Trailside Elementary

Science - Engineering Fair

Information Packet

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I. General Information

The Park City School District is pleased to invite all K-5th graders to participate in this year's SCIENCE AND ENGINEERING FAIR! Students have the opportunity to create their own personalized investigations that go beyond the classroom. It is our hope that in offering this opportunity students will further foster an appreciation for science.

What is a Science or Engineering Fair Project?

K-2nd Grade

A presentation of:

- An *observation*; or
- An *experiment* using the *scientific method* as outlined in this packet
- Show a collection

3rd-5th Grade

A presentation of:

- An *experiment* using the *scientific method* as outlined in this packet; or
- An *invention* using the *Engineering Design Process* as outlined in this packet (4th & 5th only in 2016)

Please Note: 3rd-5th Grade Students will not be judged if they prepare an observation or demonstration

Science and Engineering Fair projects, regardless of what kind they are, show the efforts of a student's investigation and provide a way for the student to show what they have learned.

Important Note: Students in 5th grade and higher have the opportunity to compete to participate in the Salt Lake Valley Science and Engineering Fair, Park City's regional fair. SLVSEF requires that projects exemplify the scientific method or the engineering design process. Therefore, the more experience students have in using these methods before 5th grade, the better. While we hope to nurture the practice of the scientific method/engineering design process, the priority is for students to participate at the most appropriate level. Please note that only 5th through 12th graders are eligible to enter this fair.

The schedule for the SLVSEF may be seen at this link:

http://slvsef.org/the-event

Students who will continue to the Salt Lake Valley Science and Engineering Fair will be required to complete a registration form online for that fair. Information and direction will be provided to those students at the completion of the Park City District Fair.

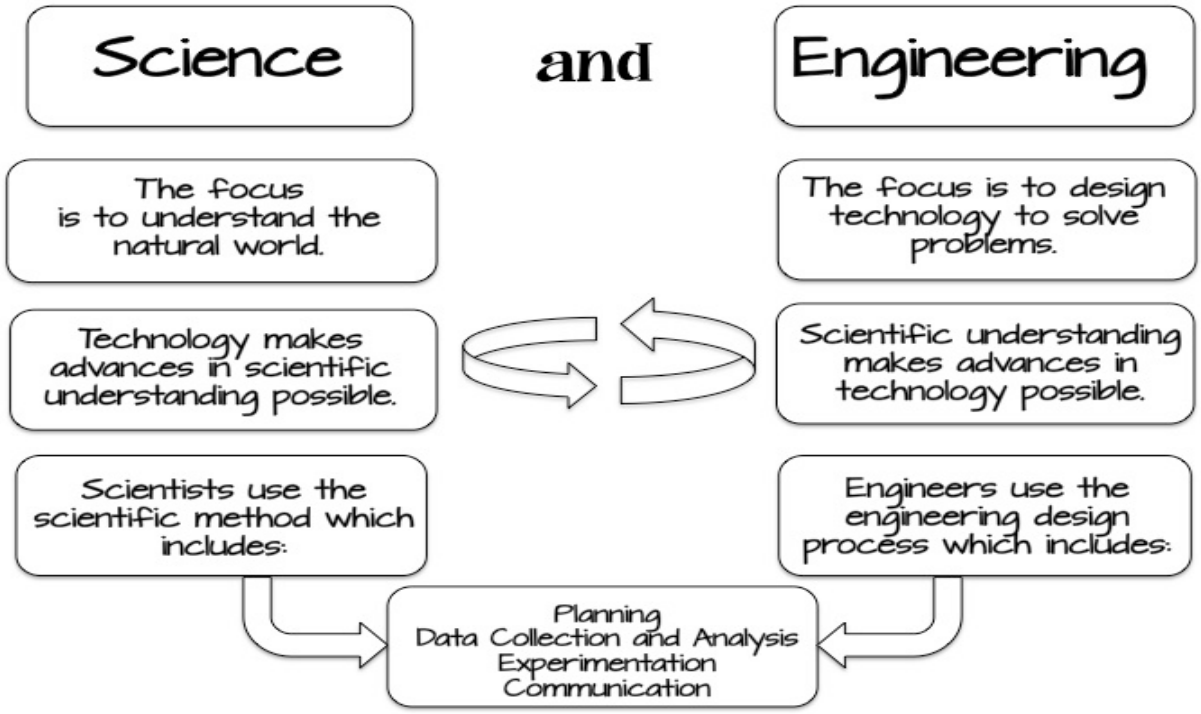
II. Science and Engineering Fair Do's & Don'ts

