# Duncan Creek Elementary

# 5th Annual

# Science and Engineering Fair

# Student and Parent

## Information Packet

Presented By: The Science Department at DCES

Dear Students and Parents:

Duncan Creek is pleased to announce that our annual Science Fair will take place during the week of January 26-January 30. This year marks the 5th consecutive year that Duncan Creek has held a fair to promote original, hands-on scientific inquiry by students. Like last year, we will also include an Engineering component to promote exploration of the creativity-based design process. (Please find attached a chart comparing and contrasting the Scientific Method and the Engineering Design Process.) All fifth and fourth grade students **will be required to participate** in the fair. Each child's presentation of his/her entry will count as a grade in the area of science. All third grade students will have the **option** of entering a project in the fair. Below is a schedule outlining due dates and important information regarding your child's project. Ample time has been scheduled and work has been spread out, so students can complete the work at a comfortable pace.

The project must be experimental in nature as opposed to research oriented. In other words, students must do a test, survey, or experiment to determine the answer to their question instead of just looking it up in a book. The results should be measurable so that they can be recorded in a chart and/or a graph. If a student chooses to complete an engineering project, he/she should be looking for unique, original solutions to an established problem. Students should have a genuine interest in the topic since they will be working on these projects independently for multiple weeks. Please note: There are to be no projects using humans as test subjects. Human trials include any experiment where a human is observed, manipulated, or used to collect any data or information. The ethics of human experimentation are quite significant.

Attached is a list of acceptable Science Fair Project Ideas. Please take a moment to review these with your child in order to generate topic ideas. Students may choose one of these or, if they have a different idea, they may bring it to their science teacher for approval. It is very difficult to work alone without the exchange of ideas, so we encourage you to brainstorm with your child on different ideas and possible topics your child may want to pursue. Science Fair proposals (the outline of their experiment) are due on **Friday, October 24, 2014.**

Each student taking part in this year's fair will be submitting the following:

- Science Fair Project Proposal(outline of your experiment) Due on **Friday, October 24, 2014**
- Log Book (record of the data collected or designs tested and your thoughts while doing the experiment)
- Backboard Display (including display materials for the Science Fair) and Prototype if completing an engineering project
- Oral presentation to the class.
- Final written report that includes summary of data and conclusions or description of the design process.
- The final four (log book, display, oral presentation, and report) are due on **Wednesday, January 21, 2015** (when presentations begin).

Project guidelines state, "all work must be done by the students"; however, assistance may be provided by teachers, parents, etc. We are looking forward to working with you to make this a valuable learning experience for your child. We appreciate your support on this important project. As acknowledgement and part of your child's homework, please sign, date, and return the bottom portion of this letter by **Friday, October 17, 2014.**

Sincerely,

The Duncan Creek Science Committee

----------Please cut here----------

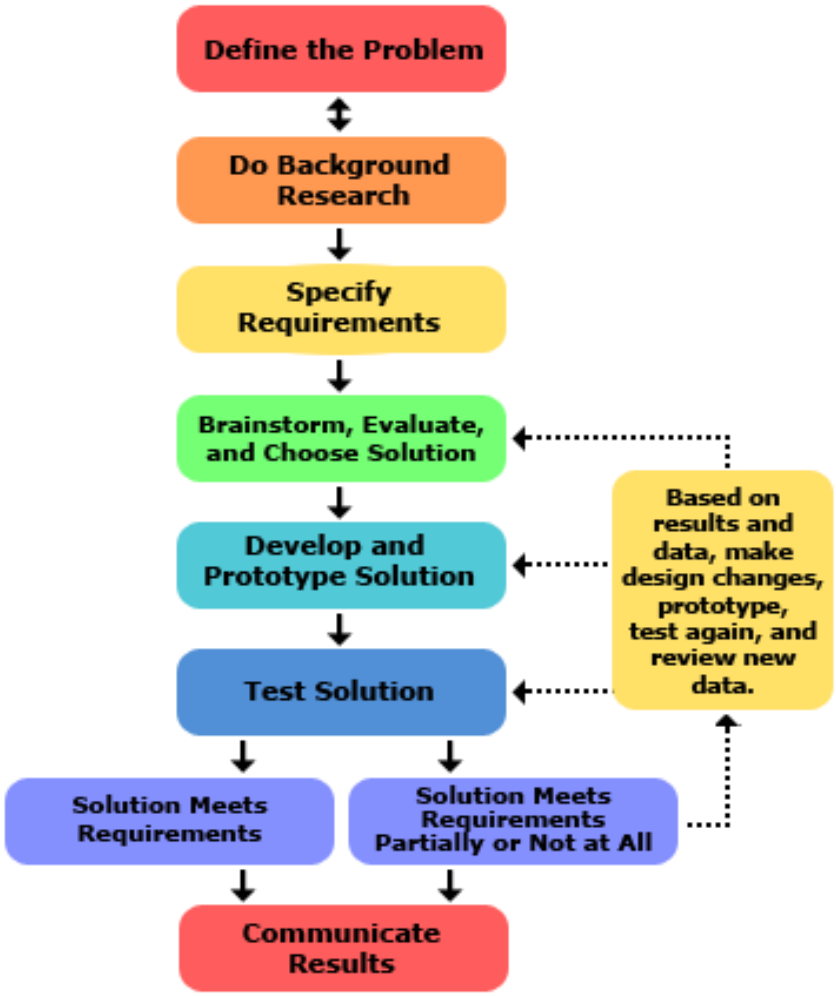
I have reviewed the Science Fair information and calendar with my child,_____

