LIVE INTERACTIVE LEARNING @ YOUR DESKTOP

Teach STEM Skills in Your Classroom Through eCYBERMISSION

Presented by: Larry Cain

November 8, 2012
6:30 p.m. – 8:00 p.m. Eastern time
Introducing today’s presenter…

Larry Cain
National Science Teachers Association
Teach STEM Skills in Your Classroom through eCYBERMISSION

1. eCYBERMISSION Overview
2. How to Choose a Topic
3. How to Write a Problem Statement
4. Data Collection/Analysis
5. Drawing Conclusions and Presentations
Poll: How familiar are you with eCYBERMISSION?

A. I have been an eCYBERMISSION Team Advisor
B. I have not participated, but am familiar with eCYBERMISSION
C. I don’t know much about eCYBERMISSION
D. Other (share details in chat)
Teach STEM Skills in Your Classroom through eCYBERMISSION

eCYBERMISSION Overview
1. eCYBERMISSION Overview
What is eCYBERMISSION?

- **Competition** – eCYBERMISSION is a Science, Technology, Engineering and Mathematics (STEM) competition sponsored by the U.S. Army and administered by the National Science Teachers Association: free for students in grades six through nine.

- **STEM** – Science, Technology, Engineering and Mathematics are exciting fields that need the interest and commitment of today’s youth.

- **Virtual** – All eCYBERMISSION activity is web-based. eCYBERMISSION has online tools and Webinars to help students and their advisors through the process.

- **Rewards** – Winning students can advance to the Regional and National Competition and have the opportunity to win up to $8,000 (maturity value) in U.S. Savings Bonds.
1. eCYBERMISSION Overview

Winners

- Each State Winner receives $1,000 (1st place) or $500 (2nd place) in U.S. Savings Bonds
- Each Regional Winner receives $2,000 in U.S. Savings Bonds and an all-expense paid trip to the Washington, D.C. area, to compete for the First-Place National Award
- Each National Winner receives an additional $5,000 U.S. Savings Bonds (maturity value)
1. eCYBERMISSION Overview
How does the competition work?

- Students work in teams of three or four with the help of an adult Team Advisor.

**Step 1**

**Register** your team on the eCYBERMISSION website

[www.ecybermission.com](http://www.ecybermission.com)
1. eCYBERMISSION Overview
   Brainstorming exercise

**Step 2**

**Identify a problem** in the community and select a corresponding Mission Challenge.
1. eCYBERMISSION Overview

Experimentation

Step 3

Scientific Method/Inquiry

- Team Collaboration
- Use of Scientific Method/Inquiry
  - Problem Statement
  - Hypothesis
  - Experimental Design
- Data Collection and Analysis
- Drawing Conclusions
- Benefit to the Community
- Submit Your Mission

OR

Engineering Design Process

- Team Collaboration
- Engineering Design Process
  - Problem Statement
  - Experimental Design
  - Build Prototype
  - Test Prototype
  - Drawing Conclusions
- Benefit to the Community
- Submit Your Mission
1. eCYBERMISSION Overview
Step 4: Submit the project online
1. eCYBERMISSION Overview
Resources for teams: Mission Control

- Mission Control Help Desk:
  - 1-866-GO-CYBER (462-9237)
  - missioncontrol@ecybermission.com

- Mission Folder tips and worksheets:
  - The eCYBERMISSION website has many worksheets and tools on the experimentation process and other methods to help students through every step of their projects.
1. eCYBERMISSION Overview
Resources for Teams: Mission Control

- Webinars:
  - Students can chat with CyberGuides, Volunteer STEM experts in the field, to ask questions about their projects

Name: Amy Klopotoski
Username: Klopotoski
Organization: Natick Soldier RD&E Center
Job Title: Contingency Basing Science & Technology Lead
Years with eCYBERMISSION: 3
College Degree: Chemical Engineering
Mission Challenge Strengths: Alternative Sources of Energy

Fun Facts:
I had a baby in March. Rebecca Carol, who keeps me very busy in my free time! She is just starting to crawl and a lot of fun! I also love being outdoors: camping, hiking and skiing in the winter. I am a huge Boston sports fan. My husband and I try to get to Sox/Brums/Patriots games when we get a chance, otherwise they are always on our TV.

