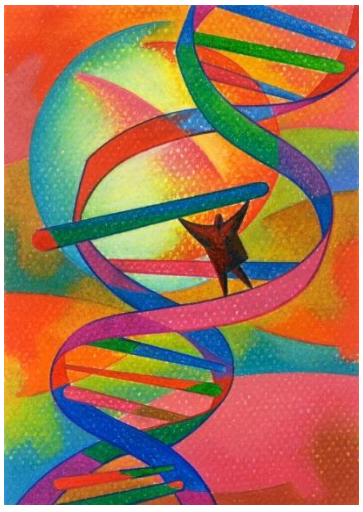
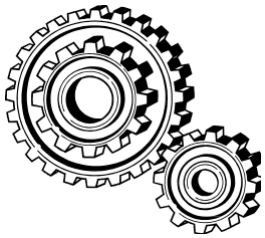
Innovation Expo

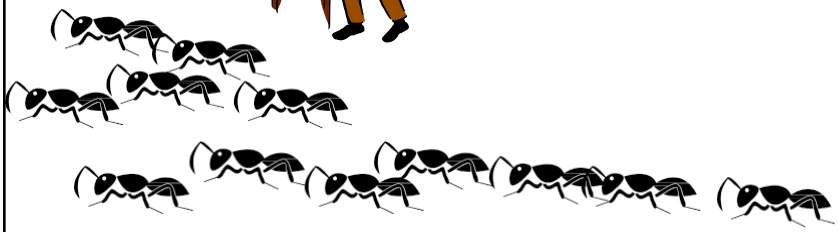
Elementary STEM Competition

Parent/Student Handbook

2019







Purpose

The Innovation Expo grew out of a realization that many kinds of learning experiences, both in and beyond the classroom, contribute significantly to the education of students. The Innovation Expo provides a valuable opportunity for young people to be creative, develop scientific understanding through research or hands-on learning, and build 21st Century Skills. The goal of having an elementary STEM competition at the Innovation Expo is to help students become more proficient in their scientific questioning, problem solving and communication skills, so that in later grades, students are adept at generating ideas and solving highly challenging problems with original experimentation. In addition to the elementary STEM competition, the Innovation Expo will showcase the progression of PreK-12 STEM and Innovative learning in Everett Public Schools and spotlight STEM careers through interactive hands-on exhibits by Everett students and members of the STEM community.

Student Competition Goals

1. To emphasize and support state science standards through meaningful applications of science and mathematics.
2. To provide a focus for students to apply skills and concepts learned in science, mathematics, reading, writing, technology and art.
3. To help students develop self-reliance, organizational skills, and productive work habits.
4. To provide our schools and community with the opportunity to recognize and encourage student interest in STEM.

Innovation Expo – Elementary Competition Handbook

2019

Table of Contents

Innovation Expo - Parent Letter

Dear Parents/Guardians,

For the fourth year in a row, Everett Public Schools will host the spring **Innovation Expo** at Angel of the Winds Arena in Everett. The Innovation Expo provides a valuable opportunity for young people to be creative, develop STEM understanding through research or hands-on learning, and build 21st Century Skills. Specific details and updates about the Innovation Expo will be distributed to schools as well as communicated via Everett Newslinks, Peachjar and on the district website.

Event: Innovation Expo
Date: Wednesday, June 5th, 2019
Location: Angel of the Winds Arena in Everett
Time: 5:00 – 8:00 PM (Student project check-in anytime between 3:30 – 5:00 PM)

The Student STEM Competition at the Innovation Expo provides a unique setting where selected 4th & 5th grade and middle school projects from across the district will be displayed and judged in a common public area. Students will first submit their projects to their 4th or 5th grade teacher who will then select two projects to move on to the Innovation Expo. Projects selected for the Innovation Expo will then be reviewed, at the Expo, by Everett teachers, using the rubrics provided for each project entry type. All students selected for the Innovation Expo will receive recognition for their work. The Student STEM Competition at the Innovation Expo will showcase and celebrate the very best 4th grade, 5th grade and middle school STEM projects from across the district. This will be an exciting experience for your child!

Individual students can also submit entries for the Student STEM Competition even if their whole classroom is not participating.