(printed name of child) and we understand the requirements for a successful Science Fair Project.

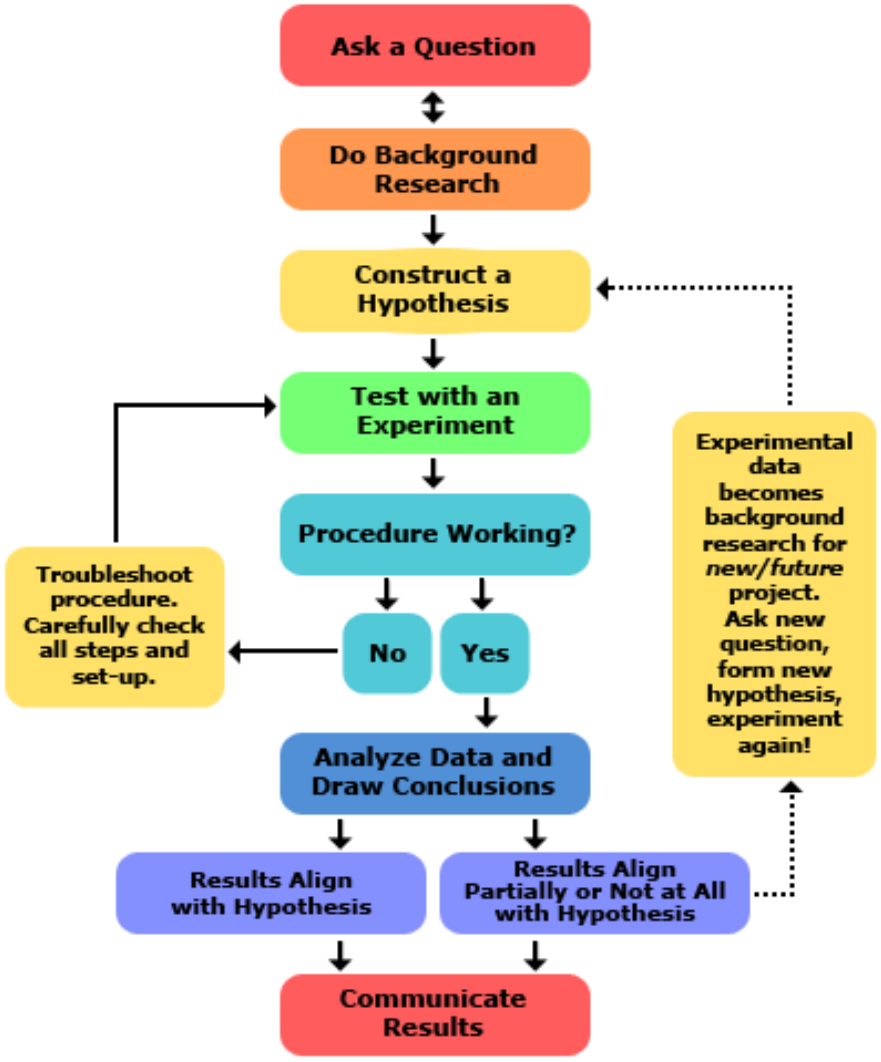
_____ _____

(Student Signature/Date) (Parent Signature/Date)

## Engineering Method




## Scientific Method



Name: _____ Grade: _____

# Science Fair Project Proposal- Due Friday, November 7, 2014

| **Your Problem**<br>**(Testable Question)** | |
|---|---|
| | |
| **Your Hypothesis**<br>**(If……Then Statement)** | |
| | |
| **Independent Variable**<br>**(What you are purposely changing?)** | **Dependent Variable**<br>**(The change that you measure.)** |
| | |
| **Controlled Variables**<br>**(What stays the same during the experiment?)** | |
| | |