DO:	DON'T:
• Find projects that interest you and that you can understand!	• Let adults pick your topic, do your research, or lay it all out for you; you should be involved from the first step, regardless of your age.
• Make sure the topic is age appropriate; you have to explain your project to judges, and if it's beyond your abilities you won't be able to.	• Pick overly complex, difficult to control projects; these will cause frustration instead of curiosity. The goal is to have fun while learning!
• Get help! Contact your teachers and specialists with questions.	• Let adults do it for you! Judges can tell when you did the work, and they'd rather see your hard work and understanding than have a "perfect" display.
• Plan, make an outline, and allow lots of time. START EARLY!	• Try to rush; good science takes time.
• Review the resources and guidelines in this packet; the packet will answer many of your questions!	• Panic. With time, planning, help and patience, you can produce a fantastic science fair project.
• **Make sure you keep a Journal!!** When errors are made, simply cross out the information and write the new. Take notes and pictures every step of the way. Draw pictures in your journal. Even tape things in! The Journal is VERY IMPORTANT to the scientific process.	• Tear pages out of the journal, erase things, or do anything that destroys the fabulous evidence of the science taking place.
• Make a display that: ○ Includes an *attention-grabbing title* ○ Includes *photographs* ○ Is *organized* and logically presented ○ Is *eye-catching* ○ Follows *safety rules* and size limits	• Spend a lot of money on the display. Construction paper, colored markers, and homemade equipment are great for displays
• Practice presenting! Great research does not make a great project if you do not present it well	

III. What Type of Science or Engineering Fair Project Is Right For Me?

(For help figuring that out, visit the Project Guide tab at www.sciencebuddies.org)

K-5th | **4th-5th ONLY!**



Observational Project (K-2nd grade only)

1. Find a subject that interests you
2. Do basic background research
3. Make & record personal observations on the subject
4. Share your findings

Examples: How does a seed sprout? What are the parts of a pinecone? How do birds feed at a bird feeder?

A. Planning Worksheets: THE SCIENTIFIC METHOD (Grades K-5)

The scientific method is a way to ask and answer scientific questions by making observations and doing experiments.

After deciding on an area of interest, use the following scientific problem solving process (steps 1-6 below) that will prepare you and guide you through your experiment and project preparation. **Be sure to log or record everything that you do into a journal or bound notebook.**

1. **Purpose, Problem or Question**: The purpose shows that the project intends to solve some problem from which others can learn or benefit. The problem statement or question should be clearly written and easy to understand.

   What problem are you trying to solve? What question are you trying to answer?

   _____
   _____
   _____

2. **Research or Background Information**: Once the purpose has been stated, begin researching the topic. **Be thorough and record all information in your journal.** Check out library sources such as science books and magazines. Learn from past studies on some experiments that have already been done. Seek out experts and technology sources on your project subject.

   What information would be helpful to know in order to understand your project?

   _____
   _____
   _____

3. **Hypothesis**: The hypothesis is your prediction as to what will happen as a result of the experiment. Predicting the expected results of this scientific study is based on consistent conditions, exact measurements and thorough research.

   What do you think will happen?

   _____
   _____
   _____

4. **Experiment or Procedure**: The experiment is to test the hypothesis for correctness. There are four parts to the experiment:
   - Write a materials and equipment list you will need
   - Write a step-by-step process you are going to follow
   - Identify the experimental variable that is going to change and the control variables (or unchanged variables)
   - Conduct the experiment

As you do the experiment, collect the data you observe by writing them in your journal or notebook. Pay attention to correctness in measuring and observations. Do the experiment at least 3 times, always keeping the conditions of the experiment the same. Be sure to gather enough data to make a conclusion.

What did you do to answer your question? Be specific about the step-by-step process and the equipment used

_____
_____
_____

5. **Analysis or Results**: The analysis is deciding what the data means. This can be done by asking the following questions:
   - What happened?
   - What steps were important?
   - How do the outcomes compare to the hypothesis?
   - What observations during the experiment were expected or unexpected?
   - What does the data mean?
   - What are the first-thought conclusions?