There are three project types that students can chose from for consideration into the Innovation Expo. Some of these project types require less materials and time outside of school. Rubrics for each project type are included at the end of this packet.

Project Entry Types:

- **Experiment** – Dive into the world of science by investigating original, student-driven scientific questions! Students will conduct an experiment to investigate a scientific question/problem. Using the **steps of the inquiry process**, students will ask a question, do preliminary research, make a prediction, plan and conduct an experiment, and analyze their results in order to make a conclusion that answers their question.

- **Research Project** – Have you ever had an interesting science or math question that you didn't know the answer to? Do you love to read informational texts to learn new information and enjoy teaching what you've learned to others? Now you can do both at the same time!! **Students will come up with an interesting science or math question/problem to research and will look for the answer/solution** by reading books, talking to experts, and gathering information from other sources such as schools and public libraries. Students can use independent reading time to research their questions using informational texts. Examples: How does a solar cell work? How do clouds form? How are snowflakes mathematical? How is music mathematical? The research projects students do will become their presentations.

- **Engineering Design** – Everyone is an engineer! Students will use science, math, and creativity to redesign an object or a process to solve a real-life problem. Using **The Engineering Design Process** will take students through all the necessary steps: asking a question, imagining or brainstorming possible solutions, planning, creating, testing, and redesigning the chosen solution to make it even better. Lesson 4 of the EIE kits can be used for this project type. Groups of students can submit their final redesign from EIE Lesson 4 for consideration into Everett's Innovation Expo.

Student Participation Requirements:

Students who would like to submit a project to their teacher so that they can be considered for participation in the Innovation Expo Student Competition will need to:

- Have a completed **project presentation board** that is based on the criteria outlined in the Project Presentation Board Guidelines sheets.

- Complete and return a **signed safety contract**

- Students who attend or have their work shown at the district Innovation Expo may have their work, names and photos appear in district publications and on the district website and district social media channels.

Your support and assistance are essential to your child's success. A general rule of thumb to go by is:

- Students should be doing the entire STEM project by themselves. However, they may need encouragement to follow the format given and to get their project completed on time.

The STEM project allows children to use critical thinking and problem-solving skills learned in science, math and literacy.

Attached is a **STEM Project Proposal Form** and a **Safety Contract**. Please complete both forms with your child and have your child return them to his/her 4th or 5th grade homeroom teacher.

Sincerely,

Allison Greenberg
Elementary Science/Engineering Instructional Facilitator

Innovation Expo
Helpful Hints for Parents

Welcome to the Innovation Expo!

This should be a fun project! Success is when your child asks their own question, completes their project with a smile, and knows more than when they started. Enjoy this time of discovery and fun for you and your child!

- ☐ The goal is that your child learns the steps of the inquiry process, research skills, or the engineering design process through direct experience.

- ☐ For their daily reading, recommend they choose a science book that can be a research resource for their project.

- ☐ A **Project Presentation Board** is part of the process.
  - It needs to be put together by the student, to be considered for the Expo.
  - The Project Presentation Board information should cover project rubric content.
  - Use the attached **Project Presentation Board guidelines sheets** as a guide to create the presentation board.

- ☐ It is best to guide and answer your child's questions with questions. You may know the answer, but help them discover it themselves.

- ☐ Encourage your child's artistic side with the display. For example, you can show how the use of color, shapes, and graphics can be used to draw attention to important parts of the display.

- ☐ If you allow your child to use web sites for research; verify the site is "correct" and then let them use the research found there. *Remember:*
  - Anyone can create a web site; this does not mean its information is correct!
  - Make sure the web site is run by a large, recognized group such as a college or organization.
  - DOT "org", "gov" or "edu" are generally trustworthy for accuracy of content.

- ☐ What is an acceptable Innovation Expo STEM Competition project?
  - Something that answers a question to which they do not know the answer
  - Something they can figure out through experimentation or design
  - Something they can change somehow, add another variable, and then predict the outcome.
    That's an experiment!

- ☐ What is NOT an acceptable Innovation Expo STEM Competition project?
  - Reproducing results found on the web is *not* an experiment; it's a reproduction.
  - A demonstration is not an experiment (i.e., volcano).