Bio:
- I lead a team of engineers working on technologies for base camps. These can be small camps in austere locations, or all the way up to the large tent cities you might see on the news. The technologies we work provide everything the Soldier needs to live in the field.
- I get to work on very interesting technologies like solar panels to generate electricity for base camps and advanced composites for shelters. One of my favorite parts of my job is when we build new technologies and then work with the Soldiers to test them in the field.
- I have been working at Natick for ten years and love what I do. I also participate in our Women in Science and Engineering program, where we work with local schools to teach them about the role of math and science in the Army.
1. eCYBERMISSION Overview

eCYBERMISSION social media

- Be part of eCYBERMISSION’s social media network with real-time photos, videos and stories throughout the competition year
  - [facebook.com](http://facebook.com) (search eCYBERMISSION)
  - [twitter.com/ecybermission/](http://twitter.com/ecybermission/)
  - [ecybermission.blogspot.com](http://ecybermission.blogspot.com)
  - [youtube.com/ecybermissionteam](http://youtube.com/ecybermissionteam)
  - [flickr.com/photos/ecybermission](http://flickr.com/photos/ecybermission)
What would your students most need assistance with?

Use clip art to stamp your answer.

<table>
<thead>
<tr>
<th>Picking a topic</th>
<th>Writing a problem statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collecting and analyzing data</td>
<td>Drawing conclusions and final presentation</td>
</tr>
</tbody>
</table>
Questions?

Type your questions or comments in the chat.
Teach STEM Skills in Your Classroom through eCYBERMISSION

Choosing a Topic
2. Choosing a Topic
Mission Challenges

- Alternative Energy Sources
- Environment
- Food, Health & Fitness
- Forces & Motion
- National Security & Safety
- Robotics
- Technology
2. Choosing a Topic
What Are You Interested In?

- Are you interested in green energy or the environment? How could you demonstrate through experimentation and research how people could become more energy efficient and/or eco-friendly?

- Do you like to play sports? Are the sports you play safe? How could you make them safer?

- Do you use a lot of technology in your life? What do you think might be the next step for some of the technology you use? Is there a device that we don’t have right now that would make our lives easier?

- Are you interested in plant life or agriculture? How do different vitamins and nutrients affect the growth of plants? Is there a non-chemical additive that could be safely used to increase crop yields?

- Do you like robots or other forms of artificial intelligence? In what ways could they assist us that we are not utilizing?
2. Choosing a Topic
Interview Members of the Community

- They can interview:
  - Other students
  - Teachers
  - Parents
  - Other members of the community

- Problems that affect:
  - Their school
  - Their hometown
  - Their state
2. Choosing a Topic
Surf the Web

- Read current news headlines
- Go to the eCYBERMISSION website
- Search for past science fair topics
2. Choosing a Topic
Brainstorming!

- Set aside 15-20 minutes
- Find a quiet space
- Have your team sit together
- Everyone submits ideas – ANY IDEAS!
- Have someone write down all of the ideas
- Review the ideas when you are finished
2. Choosing a Topic
Don’t Get Discouraged

- Remember this is a process
- This isn’t easy
- Use:
  - The Mission Challenges
  - Questions
  - The Community
  - The Internet
  - Brainstorming
- Practice collaboration
- Inspiration is EVERYWHERE!
How would your students feel about this step?

Use the virtual pen to mark your answer.

- Bored
- Anxious
- Excited
- Confident
Questions?

Type your questions or comments in the chat.
Teach STEM Skills in Your Classroom through eCYBERMISSION

How to Write a Problem Statement?
3. How to Write a Problem Statement
Components of the Mission Folder

- Team Collaboration
- Use of Scientific Method/Inquiry or Use of Engineering Design Process
- Benefit to the Community
Poll: Have you used the engineering design process in class?

✅ Yes

❌ No

If yes, share your impressions in the chat.