   The best way to display the data is to put it as a graph or a chart. A graph is a "picture" of your results. In a scientific investigation the experimental variable is always written at the bottom of the graph (horizontal axis). The information that you collected by measuring, weighing, or timing is recorded up and down on the left side of the graph (vertical axis).

   _____
   _____
   _____

6. **Conclusion**: The conclusion is the summary of your experiment. It would answer questions such as:
   - Did the results confirm or conflict with the hypothesis
   - What was learned form the experiment?
   - Are there any suggestions or new questions to investigate?
   - In what way was this investigation important?
   - Is there anything that could be changed to make it a better experiment next time?

   _____
   _____
   _____

Presentation or display board: When you are finished with the scientific problem solving process (steps 1-6 above) you need to create a display for your project so your ideas can be shown at a classroom, a grade or a school science fair. The display should have these things or qualities:

- It should be physically sound and durably constructed, and able to stand by itself
- It should show all the steps (1-6) of the problem solving process.

- It should be neat, edited and easy to follow.
- Your journal is to be in the front of the display.
- The items you used and the results of the experiment may be placed in front of the board as long as they follow the fair guidelines.

Oral Presentation: Since it is likely that you will be discussing your project with a judge, practice a short oral presentation before going to the fair. Know these things:

- What scientific information you learned in your research
- What you did at each step in the scientific problem solving process
- What you learned from your project
- What new questions you have
- What you would change if you did the experiment again

Thoroughness: These are the things that judges will look for as they look and listen to you and your project:

Goals met in your project

- Creativity in your purpose and approach
- Clarity
- Appropriate methods used
- Appropriate equipment used
- Knowledge of the subject

A. Planning Worksheets: THE DESIGN ENGINEERING PROCESS (Grades 3-5)

The engineering design process is the set of steps that a designer takes to go from first, identifying a problem or need to, at the end, creating and developing a solution that solves the problem or meets the need.

- The steps of the engineering design process are to:
    - Define the Problem
    - Do Background Research
    - Specify Requirements
    - Brainstorm Solutions
    - Choose the Best Solution
    - Do Development Work
    - Build a Prototype
    - Test and Redesign
- During the engineering design process, designers frequently jump back and forth between steps. Going back to earlier steps is common. This way of working is called **iteration**, and it is likely that your process will do the same!

- While engineers create new things, such as products, websites, environments, and experiences, scientists study how nature works.
    - If your project involves making observations and doing experiments, your project might better fit the Steps of the Scientific Method.
    - If you are not sure if your project is a scientific or engineering project, you should read Comparing the Engineering Design Process and the Scientific Method on sciencebuddies.org

IV. Park City School District Science Fair Rules:

1. Students may enter a project individually or as a part of a group of no more than 3 students.
2. No open flames, dangerous or illegal chemicals, explosives, or live animals permitted.
3. No growing bacteria of any kind.
4. Experiments that harm animals are not permitted.
5. Exhibits must be self standing and no larger than 36" wide/high x 24" deep.
6. Students are responsible for supplying all items needed for their display—including extension cords, etc. The school supplies tables only.
7. PCSD is following the rules and regulations of the Salt Lake Valley Science and Engineering Fair (SLVSEF). Selected/Winning students (5th graders and higher) from Park City's school fairs will have the opportunity to participate in the regional fair, held late March in Salt Lake City. More information about SLVSEF is available at http://slvsef.org Please note that students competing in the SLVSEF will have an additional registration form, which will require the writing of a synopsis of the project and an entry fee. Registration forms will be made available to the "winning" students.

It is important to refer to the individual school's rules and regulations as well. Some may have additional rules or may provide exceptions to the above in special cases. Please consult with the Science Fair Coordinator at each school or the principal with additional questions.