STEM Project Proposal Form (page 1 of 2)

Student Name: _____ Entry Type: _____
(Examples: Experiment, Research, Engineering Design
See descriptions below)

Teacher's Name: _____ Grade: _____ Room #: _____

The question I plan to investigate in my experiment, research or engineering design project is: *Examples of entry type question formats:* • **Experiment**: *How does _____ (manipulated variable) affect _____ (responding variable)?* • **Research**: *Why do bears hibernate? How do caterpillars change into butterflies?* • **Engineering Design:** *How can I design/redesign _____ to make it solve a problem/work better?*
Question:

Entry Type Descriptions:

- **EXPERIMENT** - Dive into the world of science by investigating your own scientific question! You will conduct an experiment to find the answer to your question/problem, using the steps of the inquiry process (asking a question, doing preliminary research, making a prediction, planning and conducting an experiment, and analyzing results).

- **RESEARCH PROJECT** - Have you ever had an interesting science or math question that you didn't know the answer to? Do you love to read informational texts to learn new information and enjoy teaching what you've learned to others? Now you can do both at the same time!! Students will come up with an interesting science or math question/problem to research and will look for the answer/solution by reading books, talking to experts, and gathering information from other sources such as schools and public libraries. Students can use independent reading time to research their questions using informational texts. Examples: How does a solar cell work? How do clouds form? How are snowflakes mathematical? How is music mathematical? The research projects students do will become their presentations.

- **ENGINEERING DESIGN** - Everyone is an engineer! You will use science, math, and creativity to dream up or redesign an object or a process to solve a real life problem. Using **The Engineering Design Process** will take you through all the necessary steps: asking a question, imagining or brainstorming possible solutions, planning, creating, testing, and redesigning the chosen solution to make it even better.

STEM Project Proposal Form (page 2 of 2)

Project Checklist:

Is your experiment, research or engineering design project safe to perform?	Yes / No
My parent/guardian and I have read, signed and agree to follow the STEM Competition Safety Contract.	Yes / No
Do you have all the materials and tools you need for your project, or will you be able to get them quickly and for under a few dollars?	Yes / No
Do you have enough time to do your experiment, research or engineering design project before the report and board are due?	Yes / No
(For a "3"): Can you find at least two sources of written information on this topic?	Yes / No

Please check the box below and sign your name.

☐ **I have agreed to my child's STEM project choice and can provide the material and support to complete this assignment.**

Parent Signature_____ **Date**_____

** This part to be completed by the teacher!!

- Teachers, please double check that the category the student is entering a project in matches the content of their project.

TO: Student Name

_____

Innovation Expo
Project Approval Form

Your STEM Project has been approved! It looks like you are on the right track to answer your question (problem). Good luck finding out the answer and have fun!

The type of project you have chosen is: EXPERIMENT RESEARCH ENGINEERING DESIGN

The safety contract has been received: Yes / No

Reminder: Your completed project is due on _____.

Teacher Signature: _____

Experimental Projects (Grades 4 & 5)