- What were the challenges and advantages?
- Did students enjoy it?
- Would you use it again?
### 3. How to Write a Problem Statement
Use of the Scientific Method/Inquiry or Use of the Engineering Design Process

<table>
<thead>
<tr>
<th>Mission Folder Scorecard Sections</th>
<th>Scientific Mission Folder</th>
<th>Engineering Mission Folder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Statement</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Hypothesis</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>Experimental Design</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>Build Prototype</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Test Prototype</td>
<td>-</td>
<td>75</td>
</tr>
<tr>
<td>Data Collection and Analysis</td>
<td>75</td>
<td>-</td>
</tr>
<tr>
<td>Drawing Conclusions</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>“Use of” Subtotal</td>
<td>350</td>
<td>350</td>
</tr>
</tbody>
</table>
3. How to Write a Problem Statement
Scientific Method/Inquiry Vs. Engineering Design

- Observe and explore
- Ask question
- Do Background Research
- Construct Hypothesis
- Test with an Experiment
- Analyze Results and Draw Conclusions
- Report Results
- More questions
- Reflect on what happened
- Experiment or observe to answer question

- 1. Identify the Problem
- 2. Refine the Design
- 3. Brainstorm Possible Solutions
- 4. Select an Approach
- 5. Explore Possibilities
- 6. Generate Ideas
- 7. Build a Model or Prototype
- 8. Identify Criteria and Constraints
- 9. Explore Possibilities

Source: http://www.nasa.gov
3. How to Write a Problem Statement

Asking Questions

- Get your team asking questions
- Questions are helpful for both processes
- Questions might lead to a problem to investigate.

Example:

- One of the highest costs for our school district is energy bills and purchasing new light bulbs.
3. How to Write a Problem Statement

What is a problem statement?

- What problem will you be solving?
- The foundation of the entire project
- In the context of eCYBERMISSION
  - Three parts:
    - What problem in your community did your team try to solve? Why is this problem important to your community?
    - Ten resources
    - Describe what you learned in your research
      - Worth 75 points in the Mission Folder
      - Needed in both the scientific method/inquiry and the engineering design
3. How to Write a Problem Statement

Problem Statement

- What problem in your community did your team try to solve? Why is this problem important to your community?
  - What will happen if the problem continues?
  - How will solving the problem help the community?
  - What will improve and what will happen as a result of that improvement?
3. How to Write a Problem Statement

Problem Statement

- List at least 10 resources you used to complete your research
  - Websites
  - Professional journals
  - Periodicals
  - Subject matter experts

"If I have seen further, it is by standing on the shoulders of giants" – Isaac Newton
3. How to Write a Problem Statement

Problem Statement

- Describe what you learned in your research
- Paragraph form, not bullet points

- Find examples at eCYBERMISSION.com
How would your students feel about this step?

Use the virtual pen to mark your answer.

- Bored
- Excited
- Anxious
- Confident
Questions?

Type your questions or comments in the chat.
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Data Collection & Analysis
4. Data Collection & Analysis
What To Do with Data

- What are the data for?
- Why was data collected?
- Questions the team should ask (according to Darci Harland in “STEM Student Research Handbook”):
  - What is true about our data? What additional questions come from the data?
  - How do the data describe the relationship between the two variables?
  - Do the data support the hypothesis (yes, no, partially)? OR Do the data support or refute your design statement?*

*This second question is not included in the “STEM Research Student Handbook” but is added here to support the engineering design process option.
4. Data Collection & Analysis
What is True About Our Data?

- Why did certain groups perform better than others?
- Which group had the most drastic changes? Why?
- Why did one group do so much better than the others?
- How does the control group compare to the experimental group?
- What strange possible reasons could explain the results?
4. Data Collection & Analysis
Questions About the Data (cont.)

- What trends or patterns are noticeable? Why did these occur?
- Are there any surprising outcomes of the experiment? Why did these occur?
- Are there some data that do not lie within in the normal distribution of the majority of the data? Why might this be? What could account for this?
- How might the procedure have influenced the results?
- How did any irregularities affect the results?
What should the team do about the new questions that were raised?

- Attempt to answer the question with new investigations
- Record the questions to be answered later
  - Your team
  - Others who study your investigation
4. Data Collection & Analysis
How Do the Data Describe the Relationship Between the Two Variables?

- Scientific Method/Inquiry
- Independent variable
- Dependent variable

- Engineering Design
- Prototype
- Observed changes

What caused the changes?
4. Data Collection & Analysis
Do the Data Support the Hypothesis?