## Procedures/Steps

**Explain how you are going to test your questions.**

*How are you going to obtain(get) quantitative(measurable) data. What tools/instruments will you use to make measurements? Summarize your procedures in a numbered list. Attach another piece of paper if necessary.*

## Materials List

**(What do you need to do your experiment?)**

*Please list with details.*

**How many trials (minimum 3-5) will you need to perform your experiment?**

# Engineering Project Proposal- Due Friday, November 7, 2014

## The Problem

*(What is the problem or need? Who has the problem or need? Why is it important to solve?)*

## Specify Requirements

*(State the important characteristics that your design must meet in order to be successful.)*

## Potential Solutions

*(Brainstorm some potential solutions. This step of developing ideas is called **ideation**. This is what you've BRAINSTORMED so far!)*

| | | | |
|---|---|---|---|
| | | | |

## Testing Procedures/Steps

*Explain how you are going to test your designs and solve the problems that you find. How are you going to obtain(get) quantitative(measurable) data. What tools/instruments will you use to make measurements? Summarize your procedures in a numbered list. Attach another piece of paper if necessary.*

## Materials List

**(What do you need to build your prototype?)**

*Please list with details.*

## How many design changes (minimum 3-5) will you make as you develop your prototype?

**Display Boards**

All students will be required to present their project on a tri-fold display board (dimensions 36 X 48 inches). Duncan Creek will have display boards available for purchase. The cost is $4.00. **If you would like to purchase a board, please include the money with this form**.

_____ Yes, I would like to purchase a display board from the school.

_____ No, I will provide my own board with the correct dimensions.

_____Please revise and resubmit.

_____Please choose another idea and write another proposal

Your project uses human trials.

Your project has more than one independent variable.

Your project is collecting qualitative data (not quantitative).

Your project is very complicated or broad. Please see me.

Your project violates one or more science fair rules.

# GUIDELINES FOR SCIENCE FAIR WRITTEN REPORT

**Cover: Make an attractive cover page with the title of your project, your name, and your grade level. (**Use a report cover or folder with brads with notebook paper in it.)

**PAGE 1**

***Title Page***: Name, title, grade level, and date

**PAGE 2**

***Investigative question***: State the problem in the form of a question. This identifies the problem you are trying to solve.

Below your investigative question, please identify the following elements using complete sentences. Your paragraph should be 5-7 sentences.

- **Hypothesis**: Your prediction on what will happen in the experiment should be based on prior knowledge and observation and not just a guess. Must be in the form of an If…….then statement.
- **Independent Variable**: What is the **one** condition you will change in your experiment?
- **Dependent Variable**: What will you measure to see if you have solved the problem (answered the question)? It needs to be able to be measured.
- **Controlled Variable**: What are the three to four variables that you plan to keep the ***same*** during your experiment.

***Materials List***: This list does not need to be written in paragraph form. Include everything that you used for your experiment.

**PAGE 3**

***Procedure List***: This list does not need to be written in paragraph form. Number each step that you took to complete your experiment. Write out directions where an explanation is necessary.

***Results Summary/Conclusion***: Describe the results of your experiment. Your paragraph should be 5-7 sentences long. Be sure to include whether or not you proved or disproved your hypothesis. **Don't forget to turn in your logbook, too.**

# GUIDELINES FOR SCIENCE FAIR LOG BOOK

**LOG BOOK INSTRUCTIONS**

**What is a Log Book?** It is a record of your experiment (like a journal) that is kept in a report cover or folder with brads and notebook paper. Everything written in the logbook stays.

- **What should be in your Log book?** When you begin your experiment you need to record the following in your logbook:
- **The Problem** (in the form of a question).
- **Hypothesis**
- **Independent Variable**
- **Control Variable**
- **Dependent Variable**
- List of the **Materials** that you actually use. (This may change slightly from your original proposal).
- List and number the **steps/procedures** that you are following for your experiment. Include sketches and diagrams of the setup of your experiment. You may wish to take photographs during each step.
- **Data** – You need to record neatly everything that happens in your experiment. Use a ruler to make neat data charts. Be sure to write observations neatly that can be read by others. Please date all entries when they occur. Include photos and drawing if it helps show what has occurred.
- If you run into problems, record the problem and how you plan to solve the problem in your logbook. Research possible solutions. If it doesn't solve the problem, come up with a new plan and try that.
- Include question and ideas for further experiments or questions for your teacher

# GUIDELINES FOR SCIENCE FAIR DISPLAY BOARD

## What makes for a good Science Fair Project Display Board?

Does your display board include?