Rubric for Innovation Expo STEM Competition

	Basic 1 point	Attempted 2 point	Proficient 3 points	Advanced Proficient 4 points
Guiding Question	• Does not state the problem as a question	• States the guiding question as a question that cannot be tested in an experiment.	•States guiding question as a question that can be tested	•States a unique, original guiding question as a testable question •States the changed and measured variables in the question
Prediction	• Does not make a prediction.	• Makes a prediction that does not connect to the stated guiding question	•Makes a prediction that connects to the stated guiding question	•Makes a prediction that connects to the stated guiding question and includes scientific reasoning
Materials & Procedure	• Material list is missing. • Procedure is missing two or more of the following: ○ steps to do the experiment ○ one changed or one measured variable ○ how often measurements should be taken and recorded	• Materials list is incomplete to carry out investigation. • Procedure is missing one or more of the following: ○ steps to do the experiment ○ one changed or one measured variable ○ how often measurements should be taken and recorded	•Materials are listed but lack detail. •Procedure includes: ○ relevant steps to do the experiment ○ one changed variable ○ one measured variable ○ how often measurements should be taken and recorded	•All materials are listed with details such as quantity and size. •Procedure includes: ○ Clear and logical steps for the experiment ○ one changed variable ○ one measured variable ○ how often measurements should be taken and recorded
Data Table	• Data table missing	• Only performed one trial of experiment • Data is incomplete	• Performed more than one trial of experiment • Data is organized in a data table	• Performed experiment at least three times • Data is organized in a clearly labeled data table with appropriate measurement units, identifying the changed and measured variables
Conclusions	• Does not answer the experimental question. • Supporting data not used.	• Answers the experimental question • Includes limited **supporting** data from the data table • Does not explain how these data **support** your conclusion	• Answers the experimental question • Includes **supporting** data from the data table • Explains how these data **support** your conclusion	• Answers the experimental question • Includes relevant **supporting high and low** data from the data table • Clearly explains how these data **support** your conclusion
Visual Display	• Project is not easy to read • Display is missing two or more of the following parts: **Guiding Question, Prediction, Materials, Procedure, Data Table, Conclusion, Visual Display** • Display is missing pictures or visuals	• Project is not easy to read • Display is missing one of the following parts: **Guiding Question, Prediction, Materials, Procedure, Data Table, Conclusion, Visual Display** • Display is missing pictures or visuals	• Project is easy to read • Display is organized and includes all of the following parts: **Guiding Question, Prediction, Materials, Procedure, Data Table, Conclusion, Visual Display** • Display includes pictures and/or visuals and mathematical data with appropriate measurement units	• Project is easy to read • Display includes all parts listed in "Proficient" and is organized neatly • Information is written with correct grammar, spelling and punctuation • Display includes pictures, visuals, data with appropriate measurement units and/or models that support the research in an inventive/creative way
Presentation	• No student presentation	• Presentation of project to judges is incomplete or doesn't answer judges' questions	• Presentation of project to judges is complete and answers some of the judges' questions • Answers to judges' questions are backed up with facts	• Presentation of project to judges is complete and provides clear answer to all of the judges' questions • Answers to judges' questions are sequenced logically, using appropriate facts

Research Projects (Grades 4 & 5)

Rubric for Innovation Expo STEM Competition

	Basic 1 point	Attempted 2 points	Proficient 3 points	Advanced Proficient 4 points
Guiding Question	• Does not state the problem as a question	• The guiding question is vague or there is no connection to a scientific or mathematical concept • Addresses an issue to which the student already knows the answer	• States the problem as a question • Shows a connection to a scientific or mathematical concept	• States the problem as a question • Addresses a connection to a scientific or mathematical concept • Unique, or original question applies to a current world problem or issue
Prediction	• Does not make a prediction.	• Prediction doesn't connect to the question • Prediction appears to be completed after the research is done	• Prediction connects to the question and is made before the research is done • Prediction is made using text features or prior knowledge	• Prediction connects to the question and is made before the research is done • Prediction is made using both text features and prior knowledge
Research	• Does not use sources or little research completed on topic • Research doesn't connect to the question.	• Only one quality source is used • Some research is completed • Limited connection to the question or prediction • Not written in the student's own words	• Two or more quality sources are used • One supporting quote is used • Research demonstrates a connection to the guiding question • Written in student's own words	• Four or more quality sources are used • Two or more supporting quotes are used • Research demonstrates a clear, in-depth connection to the guiding question • Research states how this affects the environment and/or people • Written in student's own words
Conclusions	• No conclusion or conclusion doesn't answer the question	• Conclusion answers the question, but does not refer back to the prediction • Contradicts the evidence found in the research	• Conclusion answers the question • States if prediction was supported or rejected • Quotes evidence from research • Explains the connection between the evidence and the conclusive statement	• Conclusion answers all aspects of the question, • States if the prediction was supported or rejected • Quotes evidence from research • Explains the connection between the evidence
Visual Display	• Project has limited eye appeal or cannot be read at 2 feet distance • Project is not organized, or contains major language or spelling errors • Display is missing pictures or visuals	• Project has limited eye appeal or is not easily readable at approximately 2 feet distance • Project has limited organization, or contains confusing visuals, or contains major language or spelling errors	• Project is appealing and readable at from 2 feet away • Organized and clear • Uses understandable visuals and/or models • Contains minimal language and spelling errors • Display includes pictures and/or visuals	• Project is appealing and neat, and readable from 2 feet away • Well organized and clear • Flawless language and spelling • Display includes pictures, visuals and/or models that support the research in an inventive/creative way
Presentation	• No student presentation	• Presentation of project to judges is incomplete or doesn't answer judges' questions	• Presentation of project to judges is complete and answer some of the judges' questions • Answers to judges' questions are backed up with facts	• Presentation of project to judges is complete and provides clear answer to all of the judges' questions • Answers to judges' questions are sequenced logically, using appropriate facts
Sources	• No sources listed	• Sources at the end of the written report are listed by title only, or represent an incomplete list	• Two or more sources are cited with most of the information given, i.e., name, title, web address, date	• Four or more sources are cited correctly with complete information