- Use the data as proof
- Supports the hypothesis
  - Make sure the team can explain how it does so
- Does not support the hypothesis
  - This is OK!
  - What could be changed next time?
4. Data Collection & Analysis
Do the Data Support or Refute the Design Statement?

- Use data as proof
- Supports the design statement
  - Be able to explain how
- Refutes the design statement
  - This is OK!
- What could be changed next time?
4. Data Collection & Analysis
Data Tables

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Green Leaves</th>
<th>Number of Red Leaves</th>
<th>Number of Yellow Leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/15</td>
<td>58</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>9/16</td>
<td>55</td>
<td>3</td>
<td>2</td>
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<tr>
<td>9/17</td>
<td>50</td>
<td>6</td>
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<td>9/19</td>
<td>37</td>
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<td>8</td>
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<td>9/20</td>
<td>25</td>
<td>22</td>
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<tr>
<td>9/21</td>
<td>19</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>9/22</td>
<td>10</td>
<td>30</td>
<td>20</td>
</tr>
</tbody>
</table>
4. Data Collection & Analysis

Graphs

Number of Green Leaves

- 15-Sep
- 16-Sep
- 17-Sep
- 18-Sep
- 19-Sep
- 20-Sep
- 21-Sep
- 22-Sep

- Number of Green Leaves
- Number of Red Leaves
- Number of Yellow Leaves
How would your students feel about this step?

Use the virtual pen to mark your answer.

Bored | Excited

Anxious | Confident
Questions?

Type your questions or comments in the chat.
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Drawing Conclusions and Presentations
5. Drawing Conclusions and Presentations

Drawing Conclusions

- Results support the hypothesis or design statement
- Results do not support the hypothesis or design statement
- Put this into a well-written format
- Include background research to explain the results
5. Drawing Conclusions and Presentations
Results Were What You Expected

- Summarize how this happened
- Compare the relationship between the variables
- Clear and easy to understand
5. Drawing Conclusions and Presentations
Results Were Not What You Expected

- Don’t change your results
- Explain why this happened
- Describe what should happen next (and maybe even do it!)
5. Drawing Conclusions and Presentations
Make a Good First Impression

- Team Collaboration and State the Problem sections are seen first
- Have students think about what excites them
- “Wow” factor
- Get the readers (the judges) excited too
5. Drawing Conclusions and Presentations
Check Grammar and Spelling

- Don’t rely on Spell Check and Grammar Check
- Each member of the team should review the Mission Folder
- Have a peer and the Team Advisor review the Mission Folder
- Sometimes a small mistake can make a big difference
5. Drawing Conclusions and Presentations
Upload Images and Files

- Images and documents help the judges
- Reference the attachments in the text
- Use correct file names
- Save attachments as Adobe Acrobat PDF documents if possible
5. Drawing Conclusions and Presentations

Face-to-Face Presentations

- Eye-catching
- “Wow” factor
- Showmanship

Include
- Problem
- Data
- Team collaboration
- Why this helped the community
How would your students feel about this step?

Use the virtual pen to mark your answer.

Bored — Excited

Anxious — Confident
What excites YOU most about eCYBERMISSION?

Use clip art to stamp your answer.

<table>
<thead>
<tr>
<th>Scientific method/inquiry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering design process</td>
<td></td>
</tr>
<tr>
<td>Self-directed learning/discovery</td>
<td></td>
</tr>
<tr>
<td>Teamwork</td>
<td></td>
</tr>
<tr>
<td>Competition/prizes!</td>
<td></td>
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<tr>
<td>Other - use the text box tool to type</td>
<td></td>
</tr>
<tr>
<td>your answer</td>
<td></td>
</tr>
</tbody>
</table>
5. Drawing Conclusions and Presentations
What to do next

<table>
<thead>
<tr>
<th>Register online</th>
<th><a href="http://www.ecybermission.com">www.ecybermission.com</a></th>
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<td>Contact Mission Control</td>
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5. Drawing Conclusions and Presentations

Questions/Comments

For more information contact:
eCYBERMISSION Mission Control
1-866-GO-CYBER (462-9237)

Visit our website:
www.ecybermission.com
Thanks to today’s presenter!

Larry Cain
National Science Teachers Association
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