- Title
- Question – Statement of Problem
- Hypothesis and Variables
- Materials List
- Experimental Procedures
- Data analysis and discussion including data chart(s) and graph(s)
- Conclusions (including ideas for future research)

Consider the Following:

1. Are the sections on your display board organized like a newspaper so that they are easy follow?
2. Is the text font large enough to be read easily (at least 16 points)?
3. Does the title catch people's attention, and is the title font large enough to be read from across the room?
4. Did you use pictures and diagrams to effectively convey information about your science fair project?
5. Have you constructed your display board as neatly as possible?
6. Did you proofread your display board?

# GUIDELINES FOR ENGINEERING PROJECT WRITTEN REPORT

**Cover: Make an attractive cover page with the title of your project, your name, and your grade level. (**Use a report cover or folder with brads with notebook paper in it.)

**PAGE 1**

***Title Page***: Name, title, grade level, and date

**PAGE 2**

***Define the Problem***: [Who] need(s) [what] because [why].

- What is the problem or need?
- Who has the problem or need?
- Why is it important to solve?

Below your stated problem, please identify the following elements using complete sentences.

- **Background Research:** Learn from the experience of others rather than repeat their mistakes. Who are the users or customers, and what are some existing solutions?
- **Specify Requirements:** Design requirements state the important characteristics that your solution must meet to succeed. In other words, tell what your prototype must do in order to be successful.
- **Brainstorm Solutions:** Explain a few of the ideas you had, and why you chose the one you did.

***Materials List***: This list does not need to be written in paragraph form. Include everything that you used during the design process.

**PAGE 3**

***Process Description***: This list does not need to be written in paragraph form. Number each step that you took to design, build, test, redesign, rebuild, and test the prototype(s). Write out directions where an explanation is necessary.

***Results***: Describe the results of your experiment. Your paragraph should be 5-7 sentences long. Be sure to include whether or not you were able to produce a prototype that solved the original stated problem. **Don't forget to turn in your logbook, too.**

# GUIDELINES FOR ENGINEERING LOG BOOK

**LOG BOOK INSTRUCTIONS**

**What is a Log Book?** It is a record of your design process (like a journal) that is kept in a report cover or folder with brads and notebook paper. Everything written in the logbook stays.

**What should be in your Log book?** When you begin your engineering project you need to record the following in your logbook:

- **The Problem**
- **Notes from Background Research**
- **Requirements of Solution** (*list*)
- **Brainstormed Ideas** *(doodles, sketches, diagrams, etc.)*
- List of the **Materials** that you actually use. (This may change slightly from your original proposal).
- List and number the **steps/procedures** that you are following during your design process. Include sketches and diagrams of your work. You may wish to take photographs during each step.
- **Data** – You need to record neatly everything that happens during your build. Use a ruler to make neat data charts when necessary. Be sure to write observations that can be read by others. Please date all entries when they occur. Include photos and drawing if it helps show what has occurred.
- If you run into problems, record the problem and how you plan to solve the problem in your logbook. Research possible solutions. If it doesn't solve the problem, come up with a new plan and try that.
- Include question and ideas for further experiments or questions for your teacher

# GUIDELINES FOR SCIENCE FAIR DISPLAY BOARD

## What makes for a good Science Fair Project Display Board?

Does your display board include?

- Title
- Statement of Problem
- Specified Requirements
- Materials List
- Design Process Procedures
- Evidence of Solution Testing (data collected and discussion of results of tests)
- Final Results (including prototype pictures or description)

Consider the Following:

1. Are the sections on your display board organized like a newspaper so that they are easy follow?
2. Is the text font large enough to be read easily (at least 16 points)?
3. Does the title catch people's attention, and is the title font large enough to be read from across the room?
4. Did you use pictures and diagrams to effectively convey information about your science fair project?
5. Have you constructed your display board as neatly as possible?
6. Did you proofread your display board?