Engineering Design Projects (Grades 4 & 5)

Rubric for Innovation Expo STEM Competition

	Basic 1 point	Attempted 2 points	Proficient 3 points	Advanced Proficient 4 points
Ask	• States the problem as a statement, instead of a question • Doesn't share prior learning about the problem from sources	• States the problem in the form of a question • Describes one thing learned about the topic from informational sources (such as books, videos, interviews) that helped find possible solutions	• States the problem in the form of a question • Describes 2-3 things learned about the topic from informational sources (such as books, videos, interviews) that helped find possible solutions	• States the problem in the form of a unique, original question • Describes 4 or more things learned about the topic from informational sources (such as books, videos, interviews) that helped find possible solutions
Imagine	• No possible solutions listed or solutions listed without descriptions	• Lists one or two solutions to the problem • Includes limited description of each solution	• Lists at least three practical solutions to the problem • Includes a description of each solution	• Lists three or more practical, creative solutions to the problem • Includes a clear, detailed description of each solution
Plan	• No chosen solution, or no description of how the solution will work • No diagram of chosen solution • No materials list	• Limited description of how your chosen solution will work • Unlabeled diagram of your solution • Materials list is incomplete	• Includes a description of how your chosen solution will work • Includes a labeled diagram of your solution • Major materials are listed for you solution	• Includes a detailed description of how your chosen solution will work • Includes a detailed, labeled diagram of your solution • All relevant materials are listed for your solution
Create	• No explanation for how solution was built • No test of the solution	• Limited explanation of how solution was built • Performs an incomplete test of the solution • Missing description of successes and challenges (troubles) during testing	• Explains how solution built • Perform a test of your solution, with appropriate data measurements • Includes description of successes and challenges (troubles) during testing	• Clearly explains how solution was built • Performs a test of your solution with multiple trials and appropriate data measurements • Includes detailed description of successes and challenges (troubles) during testing
Improve	• No explanations for redesign • No test of redesigned solution • No conclusion • No explanation of real world application	• Limited explanation of how solution was redesigned to work better • Incomplete retest of solution • Limited conclusion to explain how your redesigned solution solved the problem • Limited explanation of how what you learned applies to the real world	• Explains how solution was redesigned to work better • Retests solution • Writes a conclusion to explain how your redesigned solution solved the problem • Some explanation of how what you learned applies to the real world	• Explains in detail how solution was redesigned to work better • Retests solution • Writes a detailed conclusion with supporting data to explain how your redesigned solution solved the problem • Clearly explains how what you learned applies to the real world
Visual Display	• Project is not easy to read • Display is missing two or more of the following parts: **Ask, Imagine, Plan, Create, Improve** • Display is missing pictures or visuals	• Project is not easy to read • Display is missing one or some of the following parts: **Ask, Imagine, Plan, Create, Improve** • Display is missing pictures or visuals	• Project is easy to read • Display is organized and includes all of the following parts: **Ask, Imagine, Plan, Create, Improve** • Display includes pictures and/or visuals and data with appropriate measurement units	• Project is easy to read • Display is organized and includes all of the following parts: **Ask, Imagine, Plan, Create, Improve** • Information is written with correct grammar, spelling and punctuation. • Display includes pictures, visuals and/or models supporting research in an inventive/creative way
Presentation	• No student presentation	• Presentation of project to judges is incomplete or doesn't answer judges' questions	• Presentation of project to judges is complete and answers some of the judges' questions • Answers to judges' questions are backed up with facts	• Presentation of project to judges is complete and provides clear answer to all of the judges' questions • Answers to judges' questions are sequenced logically, using appropriate facts

Innovation Expo Project Ideas

These questions are provided as examples of topics you focus on for your project or how you could format your own question. You may come up with your own idea as long as it safe, you have the materials, and you can measure the results. All proposals must be approved by your teacher.

