

Veterans Elementary School

Night Of Innovation

STEM Handbook

Grades K-5



Registration

Each participant MUST complete a registration form and it MUST be signed by a parent or guardian. Students can register for an individual project or a group project. Groups may have a maximum of 4 participants and all participants listed must be VES students. Every participant must have their own registration form in order to receive credit for participation in the Fair. If siblings or children in different grades do a project together, separate grade-appropriate display boards are suggested (but not required), since student displays are arranged by grade at the Science Fair. Same-grade collaborations need only one board. If the group has students from different grades, please display the board in the highest grade level of the members in the group.

What happens during the Night Of Innovation?

The sign in desks will open at 6:30pm. Project materials can be brought along with your display board as long as they fit on a child-size desk. Please do not bring any food, chemicals, animals or bugs. All STEM projects must be taken home when the fair is over.

Participant bags contain an Eagle Earning, a homework pass, a badge, a participant ribbon and a small toy!

GT boards will be in the media center and computer labs. The GT boards will already be set up at the school.

STEM boards will be the cafeteria and gym. The STEM boards are organized by grade.

Grades K, 2 & 4 are asked to be at their boards from 6:30-7:15.

Grades 1, 3 & 5 are asked to be at their STEM boards from 7:15-8pm.

Mr. Bruce will try to speak to as many students as he can. He has help from students from the National Science Honor Society from Centennial High School and from the VES STEM Fair Committee. A sticker will be placed on the back of the students boards when someone has talked to them about their project.

Night Of Innovation STEM Project

Designing and Conducting a Well-Designed Investigation

At school, you have been conducting many interesting and exciting investigations. You have learned many new ideas through investigations and reading different books. Now you can take what you have been learning in the classroom in a new direction that interests and excites you by choosing a topic you would like to investigate for your STEM project. You can investigate a topic in science, engineering, mathematics, or technology. A science question investigates how changing one or more things affects something else. An engineering problem develops a tool or invention to solve a problem. A math project applies mathematical concepts to frame and solve a problem. A technology design project focuses on creating a hardware or software tool to perform a task.

Example Questions

Science & Engineering Questions:

How does salt affect the freezing rate of water?
What kind of light is best for plants?
What paper airplane design will fly the farthest?

Math and Technology Questions:

How many shapes can be made from just triangles?
Which juice drink should you buy based on volume?
What algorithm can be created to solve a maze?

Pick a question or topic that is relevant and interesting to you!

Getting Started

1. Choose a book or website in your area of interest to guide you as you design your investigation. Please see your teacher if you need any assistance finding resources.
2. Determine the question you would like to investigate.
3. Start designing your investigation, following the format of the well-designed investigation and including all of the important parts. Please use the worksheets in this handbook as you design and conduct your investigation.
4. Conduct your investigation and gather your data.
5. Decide how you will share your investigation and findings. You will write a final draft of each part of the investigation from your worksheets and neatly present it on a poster board. You are strongly encouraged to type your written work; however, neat, handwritten work on lined paper is acceptable. The headings of the parts of a well-designed investigation are included at the end of this packet.
6. Complete your self-standing display board, sharing each part of your investigation. Please type or neatly write all of your information for the display board. Pictures with captions, by camera or hand-drawn, are strongly encouraged. Be creative and help your audience clearly understand all the parts of your investigation. Projects must be displayed on a self-standing board that can be no more than 48 inches tall and opens to no more than 36 inches. You may use a board that you already have, that you make, or you may purchase a commercially made tri-fold board.

Steps for the STEM Project

These are suggested steps to help your children manage their project so that it is completed on time.

Step 1:

Determine your research question. When you registered for Night Of Innovation, the form included your child's topic question. Review this question as a starting point.

Step 2

1. Develop procedures.
2. Gather materials.
3. Conduct investigation, create your machine or test your algorithm.
4. Collect data (pictures, charts, tables).
5. Analyze and display data (graphs, pictures).
6. Make conclusions.

Step 3

1. Complete "Well-designed Investigation" worksheet
2. Create display board. Use color, neat pictures – be creative!

Websites to use for help:

www.hcpss.org/academics/science_elem.shtml

This is Howard County's Elementary Science curriculum website which can be used for topic ideas that are grade appropriate.