# Oral Presentation Rubric

| Category | 4 Points | 3 Points | 2 Points | 1 Point |
|---|---|---|---|---|
| **Eye Contact** | Maintains eye contact all of the time. Does not read. | Maintains eye contact most of the time. Occasionally reads from the report or backboard. | Reads from the backboard or report most of the time. | Reads from the report or backboard with no eye contact. |
| **Voice** | Voice is clear. All words are pronounced correctly. Everyone can hear the presentation. | Voice is clear. Most words are pronounced correctly. Everyone can hear most of the time. | Mumbles, pronounces words incorrectly. Students have difficulty hearing. | Mumbles or voice is too low to be heard. |
| **Poise** | Stands still and maintains focus throughout the entire presentation. | Stands still and maintains focus throughout most of the presentation. | Fidgets, giggles, seems unfocused during some the presentation. | Fidgets, giggles and is unfocused during the presentation. |
| **Content** | Completely covers required content. Adds extra interesting information. | Completely covers the required content. | Does not cover all of the content. Must occasionally be prompted to keep presentation moving. | Most of the content is missing from the presentation. Must be continually prompted to keep presentation moving. |
| **Preparedness** | Student has completely prepared and has obviously rehearsed. | Student seems prepared but needed a few more rehearsals. | Student is somewhat prepared but it is clear the rehearsal is lacking. | Student has not prepared their presentation. There are no signs of rehearsal. |

## Suggested Science Fair Project Ideas

The following is a list of experimental problems that can be used for science fair projects. Students can choose a project from this list or can choose an experiment of their choice after teacher approval.

Reminder: All experiments, surveys or tests should be experimental in nature. That is, students will find answers by using the scientific method (please refer to page 2 of this packet). The scientific method requires that you do repeated trials and/or use a large number of test subjects.

- Do oil spills affect the growth of aquatic plants?
- Does acid rain affect plant growth? (vinegar and water for acid rain)
- Does water temperature affect the growth of plants?
- Does the amount of light on plants affect their growth?
- Does potting soil really help plants grow?
- Are organic fertilizers more effective than inorganic fertilizers?
- Do radish plants grow quicker hydroponically than in soil?
- Does the color of light affect plant growth?
- Do different types of music affect plant growth?
- Is plant growth affected by magnetism?
- What type of soil is best for growing vegetables?
- Which materials will sound waves travel through the best?
- Will wrapping more coils around a nail make a stronger electromagnet?
- What material is the best insulator for keeping things warm or cold?
- Do sound barriers reduce noise? If so, which material reduces the most noise?
- Do wheels made out of steel work better than wood or plastics wheels?
- Which blade design works most efficiently on windmills?
- Can a solar hot dog cooker cook a hot dog as effectively as on the stove or grill?
- Does a homemade anemometer measure wind speed accurately?
- What color absorbs the sun's heat the best? (ice cube melt time)
- What material (sand, salt, water, or dirt) stores solar energy the best?
- Do batteries last longer when it is used on/off or with continuous use?
- Will flashlight batteries that are twice as large last twice as large?
- How do different materials react to static electricity?
- What type of material conserves heat the best?
- How does wind speed affect how quickly an object cools? (weathering the windchill!)
- Which substance will melt driveway and walkway ice the best?
- Does the density of liquid affect absorbency?
- Which laundry detergent removes stains most effectively?
- Which bubble solution makes the longest-lasting bubbles?

**Suggested Engineering Project Ideas**

The following is a list of experimental problems that can be used for science fair projects. They have been categorized for your convenience. Students can choose a project from this list or can choose an experiment of their choice after teacher approval.

Reminder: All projects should be experimental in nature. That is, students are not recreating an existing product. Instead, they are creating a new solution to a problem. The design process requires that you do repeated tests and subsequent redesigns to solve any problems identified.

- a device that cleans gutters
- a plastic product that holds a book while you eat
- a rain poncho designed for use when riding a bicycle
- a lunch-box alarm that goes off when an unauthorized person opens the box
- a bird feeder that protects feed from wind and rain
- a new board game
- a newly designed bottle opener
- a toothpaste cap that minimizes waste and mess
- a billfold that organizes money by denomination for blind people
- a new candy bar
- clothing tags to help match and coordinate clothes
- a dog collar that lights up at night
- a bedspread that zips down the middle
- safety suspenders that light up at night for joggers or bikers
- a lock for a folding door
- a new type of ice cream container that minimizes mess
- a new type of rake that allows you to pick up leaves without bending over
- a robot that distributes and collects student papers
- a glove with a light for signaling turns when riding a bike at night
- a hearing-aid guard
- a mailbox alert device that signals when mail has been delivered to a roadside mailbox
- tapeless wrapping paper
- an outside house light that flashes to signal police, firemen, or other helpers as to which house made a call for assistance
- an eyeglass defogging device
- a drying rack for gloves
- a liquid that covers fade marks on blue jeans
- a chocolate-candy device that prevents ice cream cones from dripping