Research Questions:
How do clouds form?

How does camouflaging help animals?

How are snowflakes mathematical?

Why do plants need water and sunlight to stay alive?

How is nature mathematical?

How do caterpillars change into butterflies?

Why does erosion happen faster along bends in a river or stream?

Engineering Design Questions:
How can I design/redesign _____ to make it work better?

How can we redesign packaging to keep fruit fresh for a longer period of time?

How can we redesign a hand pollinator to work better at moving pollen from one flower to another?

How can we design a bridge to be safer and stronger?

How can we redesign a container so that it protects its contents from the impact of being dropped?

How can we redesign product packaging to hold the most product with the least amount of packaging?

Experiment Questions:
How does the amount of salt in water affect how quickly it boils?

How does the amount of salt in water affect the amount of time until the top freezes over?

How does the size of a parachute affect the time it takes to fall to the ground?

How does the size of a model vehicle's tires affect the distance it will travel when rolled down a ramp?

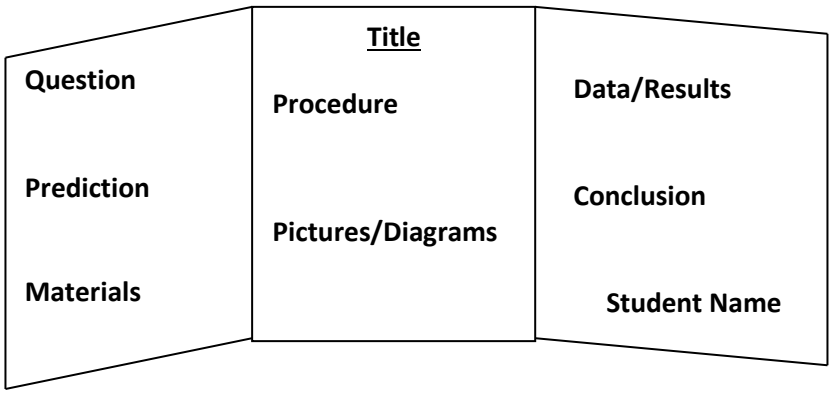
How does the temperature of a cup of water affect the time it takes a sugar cube to fully dissolve in it?

How does changing the shape of a wing affect how far a paper airplane will fly?

<u>Experiment</u> Presentation Board Guidelines

Your project must be displayed on a tri-fold board (dimensions 36” x 48”) using the layout below and should include:

☐ Title	☐ Procedure
☐ Question	☐ Data (Pictures, Charts, Graphs, etc.)
☐ Prediction	☐ Conclusion
☐ Materials	☐ Your First and Last Name (neatly, in bottom right flap



Please follow the above poster layout as you are preparing your triboard.

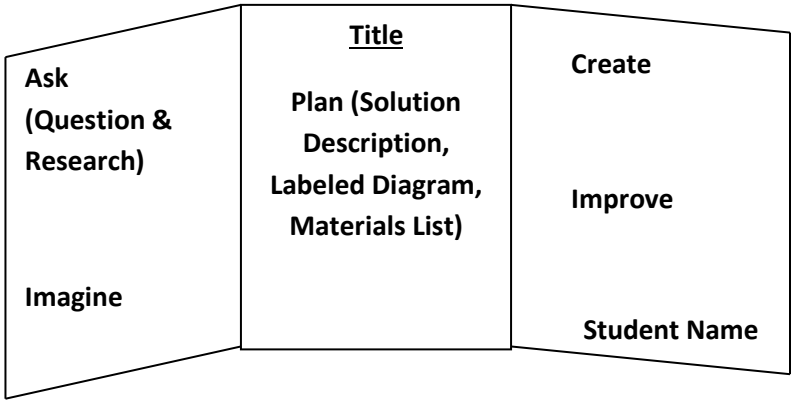
Also to consider:

- ☐ Are the sections labeled on your display board so that they are easy to follow?
- ☐ Does the title catch people's attention? Can it be read from across the room?
- ☐ Did you use pictures and diagrams to effectively show your information?
- ☐ Did you proofread your display board?
- ☐ Is your name clear and easy to find in the lower right-hand corner?

