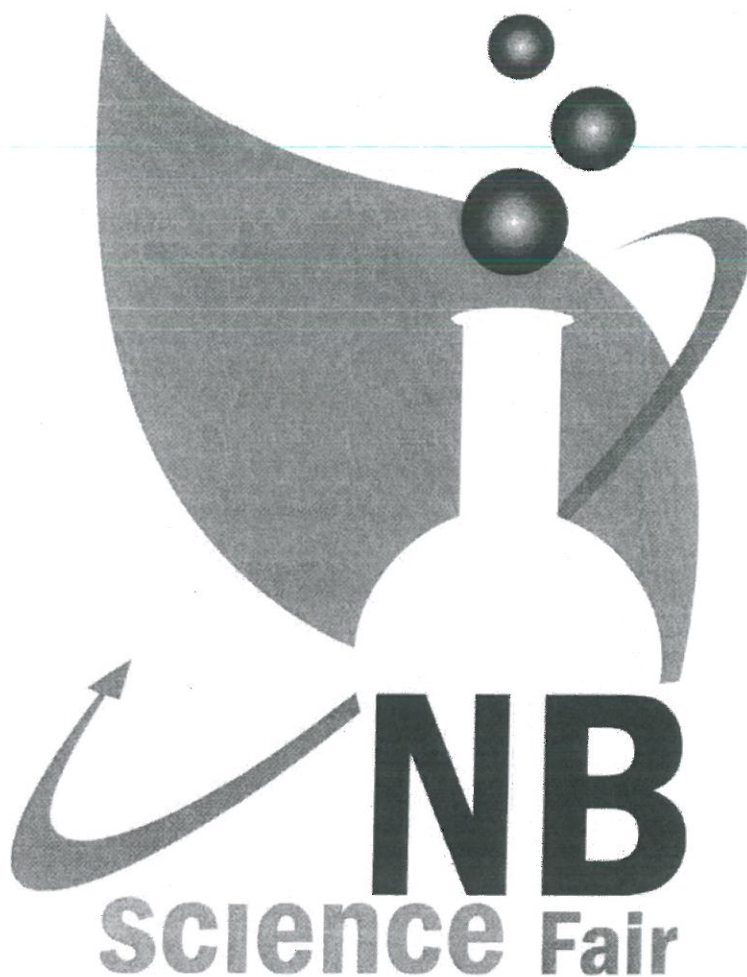




New Brunswick Regional Fairs

Fundy Regional Fair	L'Expo-sciences des districts francophones du Nouveau Brunswick	River Valley Regional Fair
UNB Saint John	Université de Moncton Campus d'Edmundston	UNB Fredericton
<u>Go to online REGISTRATION</u>	<u>Go to online REGISTRATION</u>	<u>Go to online REGISTRATION</u>

Problems with on-line registration?

Contact Karen Matheson at 506-457-2340 ext. 127 or e-mail exposcience@scienceeast.nb.ca



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New Brunswick Regional Fairs

GENERAL INFORMATION

The Science Fair is open to all Middle & High School students who participated in a fair at the school level. The school fair may involve the entire school, a grade level or even a few classes.

➤ Types of Projects – Summary:

Experiment	Innovation	Study
Undertake an investigation to test a scientific hypothesis by experimental method. At least one independent variable is manipulated; other variables are controlled.	Develop and evaluate new devices, models, theorems, physical theories, techniques, or methods in technology, engineering, computing, natural science, or social science.	Analysis of, and possibly collection of, data using accepted methodologies from the natural, social, biological, or health sciences. Include studies involving human subjects, biology field studies, data mining, observation and pattern recognition in physical and/or socio-behavioral data.

Table 1: Three Types of Science Fair Projects

➤ Project Classification:

Projects will be classified by two categories:

Junior (Grade 6-8)

Senior (Grade 9-12)

N.B. Entries submitted by Grade 6 students are not eligible for Grand Prizes.

To ensure judges have the relevant background and comfort level to judge projects, all projects must be registered as either Biology or Physical Sciences.