<http://school.discoveryeducation.com/sciencefaircentral/>

This site has a great list of science fair topics and a student handbook for completing science fair projects. Plus it includes a section just for parents. The Discovery Channel organizes this site.

<http://www.ipl.org/div/projectguide/>

This site is a good source of project topics.

The Howard County Library also has a variety of resources.

Primary Book Titles:

1. STEM Enterprise
Author: Shirley Smith Duke
Call number: CHILDRENS 500D
2. Minecraft Creator Markus "Notch" Persson
Author: Kari A. Cornell
Call number: CHILDRENS B PERSSON C
3. Discovering STEM at the Amusement Park
Author: Cynthia Roby
Call number: CHILDRENS 791.068R
4. Teaching STEM in the Early Years: Activities for Integrating Science, technology, engineering, and Mathematics
Author: Sally Moomaw
Call number: 372. 35M
5. Discovering STEM at the Zoo
Author: Theresa Shea
Call number: CHILDRENS 590.73S

Intermediate Book Titles:

1. Medical Marvels: The Next 100 years of Medicine
Author: Agnieszka Biskup
Call number: CHILDRENS 610B

2. Robotics in the Real World
Author: Robin Michal Koontz
Call number: CHILDRENS 629.892K

3. Astronomy in the Real World
Author: Susan E Hamen
Call number: CHILDRENS 520H

4. Civilian Drones
Author: Daniel R. Faust
Call number: CHILDRENS 629. 133F

5. Bioengineering in the Real World
Author: Meg Marquardt
Call number: CHILDRENS 660.6M

Science Example Investigation

Question:

Does light affect the rate at which a plant grows?

Variables:

Independent: The length of lighting time for each plant.

Dependent: The amount each plant grows with different amounts of light.

Controlled: Each plant is the same type and each plant is given the same amount of water.

Hypothesis:

If a plant is not exposed to light, it will not grow at the same rate as a plant that is exposed to light.

Materials:

- 6 plants (as similar as possible)
- Light source
- Box (to create darkness)
- Water

Procedures:

- Collect six similar plants.
- Record the heights of all the plants to have an initial reading.
- Place two in total darkness, two in 12 hours of darkness, and two in 24 hours of light.
- Record the heights of all plants once a day for two weeks.
- Water the plants at a specific interval (making sure it is exactly the same amount for each plant).

Data Collected and Displayed:

(A chart showing the daily measurements would be inserted here, along with observations made throughout the two-week period.)

The plants that were not exposed to light showed no growth during the two weeks. The two plants that were exposed to only 12 hours of light per day grew an average of 7cm. The plants that were exposed to 24 hours of light grew an average of 5 cm.

Conclusion:

Light does have an impact on the rate at which a plant grows. Exposing plants to 24 hours of light is not as effective as exposing them to 12 hours of light.

Conduct a Well-Designed Investigation

Question:

List the variables you will investigate:

Independent (the things that we will change)

Dependent (the results we observe)

Controlled (the things that stay the same)

Hypothesis:

Materials:

Procedure: Outline the steps you will follow. Write in a list or paragraph form. Explain your materials and how you will use them.

Data: What data will I collect? How will I organize my data?

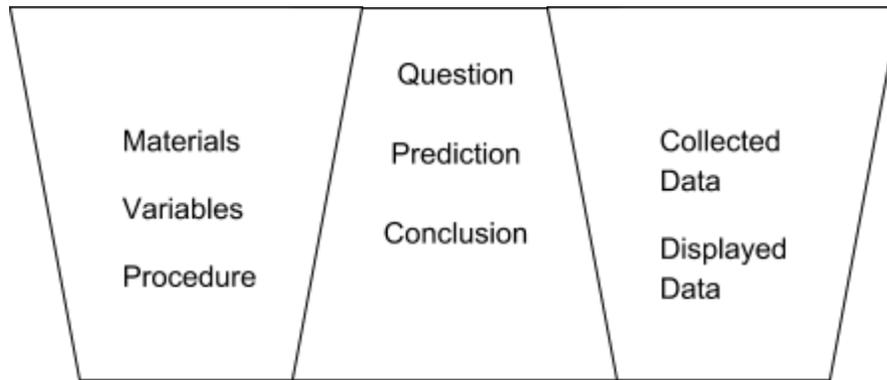
¹Conduct a Well-Designed Investigation

Display your data: How will you display your data or graph?

Conclusion/Findings: What did you find out? What conclusions can you draw? Compare results: the same or different than your hypothesis?

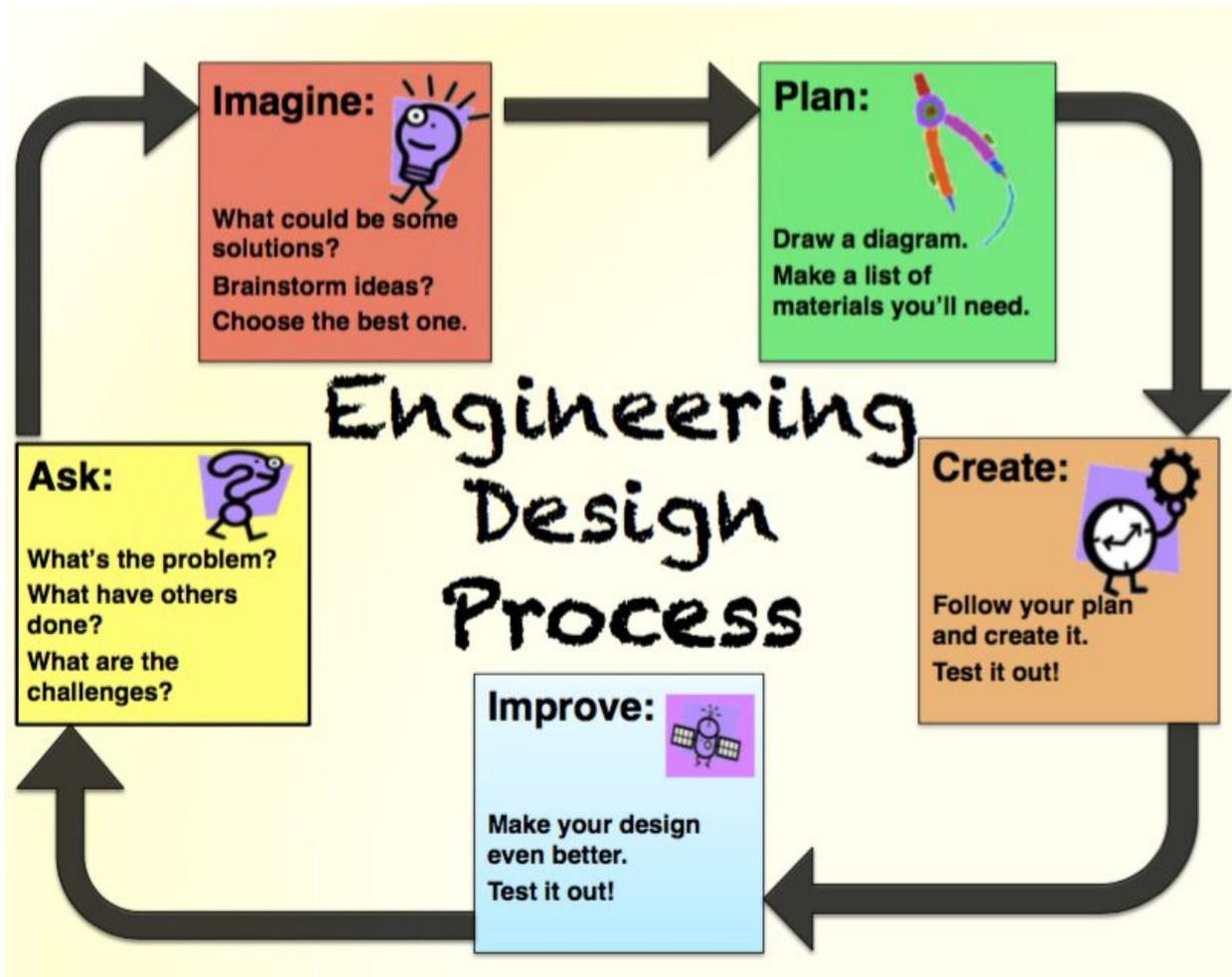
Night Of Innovation

Plan-Your-Display Sheet



Use this as a model for your own display board.

Completing a Technology Design Project



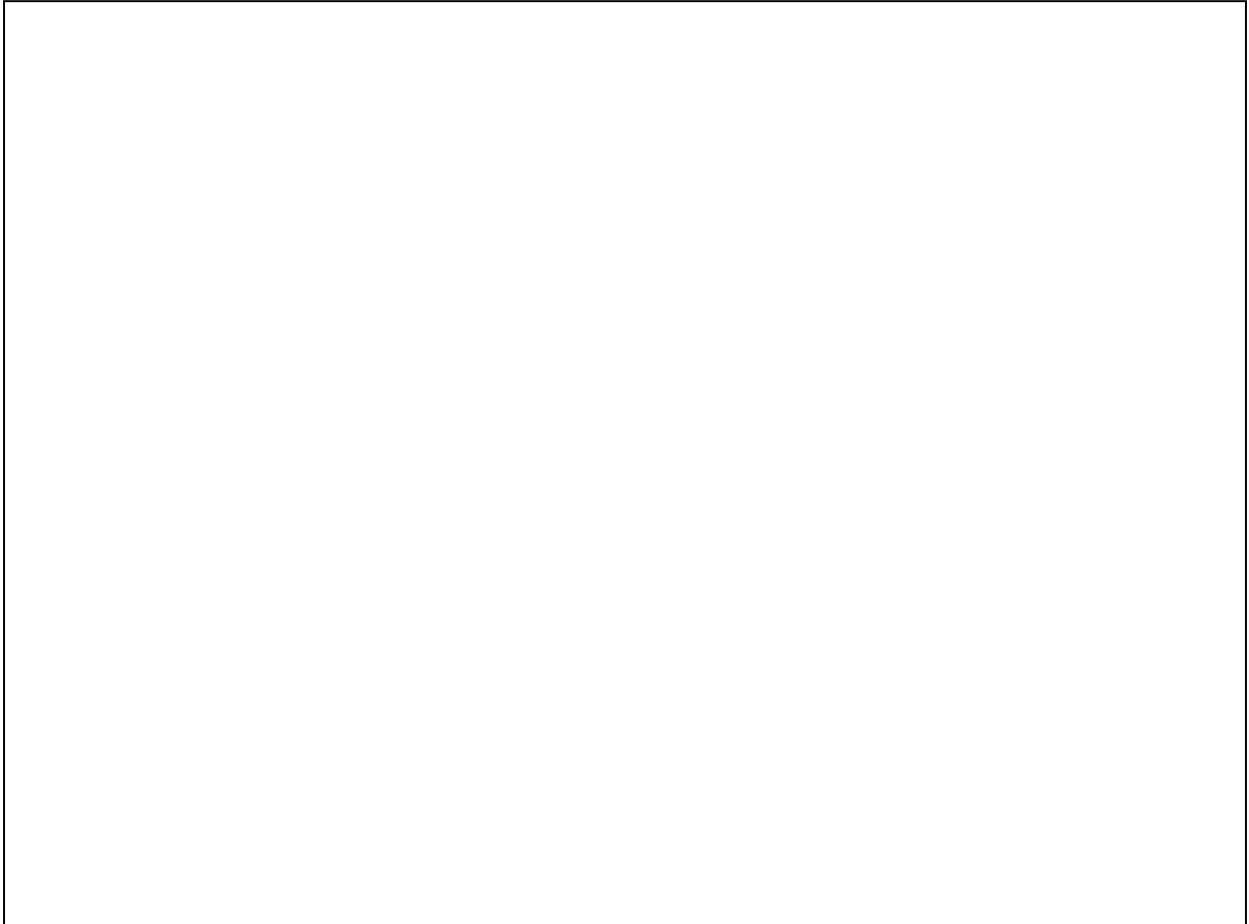
Pick a Task

Think about the things that you have to do at home and at school. Is there a task that could be easier to complete with technology?

Home	School	Other

Plan your Design

Draw and label the design for your new technology tool.

A large, empty rectangular box with a thin black border, intended for students to draw and label their design for a new technology tool.

