Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.
CCSS.ELA-Literacy.SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-Literacy.SL.8.1.a	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
CCSS.ELA-Literacy.SL.8.1.b	Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
CCSS.ELA-Literacy.SL.8.1.c	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
CCSS.ELA-Literacy.SL.8.1.d	Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Resources

http://www.ultimatecampresource.com/site/camp-activity/helium-stick.html

http://wilderdom.com/games/descriptions/HeliumStick.html

Resource Worksheet 8-1:Mission Challenge Concept Map Example

How to create a concept Map in Power Point at the website https://www.iu.edu/~lsmt/help/?p=811

How to create a concept Map in Excel at the website http://www.internet4classrooms.com/excel_concept_map.htm

Inspiration 8 Tutorial: Part 1 at website http://www.teachertube.com/viewVideo.php?video_id=117095

http://www.ecybermission.com/public/About/About_Winners.aspx

E-Cybermission Idea Engine at https://ecybermission.ideascale.com/

Community Problem Solving @MIT at the website http://web.mit.edu/cpsproject/home.html

http://www.csuchico.edu/lins/handouts/eval_websites.pdf

http://citationmachine.net/index2.php

http://scholar.google.com/intl/en/scholar/about.html

http://www.angelfire.com/scifi/ricks/hypothesis.html

http://www.docstoc.com/docs/44517659/Guidelines-and-Practice-for-Writing-Your-HypothesisStrong

http://www.sciencebuddies.org/blog/2010/02/a-strong-hypothesis.php

http://www.sciencebuddies.org/science-fair-projects/project_hypothesis.shtml

http://sciencespot.net/Media/indinvestrbrc.pdf

http://sciencespot.net/Media/pennylab.pdf

http://www.sciencebuddies.org/science-fair-projects/project_experimental_procedure.shtml

http://sciencespot.net/Pages/classgen.html

http://www.arborday.org/kids/carly/lifeofatree/

www.ahsd.org/science/sassaman/Intro%20unit/Skittles%20Lab.htm

http://nces.ed.gov/nceskids/help/user_guide/graph/whentouse.asp

http://www.realtrees4kids.org/sixeight/stemsrings.htm

http://betterlesson.com/document/226492/prentice-hall-drawing-conclusions.pdf

https://www.ecybermission.com/public/About/About_Judging.aspx

http://www.sciencebuddies.org/science-fair-projects/project_conclusions.shtml

http://www.serve.gov/toolkits/general/one.asp

http://customerservicemanager.com/20-business-telephone-etiquette-tips.htm