<u>Engineering Design</u> Presentation Board Guidelines

Your project must be displayed on a tri-fold board (dimensions 36” x 48”) using the layout below and should include:

☐ Title	☐ Create
☐ Ask	☐ Improve
☐ Imagine	☐ Your First and Last Name (neatly, in bottom right flap
☐ Plan	



Please follow the above poster layout as you are preparing your triboard.

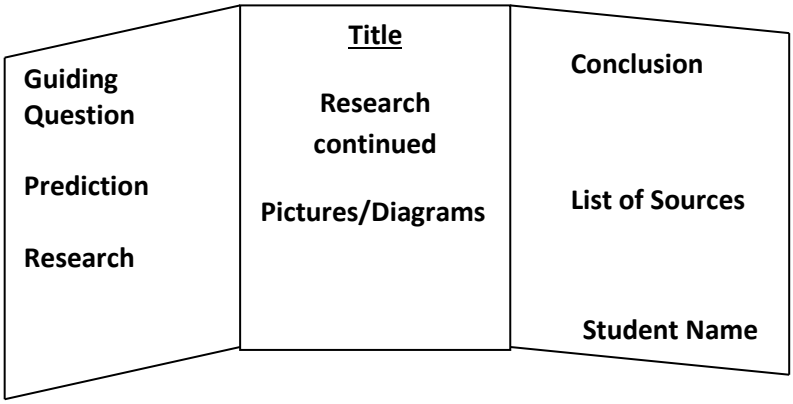
Also to consider:

- ☐ Are the sections labeled on your display board so that they are easy to follow?
- ☐ Does the title catch people's attention? Can it be read from across the room?
- ☐ Did you use pictures and diagrams to effectively show your information?
- ☐ Did you proofread your display board?
- ☐ Is your name clear and easy to find in the lower right-hand corner?

<u>Research</u> Presentation Board Guidelines

Your project must be displayed on a tri-fold board (dimensions 36” x 48”) using the layout below and should include:

☐ Title	☐ Pictures/Diagrams
☐ Guiding Question	☐ Conclusion
☐ Prediction	☐ List of Sources
☐ Research	☐ Your First and Last Name (neatly, in bottom right flap



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Also to consider:

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- ☐ Does the title catch people's attention? Can it be read from across the room?
- ☐ Did you use pictures and diagrams to effectively show your information?
- ☐ Did you proofread your display board?
- ☐ Is your name clear and easy to find in the lower right-hand corner?

Innovation Expo STEM Competition - Safety Contract

In order to have your project considered for the Student STEM Competition at the Everett Innovation Expo, students must complete and sign a Safety Contract and get approval from their parent/guardian and their classroom teacher.

Student Safety Agreement

Preparing for the Innovation Expo STEM Competition:

- I will care for science materials by handling objects carefully. I will not eat, drink, or taste any science materials.
- I will follow all safety rules.
- I will not use any toxic chemicals in my STEM Competition project. All materials must be appropriate for use in elementary schools and approved by your classroom teacher.
- I will not use fire or burning objects in my STEM Competition project.
- I will not use firearms, tobacco, drugs or alcohol in my STEM Competition project.
- I will not harm any animals in my STEM Competition project and understand that I cannot bring animals into Angel of the Winds Arena in Everett.

Materials I plan to use for my project are:

_____
_____
_____
_____
_____
_____

If chosen to participate at the Innovation Expo STEM Competition:

- I will share my project with judges and the public on a presentation tri-board.
- I will only bring a display of my work if it is not breakable, valuable, potentially harmful or messy.

Student Signature:
I will follow the above safety rules and complete my STEM Competition project in a safe manner.

Student Print Name: _____ Signature: _____

Parent Signature:
I acknowledge that the above safety precautions will be followed and that this project will be completed in a safe manner. I also acknowledge that no animals (vertebrates or invertebrates) will be harmed in any way.

Parent Print Name: _____ Signature: _____

Teacher Signature:
I received the student's signed safety agreement and approve of the student's STEM Competition project.

Teacher Print Name: _____ Signature: _____