Materials & Tools

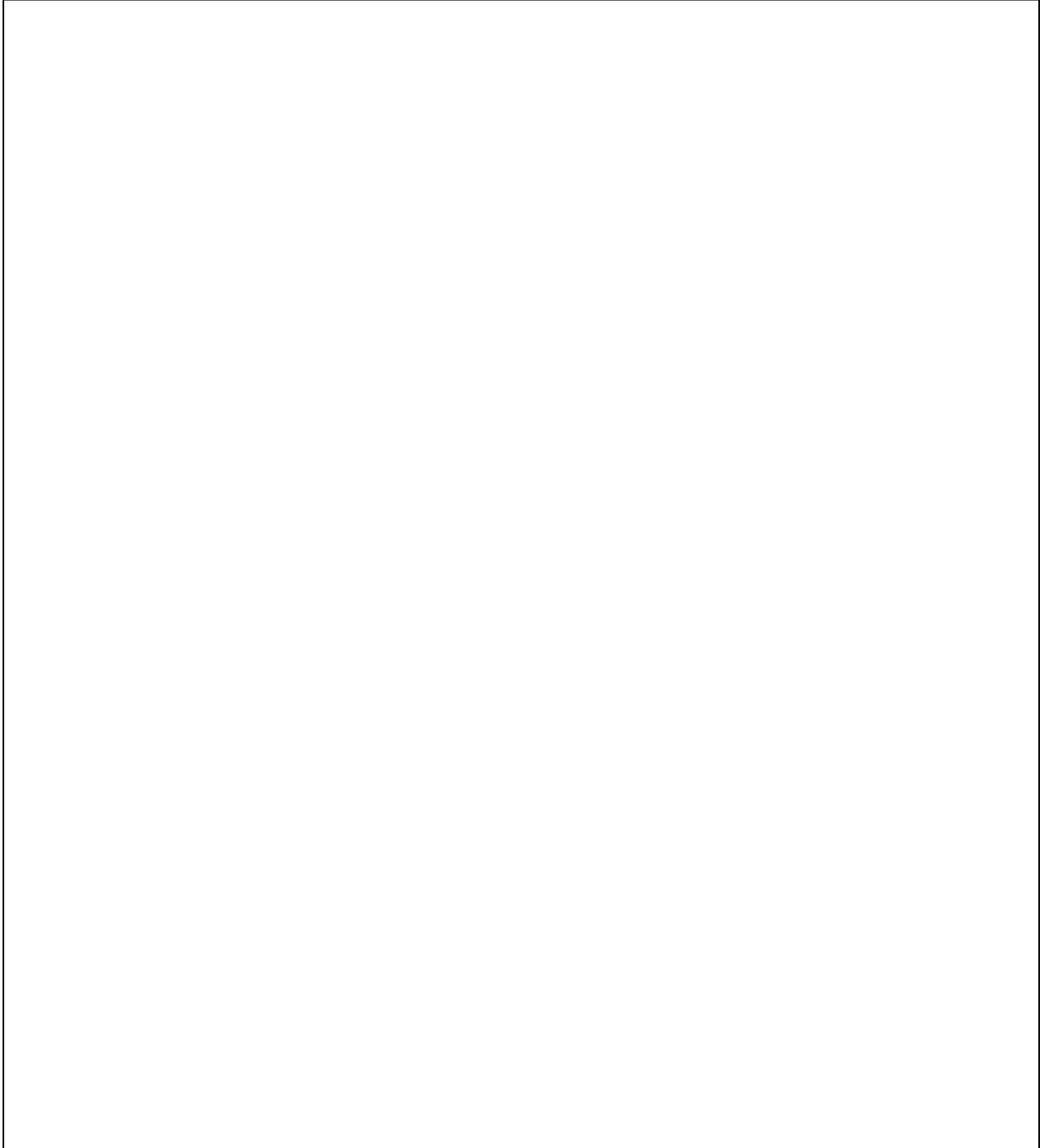
What materials or tools will you need to build your design? If you cannot actually build it, consider making a model.

Create & Test Your Design

Go ahead and make your technological tool, and see if it works! You may need to test your design multiple times. Record the results of your test(s) below. Remember that you can use different structures to record your data. You can make a list, a chart, table, drawing with labels, etc.

Explain your Design with Data

Now that you have created and tested your design, explain how the technology that you developed makes a task easier. Support your reasoning with the data from the tests you conducted.



Problem Solving in Math

- **Understand**
 - Read
 - Sketch
 - Think about what you know
- **Plan**
 - What strategies can you use?
- **Implement**
 - Choose strategy
 - Solve
 - Show work
- **Reflect**
 - Is it reasonable?
 - Does it answer the question?