The goal is to ensure that the best projects receive medals, regardless of the type of science that the project focuses on. Projects used to be classified for judging into divisions according to the type of science (e.g. Computing & Information Technology, Health Sciences, etc.).

As of 2011, all projects are judged for medals against all others in their grade category (i.e. junior or senior). Significant variance in the number of projects per division meant that excellent projects in large divisions sometimes went unrecognized. The same changes have been implemented at the Canada Wide Science Fair (CWSF). CWSF finalists, delegates, and parents no longer need worry about whether a project is registered in the right division.

Please Note: *There are new rules regarding Ethics. If your project involves experimenting with or studying animals or humans, please visit the following link for more information:*
<http://ethics.youthscience.ca>

For additional information contact:

Karen Matheson at 457-2340 ext. 127 or email at exposcience@sciencecast.nb.ca



➤ **Three Types of Projects**

1. **Experiment**
2. **Innovation**
3. **Study**

➤ **Steps to Making a Science Fair Project**

The following steps should not be considered as a rigid sequence. They should be seen as a “cycle”.

For example in an *experiment*, it may be necessary to come back to *step 2* and refine the question after having done some research on the topic in *step 3*. A student doing an *innovation* might need to revise the design specifications in *step 4* after building the prototype in *step 6*.

	Experiment	Innovation	Study
Step 1	Select a Topic	Identify a Design Opportunity	Identify the Area of Study
Step 2	Formulate the Question	Research the Design Opportunity	Do a Literature Review
Step 3	Research the Topic	Brainstorm Possible Solutions	Formulate the Question
Step 4	Formulate the Hypothesis	Draft a Design Brief	Determine how the Study will be Conducted
Step 5	Design the Investigation	Prepare Requirements and Drawings	Gather Relevant Data (or Information)
Step 6	Conduct the Investigation	Build a Solution Prototype	Analyze Data
Step 7	Analyze the Results	Test, Evaluate and Revise	Search for New Understanding Emerging from the Analysis
Step 8	Write the Report	Write the Report	Write the Report
Step 9	Make a Display	Make a Display	Make a Display
Step 10	Prepare a Presentation	Prepare a Presentation	Prepare a Presentation

Table 2: Types of Science Fair Projects – Step by Step



Project Type 1 - Experiment

Projects of this type involve an original scientific experiment to test a specific hypothesis in which the student recognizes and controls all significant competing variables and demonstrates excellent collection, analysis, and presentation of data. The experimental design is as important as the actual results from the experiment. The process of designing an investigation should have a cyclical progression and not limited to a sequential or a rigid method.

The Experimental Process

1. Select a Topic.

The first and most important step is to select a topic of interest. Choosing a topic is difficult because the possibilities are endless. The topic you choose should represent something that you are really interested in. It is not enough just to go on the internet and select an experiment that has already been done.

2. Formulate the Question.

After a few days of reflection, you need to formulate an open-ended question that can only be answered by doing an experiment. Good questions are specific. That is, they are testing the relationship between only two variables, not three or four. By keeping the question simple and specific, you are preventing your experiment from taking too long or from being too complicated.

3. Research your Topic.

Once you have identified a question, the next step is to learn as much as possible on the subject. Take some time to do research at the library or on the internet. The object is to be prepared to form an intelligent testable hypothesis.

4. Formulate a Hypothesis.

This step allows you to focus on the details of the investigation. You need to formulate a hypothesis that can be easily verified with an experiment. A hypothesis has the following:

- i) subject identification,
- ii) what is being measured,
- iii) identification of the variables and
- iv) expected results.

Example: *Bean plants grown under a green light 24hrs a day, for a period of 2 weeks, will grow taller than bean plants grown under a natural light over the same period of time.*

- i) Subject: Bean plant
- ii) Measurement: Height of the bean plant
- iii) Independent variable: Color of the light
Dependent variable: Height of the plant
- iv) Result expected: Green light is better than natural light

5. Design the Investigation. (Experimental Design)

The plan needs to include the following:

- I. Materials needed
- II. Variables involved
- III. Detailed procedure
- IV. Data collection plan



Before you begin your experimental design, you need to identify the variables and controls. There are three things to identify:

- a) **Independent Variable:** This is the variable that is manipulated. This is what you purposefully change in the experiment.
- b) **Dependent Variable:** The purpose of the experiment is to see if this variable will be affected by the changes you make. The dependent variable is what is being measured in the experiment.
- c) **Controlled Variable:** These are the variables that need to be constant throughout the experiment.

6. Conduct the Investigation.

This is when you actually do the experiment (this can happen at home). During the experiment, you may take pictures, record data and keep detailed notes of observations.

7. Analyze the Results.

When the experiment is over, you need to compare the results with your hypothesis and form a conclusion. You need to establish if your hypothesis was confirmed or not. At this point, you may have found new questions to be answered and suggest new variables, different materials or a procedure for another investigation.

Results:

The results that are collected can occur in two forms:

- If the results can be physically measured, counted and/or if it can be timed... the results are presented in tables and/or graphs.
- If the results are visuals, illustrations, photographs or a video recording maybe more appropriate.

Conclusion:

- Discuss or mention every table, graph, illustration etc...
- Make reference to the hypothesis.
- Indicate whether or not the results support your hypothesis.
- Review the variables.
- Indicate what could be done differently next time to avoid the same mistakes.
- Highlight some practical applications where this knowledge maybe useful.
- Include ideas for future study.

8. Write the Report.

Writing a report about all that was done, how it was done, and what was discovered is an important aspect of a Science Fair Project. Scientists need to communicate their investigation clearly to allow others to conduct the same investigation and arrive at the same conclusions. The written report is a summary of everything you did to investigate your question or problem. It provides information about the extent of the project as well as what you learned through it. The maximum number of pages is 5 plus the bibliography. The contents of the report should include:

Title page: Include first and last name, date, topic, category and registration number.



Purpose (Introduction): This should state the objective in only a few lines (less than 8). It is also worth mentioning the main details of the work accomplished.

Question: What do I want to find out? What do I want to understand?

Hypothesis: An educated guess that answers the problem. It is based on what the student already knows and on the research they have done on the topic. What is a possible and measurable explanation to the question?

Materials: Anything used in the project (equipment).

Experimental procedure: Steps taken from beginning to end.

Observation and results: This is the body of the report. Ensure time is taken to explain the results, details and information regarding research.

Conclusion (Discussion): Summarize details of the project and conditions in which the work was done. This is also a good place to write about possible future endeavours for the topic/ project.

Bibliography: Any science fair project should have had some type of resources consulted; everyone **must** cite all sources used for the project.

Acknowledgments: This is where students acknowledge those persons who assisted them in research etc. Remember the importance of not plagiarizing someone else's work.

9. Make a Display

Refer to page 16.

10. Prepare a Presentation.

Refer to page 17.



Project Type 2 - Innovation

Projects of this type involve the creation and development of new devices, models or technologies. Usually, an original device is constructed or designed that has commercial applications or is beneficial to humans. The design process is as important as the actual end product.

The Design Process

(Adapted from: *Design and Discovery Curriculum, Intel, 2004*)

The design process is a systematic problem-solving strategy used to develop many possible solutions to solve a problem or satisfy human needs and wants and narrow down the possible solutions to one final choice. It is a recognized set of generally defined steps designers and engineers use based on a problem solving strategy that leads to product development.

1. Identify a Design Opportunity.

The design process begins with identifying a need. Notice that opportunities to design a new product or redesign an existing one are everywhere. They often come from a problem that has been experienced personally. The goal is to identify many design opportunities and narrow them down later.

2. Research the Design Opportunity.

Gather a lot of information about the nature of the problem in order to narrow down your choice. Find out if other people experience the same problem and research any existing products or solutions that may currently be used to solve the problem. Choose a design opportunity to address the problem. Write a problem statement.

3. Brainstorm Possible Solutions to the Problem.

Try to come up with as many ideas as you can for solving the problem or addressing the design opportunity. Brainstorming may involve the use of techniques such as *SCAMPER*. Then, narrow down your solutions and choose one to three to pursue further.

4. Draft a Design Brief.

Write a design brief to outline the problem. A design brief includes a problem statement, a description of the user needs, a proposed solution, and often a sketch of the idea or solution. This is a working document that can be changed.

5. Prepare Design Requirements and Conceptual Drawings.

Define the criteria the solution must meet (design requirements) and sketch conceptual drawings.

6. Build a Solution Prototype.

Develop detailed project specifications, consider material properties required, choose materials, and create a working prototype.

7. Test, Evaluate and Revise your Solution.

Evaluate the prototype for function, feasibility, safety, aesthetics and other criteria. Consider how it could be improved. Modify your prototype or create another and test it.

8. Write the Report.

Writing a report about all that was done, how it was done, and what was discovered is an important aspect of a Science Fair Project. Scientists need to communicate their investigation



clearly to allow others to conduct the same investigation and arrive at the same conclusions. The written report is a summary of everything you did to investigate your question or problem. It provides information about the extent of the project as well as what you learned through it. The maximum number of pages is 5 plus the bibliography. The contents of the report should include:

Title page: Include first and last name, date, topic, category and registration number.

Introduction: This should state the design opportunity and the problem or the need that you want to address. Is the project suggesting improvements to an existing product or creating a new product from a new design?

Research on the Design Opportunity: This section should include what you have learned from your research about what already exists concerning your proposed design opportunity.

Design Brief: Include all design specifications and drawings.

Materials: Anything used in the project (equipment).

Procedure: Steps taken from the first to the final versions of the prototype.

Observation and results: This is the body of the report. Explain whether or not the final prototype meets the design specifications.

Conclusion (Discussion): Summarize details of the project and conditions in which the work was done. This is also a good place to write about possible future endeavours for the topic/ project.

Bibliography: Any science fair project should have had some type of resources consulted; everyone **must** cite all sources used for the project.

Acknowledgments: This is where students acknowledge those persons who assisted them in research etc. Remember the importance of not plagiarizing someone else's work.

9. Make a Display.
Refer to page 16.

10. Prepare a Presentation.
Refer to page 17.



Project Type 3 - Study

Studies are probably the least common type of project. They involve the collection or use of data for personal analysis, in order to reveal patterns, relationships or discoveries. The information (data) may be collected by the student themselves or from outside sources, other than the students. The analysis of the data should lead students to make claims that are supported by the data.

Research Process

1. Identify an Area of Study.

The first and most important step is to select a topic of interest. Choosing a topic is difficult because the possibilities are endless. The topic you choose should represent something *related to science* that you are really interested in. Typically, it could be a subject that affects/concerns you, your family or your community.

2. Literature Review.

An in-depth research in the library or on the internet should provide you with the background information you need to formulate a research question.

3. Research Question.

After reflecting on your new background information, you need to formulate an open-ended question that will be answered at the end of your study. Good questions are specific and simple. By keeping it that way, you are preventing your study from taking too long or from being too complicated.

4. Determine how the Study will be conducted.

What kind of data (information) are you looking for? *Primary data* is information you collect yourself. Methods for collecting primary include: questionnaires, surveys, interviews and observation. *Secondary data* is information that someone else has collected. Sources for collecting secondary data may include: books, magazines, journals, newspapers, internet, etc... You need to decide which way is the best to collect the data to answer your question and make a plan of action

5. Gather Relevant Data.

Having now determined the type of data you need (primary or secondary) and the plan for collecting it, you need to implement your plan to collect all your data.

6. Data Analysis.

At this stage, you have gathered a lot of information and need to simplify it into general categories. Initially, you may have 10-20 different categories. Keep in mind that you are trying to answer your initial question. Look at all the data several times and try to see if there are any relationships between the categories. Eventually, you may end up with 5-6 distinct categories of information.

7. Search for New Understanding.

After spending a lot of time looking at the data and the different categories, you will be able to detect some patterns, relationships and discoveries. You need to write down what you see. These are the claims you are making as a result of your study.



8. Write the Report.

Writing a report about all that was done, how it was done, and what was discovered is an important aspect of a Science Fair Project. You need to communicate clearly about everything you did to investigate your question or problem. It provides a summary about the extent of the project as well as what you learned through it. The maximum number of pages is 5 plus the bibliography. The contents of the report should include:

Title page: Include first and last name, date, topic, category and registration number.

Introduction: This should state your topic of interest, the reason why you selected it and the question you want to answer.

Review of the literature: This section should include what you have learned from your preliminary research about what already exists concerning your topic.

Research Method: You need to explain the kind of data you collected and how you collected it.

Data Analysis and Results: Elaborate on how you analyzed your data and what results you found. What claims can be made from the analysis?

Conclusion (Discussion): Summarize the findings of your study. Are you able to answer your initial question? This is also a good place to write about possible implications from those findings.

Reference: Include all the sources where you took your data. You should follow this format:
Hodson, D. (2006). Why we should prioritize learning about science. *Canadian Journal of Science, Mathematics & Technology Education*, 6:3 July, 2006, 293-311.

Acknowledgments: This is where students acknowledge those persons who assisted them in research etc. Remember the importance of not plagiarizing someone else's work.

9. Make a Display.

Refer to page 16.

10. Prepare a Presentation.

Refer to page 17.



➤ Preparing for Science Fair Judging:

1. Students must be present during the judging sessions to explain their project and answer questions from the judges.
2. Participants should be able to present their work to the judges in five minutes or less.
3. Judging is based on the following criteria:

Judges' Criteria used to make decisions	What the judges are trying to determine	Things to consider mentioning in your presentation
Scientific Thought (45%)	Did the student understand the scientific method and apply it appropriately with originality?	Discuss your approach to the experiment (problem, analysis, variables, solution/results, etc.).
Creativity / Originality (25%)	Is this work creative, imaginative, original, novel?	Why did you choose this topic and how did you settle on your approach to the problem?
Clarity / Presentation (20%)	Can the student clearly and easily discuss all aspects of his or her project? Does the visual display flow logically, demonstrate effort, and appear self-explanatory?	If your tests had shown XYZ instead, what would you have done? Why?
Background Information / Summary (10%)	Did the student submit a summary of their project that demonstrates all elements neatly? Does the student understand what was done previously in the field?	What makes your project different from others?

Table 3: Judging Criteria Summary

How Do Judges Evaluate Your Project?

No two judges will approach your science project from the same perspective. They come from different personal and professional backgrounds, they might or might not have judged at this type of competition before, and they might be more or less informed about your topic. All of the judges will be trying to determine the same general thing: your ability to independently conduct and communicate original, meaningful scientific research. Table 2 lists the four criteria judges usually use to make their judging decisions. This is used as a guide for the judges to discuss the projects, as a collective group, and determine prize winners.



➤ Project Display - Appearance

Ensure your display board conveys information efficiently and accurately.

The objective of the display board is to convey as much information as quickly as possible. A well-put-together display board is an advantage, allowing you to get the basic description of your science project across quickly so that the judges can focus on asking you questions to evaluate what you did and how much you know. Graphs, pie charts, and photos, etc. are a good use of visual aids to convey your results clearly.



All displays must be able to fit on a table or on the floor not exceeding the following dimensions:

Length (front to back):	0.6 m
Width (side to side):	1.2 m
Height:	1.5 m

- Make things flow from left to right.
- Using bright colors makes the project stand out from others.
- Use a large font, bold writing and limit text.
- Using more pictures, graphs, and diagrams makes the project more interesting and easier to understand. These also can help guide the presentation and emphasize important results and conclusions.
- Construction may be of rigid cardboard, light veneer or plywood, but may not be of Styrofoam.

Experiment models / demonstrations cannot be used during judging for safety and time purposes. Participants may use video and / or photos of what was done to explain the process. All projects will be safety checked before judging.

Safety Rules / Ethics

1. Displays must be solidly constructed. Moving pieces, if any, must be firmly attached and present no danger of accident. Switches and cords must be of the approved variety and circuits adequately protected. Cell or battery-fed circuits should be safe both in design and operation. Pressure vessels must be equipped with safety valves and gas cylinders stabilized.
2. Open flames, live animals, inflammable liquids, microbial cultures, plants and soil, biodegradable material and lasers in working order may not be exhibited.
3. No toxic, corrosive or dangerous chemicals are allowed at the Science Fair. Substitutes, such as sugar, water, food dyes, salt, flour and molasses, must be used to simulate dangerous chemicals.
4. For a project involving live animals, the regulations of the Youth Science Foundation must be followed. For further information, visit www.ysf.ca



River Valley Regional Science Fair Judging Sheet

Project Title:		Project #	
Student Name(s)			
A – Scientific Thought (max 45 points)			
Level 1	• Duplication of an experiment, model, technology • Basic study of a basic issue	5-15 points	
Level 2	• Extension, modification, improvement, demonstration, justification of an experiment, model, technology • Specific study of a material collection, compilation, observation.	16-25 points	
Level 3	• Original experiment, controls and variables defined, analysis includes graphs, simple statistics and conclusions • Adaptations to technology, human benefits, and/or economic applications • Relevant study of an issue; arithmetic, statistical, or graphical analysis	26-35 points	
Level 4	• Original experimental research, variables controlled, complete analysis • Technologies, inventions, innovative designs having human/commercial benefit • Information collated, synthesis, original solutions to current problems, statistical analysis of the significant variable(s).	36-45 points	
Subtotal A (max 45 points):			⇒
B – Originality / Creativity (max 25 points)			
Level 1	• Little imagination, simple, minimal student input	5-10 points	
Level 2	• Some creativity, good design, standard approach using common resources/equipment, current topic.	11-15 points	
Level 3	• Imaginative, creative, use of available resources, organized	16-20 points	
Level 4	• Highly original, novel, resourceful, high level of creativity.	21-25 points	
Subtotal B (max 25 points):			⇒
C – Project Summary (max 10 points)			
1. Information			
	• Has the required information been provided?	0-3 points	
	• Is the information in the specified format?	0-1 points	
	• Is the information clear and concise?	0-2 points	
	• Does the summary accurately reflect the project?	0-2 points	
2. Presentation:			
	• Neatness, grammar, spelling	0-2 points	
Subtotal C (max 10 points) :			⇒
D – Display (max 20 points)			
1. Skill			
	• Necessary scientific approach illustrated	0-3 points	
	• Exhibit well constructed	0-3 points	
	• Material student's independent work	0-2 points	
2. Dramatic Value			
	• Layout logical and self-explanatory	0-3 points	
	• Exhibit attractive	0-3 points	
	• Presentation (logical, clear, enthusiastic)	0-3 points	
3. Judges' discretion			0-3 points
Subtotal D (max 20 points):			⇒
Judge's signature		TOTAL	



➤ Making a Lasting Impression – You and Your Science Project Presentation

You should carefully review the procedures outlined on the website of the competition(s) you're entering. For example, there are no model demonstrations allowed during judging. Person to person presentation is a big part of the judging process. These presentations usually have a time cap. You have 5 minutes to convey all of the information you want to your judges. In addition to explaining all the science, you will want to leave judges with the impression that you were courteous, confident, comfortable, knowledgeable, enthusiastic, and engaging.

Practice, Practice, Practice!

- Good communication will maximize your chances of winning.
- Be Professional!
- Write up a short "speech" (approximately 5 minutes long) summarizing your science fair project. You will give this speech when you first meet the judges.
(Remember to talk about the theory behind your science fair project-why your project turns out the way it does.)
- Organize a list of questions you think the judges will ask you and prepare/practice answers for them. Practice explaining your science fair project to others and pretend they are judges.
- Practice explaining your science fair project in simple terms so anyone can understand it.
- Always dress nicely for the science fair judging period-NO JEANS, Please!
- Make good use of your display board. Point to diagrams and graphs, pictures or video when you are discussing them.
- Be confident with your answers; do not mumble.
- If you have no idea what the judge is asking, or do not know the answer to their question, it is okay to say "I do not know."
- Treat each person who visits you like a judge.
- Always be positive and enthusiastic!

