Wilder STEM Fair
Project Handbook

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Contents

General Information and Expectations

The Wilder STEM Fair is a celebration of all the wonderful STEM (science, technology, engineering, and math) learning at Wilder. This event provides an exciting opportunity for student enrichment outside the classroom. Students have the chance to explore a science, technology, engineering, or math idea that they are really excited about in a hands-on, in-depth manner.

All students will have the chance to view student projects during the day with their class as well as with their family. Family viewing will be available the evening of the STEM Fair; please refer to the webpage for specific times.

This event is, first and foremost, a learning opportunity for students, therefore parents are asked to provide limited guidance and only help when necessary. Please contact your students' teacher for questions about possible project ideas.

Key parent roles

- Help your child find a project topic and activity that they are excited about
- Help your child complete the registration form and plan their project, including materials and time management
- Direct child to resources (library, online, museums, etc.) to enrich their learning and help them complete the project
- Support your child's growing independence by allowing them to complete the work themselves to the greatest extent possible
- Avoid doing the work or putting together the poster for them

Project ideas

Please see the webpage for links to projects related to this year's topic.

Types of Projects

Students may choose from a wide variety of topics for their project. To help get started, three types of projects are described: descriptive, investigation, and invention projects. Examples of all types of projects and themes are provided on the next page.

Project Type	Definition	Examples
Description	• Describe what you have learned about a particular topic • Do not require an understanding of the Scientific Method • Appropriate for younger students • Project Tips: be thorough in presenting any scientific information that explains the topic	• Eyeball (Build a model of the inside of an eye) • Shell collections (How did each animal use its shell to survive?) • Casts of animal tracks (How do the difference tracks compare among species?) • Pressed flowers (What determines a classification of a flower?) • Television (Discuss the evolution of technology. Who was involved?) • Solar system (Build a model showing how the planets rotate around the sun)
Investigation	• Collect data in order to answer a question • Understand and use the scientific method (see next section) • Can be observational or experimental	• Pizza (a survey of what type of pizza kids like best) • Stoplights (How many cars run a particular red light?) • Cereal (Which cereal gets soggy the quickest or the slowest?) • Mold (What makes different colors of molds?) • Car speed (Which lubricant makes a toy car go faster down a ramp?)
Invention	• Develop something (or a way of doing something) that solves a problem or satisfies a need • Can be a completely unique and innovative design, or a redesign and improvement of something that already exists	• What will help you clean up your room? • How can you make your chores go faster? • What new game can you invent? • What will make riding in the car more fun?

The Scientific Method

The Scientific Method is a tool that scientists use to find answers to questions and should be utilized for Descriptive and Investigation Projects. The tool involves the following steps:

1. Ask a Question/Determine the Purpose
    a. Why are you doing your project?
    b. What do you want to know or explain?
2. Gather Background Information
    a. Research and gather information on the topic from various sources
    b. Summarize the most important facts
3. Form a Hypothesis
    a. Make an educated guess (called a hypothesis) at the answer to your question
    b. Base your hypothesis on the information you have gathered
4. Design and Perform the Experiment
    a. Figure out how you are going to test your hypothesis—these steps are your methods
    b. Use your methods to complete the experiment or project
    c. Write down your methods and make notes about how you changed or adjusted your methods during the project
    d. Record your observations in a logbook.
5. Record Results
    a. Analyze the data you collected by making charts and graphs that make your results easy to understand
    b. Explain what you think happened based on scientific principles
    c. If possible, repeat your experiment to make sure your first results are correct
6. Draw a Conclusion
    a. Summarize what you have learned
    b. Describe how your data answered your question
    c. Was your hypothesis correct? Even if it wasn't, you still answered your question!
    d. Is more work needed? What would you do differently next time?

Observational Investigation Example

Investigation projects can be either observational or experimental in design. In an observational investigation, observations are made and recorded to test the hypothesis. The following example shows how the scientific method is used in an observational investigation project.

Question/Title	What type of bird is most prevalent near my house?
Purpose	To determine the most prevalent type of bird near my house.
Background Information	Common feeder birds in western North America include Chickadees, Nuthatches, Finches, Blackbirds, Thrushes, Sparrows and more.
Hypothesis	I hypothesize that there are more Red-winged Blackbirds than other types of birds near my house.
Experiment/Methods	Using a bird identification chart, I will record the numbers and types of birds I see near my yard and at my bird feeder. I will do this every morning before school, and every afternoon after school, for one week.
Results	Altogether, I saw 44 birds including 5 species. There were: 20 Varied Thrushes 11 Red-winged Blackbirds 9 Black-capped Chickadees 2 Western Scrub Jays 2 Cassin's Finch
Conclusion	The most common bird was the Varied Thrush, at least during the Spring when I took these measurements. They live in a tree in my yard and visit the bird feeder a lot. My hypothesis was not correct. Blackbirds were the second most common bird, not the first. This made me think of another question. If we changed the kind of bird food in the feeder, would different birds come to visit? This would be my next question to test.

Experimental Investigation Example

In an experimental investigation, one variable is changed while everything else stays the same in order to determine the effect of that one variable. The independent variable is the one that is changed. The dependent variables change in response to the independent variable. Each experimental investigation must have a control, or a sample, which has not been changed. The following example shows how the scientific method is used in an experimental investigation.

Question/Title	In which type of medium will marigolds grow best?
Purpose	To determine which type of medium marigolds will grow best in.
Background Information	Several different soils and media are available for growing plants. Some are rich in nutrients, some let water drain quickly through them, and some are light and fluffy.
Hypothesis	I hypothesize that marigolds will grow best in store-bought potting soil.
Experiment/Methods	We purchased 5 marigold plants as close in size as possible, rinsed the roots, and repotted in 5 different media: the soil it came in, sand, vermiculite, topsoil from our garden, and store-bought potting soil. Water, sunlight, and temperature were the same for all 5 plants over a 6-week period. Plant fullness, height, leaf color, and blossoms were measured.
Independent Variable	Planting media.
Dependent Variables	Plant fullness, height, leaf color, and blossoms.
Control Sample	A marigold in the soil it came in.
Experimental Samples	A marigold in sand. A marigold in vermiculite. A marigold in topsoil from your garden. A marigold in store-bought potting soil.
Results	The marigold in the potting soil was fuller and taller, the leaves were darker green, and it had more blossoms. (The actual measurements and photos should be displayed.)
Conclusion	My hypothesis was correct. The store-bought potting soil was best for growing marigolds. Maybe this is because it contains a mixture of the different media that provide nutrients and good drainage. My
	experiment is important because it will help us to choose a good soil for planting flowers this Spring.

The Invention Process

Following the steps in the invention process will help you develop an idea into a product:

1. Look for problems that need solving
    a. Is there a problem or hassle that affects you or your family? Someone in your community?
    b. Determine the purpose of your invention
2. Gather background information
    a. Research existing products--the internet is a great resource
    b. Avoid duplicating existing inventions, but you can add to or improve them if they exist
3. Design and develop your invention
    a. Be creative and use your imagination: getting around existing problems will often require you to think outside of the box!
    b. Make a detailed drawing (or several drawings) and label all parts so others will be able to understand how your invention works
    c. Make a model of your invention
4. Test your invention
    a. You may need to test multiple prototypes before you have a successful invention
    b. How effective or useful is your invention?
    c. How is your invention original, and how could you improve it further?
5. Keep a log
    a. As you go through the process, make a written record of your ideas, research, setbacks, and successes to create a lasting record
    b. Bring your record as part of your display at the fair
6. Name your invention
    a. Have fun with this!
    b. You can use rhyming words or your name in some form
    c. Think about if you want the purpose of the invention in the name
    d. Make it silly or serious

Displaying Your Project

Your display must be free standing on a table (cannot require support) and your space is limited to 3 feet in width by 2 feet in depth. The PTSA will provide and set up tables for project displays.

- The Wilder PTSA will provide one tri-fold poster board per project
- If your display will require electricity, please note it on the registration form
- All displays should be neatly organized and easy to follow
- Include photos, graphs, and illustrations in your display as appropriate to make it more interesting
- Students may use the 3x2 foot space in front of the poster to display items and materials

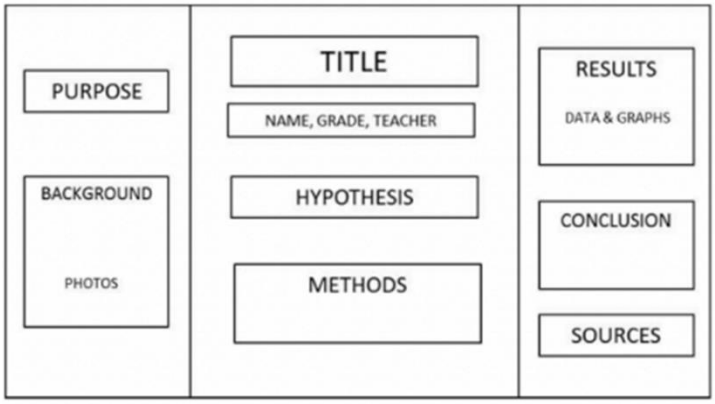
Description project displays should include:

- Title of your project
- Your name, grade, and teacher
- Background Information (can include charts, illustrations, photos, etc.)
- The collection, model, or diorama
- Sources of information

Investigation project displays should include:

- Title of your project (this can be the question you are answering)
- Your name, grade, and teacher
- Purpose
- Background information
- Hypothesis
- Methods (explain your experiment and if applicable, identify the variables and control)
- Results (include observations, charts, and graphs and bring your logbook)
- Conclusion
- Sources of information

Here is a suggested layout for an investigation project—description and invention projects will look different.



Invention project displays should include:

- Title should be the name of your invention
- Your name, grade, and teacher
- Purpose
- Background information (including other existing products with the same purpose)
- Design and development (including a drawing or diagram of your invention and a description of how it works, and bring your logbook)
- Bring your invention, or a model or photograph of your invention; you should also include photographs of all major prototypes made (and their problems) before achieving the final product
- Summary (include how successful your invention was, who will use it, and improvements you would make next time)
- Sources of information

Rules

- Projects involving live animals, fish, insects, etc. must be pre-approved by a teacher and closely monitored by a parent to ensure that organisms are treated ethically. Projects should not cause unnecessary stress or harm to any living thing. Animals may not be brought to the fair. Therefore, the only way to demonstrate the use of animals in a project is via photos, video, etc. It must be clear and true that the animals were always treated in a humane way.
- Safety is a top priority for the event, and anything deemed to pose a danger would not be allowed.
- Projects MAY NOT include the use of dangerous chemicals, extreme temperatures, high voltage, explosives, mercury thermometers, open flames, certain lasers or other very bright light sources, fluorescent light bulbs, or anything capable of producing dangerous noise levels.
- Volcanoes are not allowed.
- Molds, mildews, etc. are NOT ALLOWED per district guidelines.
- Displays may not use running water (they may include static water if the student takes responsibility for cleanup).
- Wilder Elementary and the STEM Fair volunteers assume no responsibility for loss or damage. Please leave all valuables at home.
- Projects are entered into at the risk of the students. Parental judgment needs to be exercised where appropriate.

Judging and Awards

The Wilder STEM Fair is a non-competitive event. Judges will recognize strengths in each project such as great ideas, project completion, or interesting displays of the project. Students will have the opportunity to present their projects to their classmates and answer questions.

Other Logistics and Reminders

Planning

- Since these are home projects, it's a good idea to get started right away!
- Be creative in coming up with a scientific topic that interests you that can be displayed in a form suitable for group viewing.
    - Experiments, demonstrations or collections can be elaborate or simple depending on the child's age.
- Fill out a registration form and return it to your teacher or to the office before the due date
    - Groups of 2 or more should only turn in one registration form with all participants listed
- Remember, the project display can be no bigger than the size of your school desk (approximately 24-28 inches)
    - We will provide a tri-fold poster board for each registered project
    - You may use poster board as long as it is free standing and fits in the 3x2 space
    - HAVE FUN LEARNING!
- Day of the Fair
    - Check the website for project check-in hours the day of the fair, usually the half hour before school starts
    - Projects will be displayed in the school gym for the entire day
    - There will be a volunteer in the area at all times to monitor the environment
    - Please contact stem@wilderptsa.net to make other arrangements if needed
    - Do not bring valuable, breakable, or any items that you are concerned would be lost or damaged. Neither Wilder staff nor STEM fair volunteers are responsible for lost or damaged items.
    - During the fair, plan to spend time some standing at your project to offer explanations and answer questions.
    - HAVE FUN SHARING WHAT YOU'VE LEARNED AND LOOKING AT OTHER DISPLAYS!
- After the Fair
    - All projects must be taken home the night of the STEM Fair, by 8:00 pm. Nothing can be left overnight!
    - If you have a display but are not able to stay for the whole event, be sure to make arrangements to have your equipment picked up the night of the STEM Fair.
    - HAVE FUN!