V. Resources:

- After-school sessions with Mindy Holbrook
- The library has many books on project ideas.
- Helpful websites:
    - Science Buddies www.sciencebuddies.org
    - Brain Pop www.brainpop.com/science/scientificinquiry/scienceprojects/preview.weml
    - Science Fair Projects World www.sciencefair-projects.org

- http://www.ipl.org/div/projectguide/
- http://www.exploratorium.edu/snacks/
- http://www.education.com/science-fair/
- Salt Lake Valley Science & Engineering Fair www.slvsef.org
- For help with engineering design process, visit www.eie.org

VI. Judging Rubrics

K-5, Scientific Method & Engineering Design

- Kindergarten through 2nd Grade Judging Rubric:

K-2nd Grade Judging Rubric
Project #:

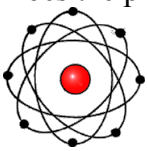
Scientist/s:_____

_____

Name of Project:_____ Grade:_____

Note: Not all questions are relevant to a given project, this is a guide.

Does the project solve a problem or teach about a problem, issue or natural phenomenon?



Does the scientist/engineer express an understanding of the project's subject?

Does the project's display board portray the scientist/engineer's thought process and intentions clearly?

Did the scientist/engineer encounter any interesting problems in completing this project? Any solutions found?

How well is the scientist/engineer able to communicate the learning that took place during this project?

Summary or additional comments:

- 3rd Grade Science Judging Rubric:

Scientist:_____Grade:_____ Judge:_____

Criteria	Excellent	Good	Developing	Comments
Question	Original Research and Idea	Unique perspective on a traditional project	Tried and true experiment	
Hypothesis	Thoroughly developed with "I think...because.."	Sufficiently developed	Not yet or partially developed	
Procedures and Organization	Easy to follow sequence of the Scientific Method. Good log/ journal. Includes observations, data collection and changes to project.	Easy to follow sequence of Scientific Method and/or has few lapses in sequence	More difficult to follow the sequence of scientific method. Had to rely more on the oral presentation than able to follow on display board.	
Investigation Trials	Experiment was performed more than 2 times or sample size great.	Experiment was performed 2 times and/or sample size was adequate	Experiment was performed 1 time or incompletely	
Analysis or Results	Data is clearly presented and directly relates to hypothesis/question	Data is mostly presented and shows some relationship to hypothesis/ question	Data not presented or is incomplete	
Evaluation and Conclusion	Logical conclusion has been drawn from the data collected and answers the hypothesis/ question and/or raises a new hypothesis/question	Reasonable conclusion has been drawn from the data collected	Conclusion drawn doesn't relate to the data collected	
Judge's Comments			Thank you for participating in the Science Fair! Science rocks and your efforts are awesome!	

- 3rd grade Engineering Judging Rubric:

Criteria	Excellent	Good	Developing	Comments
Problem	Focused, original problem statement	New question	Standard problem	
Plan	Includes research that is connected to the problem and design	Includes research. Has a plan to find out more	Includes research and key terminology	
Creativity	Project is clearly student-driven and has a novel approach to use of materials and decisions	Project is a variation on a standard design and has a new approach use of materials	Project is a standard design	
Design Criteria	Design criteria is clearly defined with measurable goals. All materials listed and a timeline used	Design criteria is defined and includes goals. Materials and a timeline are listed	Key criteria defined and materials are listed	
Analysis or Results	Data answers problem statement and is recorded in notebook. Includes appropriate use of graphs/tables and discussion of decisions	Data may answer problem statement and is recorded in notebook	Data may answer problem statement	
Evaluations and Conclusion	Logical conclusion has been drawn from the data collected and answers the problem statement and/or raises a new problem statement	Reasonable conclusion has been drawn from the data collected	Conclusion drawn doesn't relate to the data collected	
Judge's Comments			Thank you for participating in the Science Fair! Science rocks and your efforts are awesome!	

- 4th and 5th Grade Science Judging Rubric:

TSES Science - Engineering Fair 2016 Evaluation Sheet

Grades 4 - 5 SCIENCE PROJECT

Student(s):

Grade/Teacher: Title: Project #:

	ACCOMPLISHED RESEARCHER 8-10	DEVELOPING RESEARCHER 4-7	BEGINNING RESEARCHER 1-3	CONSIDER:
PROBLEM STATEMENT & QUESTION	-Focused, unique question, testable -Has conceptual understanding of topic	-New question, but not testable or not focused -Has above average grasp of topic	-Standard problem -Has grade-level grasp of topic	
PLAN	-Research cited -Has 3+ reliable sources -Connected to problem -Integrates research into data plan	-Research cited -2+ reliable sources -Key terminology used -Has a plan to find out more	-Research cited -1 source -Key scientific terms used	
CREATIVITY	-Student-driven -New idea -Novel approach to use of materials & decisions	-Variation on a standard project -New approach to use of materials	-Standard science experiment	
EXPERIMENT DESIGN	-All variable identified & adjusted for -Controlled experiment -Materials listed - Timeline used and executed	-All variables identified -Most variables accounted for -Materials listed -Timeline	-Key variables noted -Materials listed	

DATA ANALYSIS & COLLECTION	-Data answers question -Appropriate data analysis methods -Appropriate use of graphs & tables -Discussed decisions in data process	-Data can/could answer question -Data analyzed -Appropriate use of graphs ***or*** *tables* -Sufficient trials conducted (3 or more)	-Data may answer question -Data gathered -Small number of trials (less than 3)	
RECORD & LAB NOTEBOOK	-Detailed notes -Spans extended time -Has examples & illustrations -Student's own thinking	-Detailed notes -Has examples, illustrations -Has a plan	-Has notes -Has an idea	
DISCUSSIONS & CONCLUSIONS	-Answers all aspects of problem -Evaluates hypothesis -Clear understanding of results, limitations -Discusses next steps, future work	-Relates to problem -Evaluates hypothesis -Has conclusions -Has further questions	-States if hypothesis is proven or not	
INTERVIEW *For groups, all students must participate equally!*	-Interprets & explains poster/ display -Has visuals -Displays enthusiasm & curiosity	-Uses poster to explain -Shows enthusiasm & curiosity	-References poster -Shows enthusiasm	
POSTER	-Visually well-done -Logically sequenced -Clear illustrations -Well-labeled	-Visually appealing -Organized, has illustrations -Labeled, logical	-Organized visually -Labeled -Registered!	

Comments:

- 4th and 5th Grade Engineering Judging Rubric

TSES Science - Engineering Fair 2016 Evaluation Sheet

Grades 4 - 5 ENGINEERING DESIGN PROJECT

Student(s):

Grade/Teacher: Title: Project #:

	ACCOMPLISHED ENGINEER 8-10	DEVELOPING ENGINEER 4-7	BEGINNING ENGINEER 1-3	CONSIDER:
PROBLEM STATEMENT, DEFINE A NEED	-Focused, original problem statement -Has conceptual understanding of topic -Will meet potential users' needs	-New question -Has above average grasp of topic	-Standard problem -Has grade-level grasp of topic	
PLAN	-Research cited -Has 3+ reliable sources -Connected to problem -Integrates research into design	-Research cited -2+ reliable sources -Key terminology used -Has a plan to find out more	-Research cited -1 source -Key scientific terms used	
CREATIVITY	-Student-driven -New idea -Novel approach to use of materials & decisions	-Variation on a standard design -New approach to use of materials	-Packaged or standard design	
DESIGN CRITERIA	-Criteria clearly defined -Goals are measurable -All materials listed -Timeline used and executed	-Criteria defined -Has goals -Materials listed -Timeline	-Key criteria defined -Materials listed	

ENGINEERING PROCESS & PROTOTYPE	-Appropriate use of materials -Well-labeled schematics -Explains decisions -Sufficient testings (3 or more) -Considered alternatives	-Appropriate use of materials -Has schematics -Explains decisions -Sufficient testings (at least 3)	-Appropriate materials -Few testings -Data gathered -Understands design process	
RECORD & LAB NOTEBOOK	-Detailed notes -Spans extended time -Has examples & illustrations -Student's own thinking	-Detailed notes -Has examples, illustrations -Has a plan	-Has notes -Has an idea	
DISCUSSIONS & CONCLUSIONS	-Answers all aspects of problem -Evaluates design -Clear understanding of results, limitations -Discusses next steps, future work	-Relates to problem -Evaluates design -Has conclusions -Has further questions	-Relates to problem -Has conclusions	
INTERVIEW *For groups, all students must participate equally!*	-Interprets & explains poster/ display -Has a demonstration -Displays enthusiasm & curiosity	-Uses poster to explain -Shows enthusiasm & curiosity	-References poster -Shows enthusiasm	
POSTER	-Visually well-done -Logically sequenced -Clear illustrations -Well-labeled	-Visually appealing -Organized, has illustrations -Labeled, logical	-Organized visually -Labeled -Registered!	

Comments: