WESTERN UPPER PENINSULA SCIENCE FAIR

Tuesday, March 30, 2004
Memorial Union Ballroom
Michigan Technological University, Houghton, MI

STUDENT PLANNING GUIDE
~ GRADES 6-9 ~

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Sponsored by:

Western UP Center for Science, Mathematics and Environmental Education
&
MTU Omega Chi Epsilon Chemical Engineering Honor Society

GENERAL RULES

PROJECTS MUST MEET ALL GENERAL RULES ON THIS PAGE IN ORDER TO BE ELIGIBLE FOR ENTRY!

1. Students in grades four through nine submit projects on an experiment they conducted on any topic of interest. The students must follow the scientific method.

2. Science fair projects are to be designed and carried out by the student entering the Western UP Science Fair. The project idea and its execution should belong to the student, although students should seek guidance from parents and teachers as they research and complete their projects.

3. Students may work individually on a project or in pairs. There will be separate competition categories for pairs and individuals in each grade level.

4. Students are responsible for transporting and setting up their projects on the day of the fair from 3:30 to 4:30pm EST on Tuesday, March 30, 2004. Judging will start at 4:30 pm EST. Students will need to be available to explain their projects to the judges from 4:30 to 7:00pm EST.

5. The number of projects that can enter the Western UP Science Fair will be limited to 250 on a first-come first-serve basis.

6. A Science Project Registration Form is required for each project. This form must have the teacher's signature. The deadline is **Thursday, March 4, 2004**. This form is located in the back of the student guide. On the day of the fair, each project will be assigned a number. The judges will refer to each project by number, so that the judges do not know the identity of the student.

7. Each student participant must also turn in a signed Parent Consent Form. The deadline is **Thursday, March 4, 2004**. This form is on the back of the Student Registration Form.

8. Projects should fit in a space enclosed by a standard size display board: 36" (height) by 48" (width). Standard size white display boards can be purchased from Western UP Center for $2.00 each. To obtain a board, see classroom teacher or contact Loret Roberts at 482-0331 or loret@ccisd.k12.mi.us

9. No commercial kits and/or computer programs are allowed except in support of data of the project.

10. **Safety first!** Do not use any materials or techniques that harm you, others or the environment. No live vertebrate animals are allowed in your display.

11. **Q**uestions, please contact Shawn Oppliger at 482-0331 or sopplige@ccisd.k12.mi.us.

ENJOY DESIGNING YOUR OWN SCIENTIFIC INVESTIGATION!

PROJECT REQUIREMENTS

A science fair project is a presentation of an experiment conducted by the student using the scientific method. A science fair project submitted to the Western UP Science Fair must have two parts:

Part 1: The Display Unit
Part 2: The Science Fair Report

Part 1: The Display Unit

The display unit consists of three parts:

1. **Display board:** This forms the background for the project. A standard-size display board is 36" (height) by 48" (width). It may be constructed or purchased (see #5, page 1). It is usually three-sided and sturdy enough to stand on its own for several days. Various parts of the written report, graphs, charts, photographs and other materials are attached to the display board.

2. **Models, materials, devices and samples:** These should relate to the science fair project experiment and may be shown in front of the display unit. **Safety First!** These items should present no hazards to observers who may be viewing the display. No breakable or dangerous items should be included. Avoid using open containers of liquids or smelly items, as they may be a hazard to observers and neighboring displays.

3. **Information from the written report:** This information should be on the display unit in form that is NEAT, CONCISE, and EASY TO READ manner. You should include the following:

   - ***First* name (only)** of student(s) and their grade
   - **Purpose:** The problem stated in the form of a question. (This is also the **title** of your project.)
   - **Hypothesis**: An educated guess of how the experiment will turn out, worded in terms of the independent and dependent variables.
   - **Procedure & Materials List:** A summary of the procedure that was followed, including summary of materials used.
   - **Results:** The data collected, as part of the experiment, should be displayed in tables, charts, and/or graphs. Photographs, diagrams, and drawings that describe what was done and what was learned may be included.
   - **Conclusion:** A statement that summarizes the investigation and addresses the original purpose. It should include any discoveries that were not originally planned.

Part 2: The Science Fair Report

It is important to follow the scientific method when you design your science fair project. The **scientific method** is a series of steps that must be followed in order to properly design your science experiment and report your findings.

The following worksheets will help you with each step of the scientific method. Use the information from the completed worksheets to write your science fair report and put together your display. The report should be 4-6 pages long including the title page, graphs and data tables. An example report is provided at the end.

Title Page

Should include the problem to investigate (Worksheet 1), first name and grade of the student(s) only.

Worksheet 1: State the Problem.

Ask a very specific question about the problem that you want to investigate. State your question in terms of independent and dependent variables.

Worksheet 2: Review of Literature and Bibliography.

Gather information from at least three different books, magazines or websites. The bibliography should list all the printed materials you consulted in carrying out the project. Items should be listed in alphabetical order in a standard format.

Worksheet 3: Develop a Hypothesis.

Write down your prediction of how you think the experiment will turn out. You should predict how changing the independent variable would affect the dependant variable and *explain* your prediction by using the background information that you gathered from reviewing literature.

Worksheet 4: Design the Experimental Procedure.

Design an experiment that looks at the effect of change in the independent variable on the dependent variable. It is important that only one independent variable be changed at a time and that only one dependent variable is measured at a time. Determine in what increment the independent variable will change and how to measure the result of the change on the dependent variable. The experimental procedure should include information about your control, materials used (including appropriate units and amounts), and a step-by-step list of steps. All parts should be clear enough for others to follow your experiment.

Worksheet 5: Conduct the Experiment and Keep Records.

Conduct the experiment. Record the data collected and what you observed during the experiment. Also, record any errors that may have occurred during the experiment.

Worksheet 6: Analyze the Results.
Analyze the data that you collect, looking for patterns and trying to draw a conclusion. The data gathered may not support the original hypothesis. This happens to scientists all the time and it is a normal part of the scientific method. *The goal of a good experiment is a clear repeatable procedure and result.*

Worksheet 7: Develop a Conclusion.
Develop a conclusion that tells whether the data supports the hypothesis or not. The conclusion represents what you actually learned by conducting the experiment. Suggestions for improvement in the design of the experiment and a statement of the importance of the experiment should also be included.

Worksheet 8: Develop an Abstract
The abstract is a short description of your experiment. It should include a statement of the problem being investigated, a short description of the procedure, and a statement describing whether or not the data and observations collected supported your hypothesis. You must support your conclusions using the data and observations collected during the experiment.

Look for the *Light Bulb*!

It will tell you when it is *Your Turn* to add more information to your Scientific Investigation!

Worksheet 1: Statement of the Problem

Explanation

Here you will formulate a very specific question about the problem you wish to investigate. This statement should be written in the terms of independent and dependent variables. The problem should be stated in the form of a question.

Helpful Definitions

Variables: Conditions of the experiment that are either kept the same or changed or are the measure of the change.

Independent Variable: The variable that is changed and tested in the experiment.
Dependant Variable: The measure of change.
Constant Variables: Conditions of the experiment that are kept the same.

Example ~ Statement of Problem

Problem: Will the amount of table salt affect the boiling point temperature of water?

Independent Variable: Amount of salt added to the solution
Dependent Variable: Boiling point temperature (°C) of solution

Your Turn

Topic or problem you wish to investigate.

_____

_____

What is the independent variable for your problem? (The variable you will change)

_____

_____

What is the dependent variable for your problem? (The measure of the change)

_____

_____

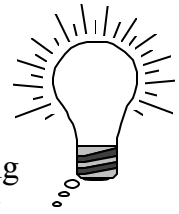
State the problem in the form of a question with your independent and dependent variables.

_____

_____

_____

<u>Worksheet 2</u>: Review of Literature and Bibliography



I. Making a List

Start by thinking about your problem. Make a list in the space below of everything that you know about your problem. Also list things that you want to learn or look up to help you in designing your investigation.

II. Locating Information

Find information about things in your list in books, magazines, Internet etc. Choose at least *<u>three sources</u>* to do your research. Write down the background information that will be helpful to you in conducting the experiment and the information will help the judge understand the project. Make sure to write bibliography information (see standard format for bibliography).

<u>1st Source Bibliography</u>:

Background Information from 1st source:

Worksheet 2 (cont.)

2nd Source Bibliography:

Background Information from 2nd source:

3rd Source Bibliography:

Background Information from 3rd source:

Worksheet 2 (cont.)

III. Bringing the Information Together ~ First Draft

On a separate sheet of paper, compile the background information from each source and rewrite in your own words your first copy of the Review of Literature. This is your first draft.

IV. Review of Literature ~ Final Draft

Have someone proofread your first draft for spelling, punctuation, grammar, etc. On a separate sheet of paper, rewrite your first draft to be part of the final written report.

Standard Format for Bibliography

Book:

Author's last name, author's first name. (Copyright date). Title of book (pages read). Place of publication: Publisher

Example: Martin, Jacqueline. (1998). Snowflake Bentley (p. 3-12). New York, N: Houghton-Mifflin Company

Magazine:

Author's last name, author's first name. (Date of publication). Title of article. Title of magazine, volume number, page numbers of article.

Example: Hembrock, Tony. (2003). Stay Out! Stay Alive!. Science Scope, v24, p. 30

Newspaper

Author's last name, author's first name. (Date of publication). Title of article. Name of newspaper, Page numbers of article.

Example: Buoniconti, Sergio. (2003, April 22). Superior Studies. The Daily Mining Gazette, p. 2A.

Encyclopedia

Title of article. Name of encyclopedia, volume number. Place of publication: publisher, year of publication, page number of article.

CD-ROM Encyclopedia

Name of program, version or release number, name of supplier, address of supplier.

Internet Source

Author's last name, author's first name. Title of document. Name of organization that posted the document, Date given on the document, Web site address.

Worksheet 3: Hypothesis

Explanation

The hypothesis is an *educated guess* of how the experiment will turn out. It is your prediction of how changing the independent variable would affect the dependant variable. This statement should be written in terms of the independent and dependent variable and should use the background information gathered from conducting your review of literature to explain the reasoning behind your prediction.

Example ~ Hypothesis

Hypothesis: If the amount of salt added to water is increased, the boiling point temperature (°C) of the solution will increase. This is because the addition of salt lowers the vapor pressure of the solution requiring it to be heated to a higher temperature in order to come to a boil.

Your Turn

Write your hypothesis statement in terms of the independent and dependent variables. It should express what you believe the outcome of the experiment will be.

Worksheet 4: Designing the Experimental Procedure

Explanation

When you design an experiment you are writing a step-by-step list of what you will do to test the hypothesis. This list is called an experimental procedure. It should be written clearly and the steps should be easy enough to follow that someone else could take your paper and understand how to perform the experiment.

I. Keep Your Variables Simple

- Make sure you are only using one independent and one dependent variable in your experiment. If you are changing more than one variable, you will not be able to know for sure which variable was causing the results you recorded. All other factors involved in the experiment should not change. The factors that do not change are your constant variables.
- Determine in what increment you are going to change the independent variable.
- Determine how you are going to measure the change in the dependent variable.
- Make sure that appropriate units are used.

Example ~ Variables

Independent Variable	(Amount of salt added to the solution) will be increased by 1 Tablespoon
Dependent Variable	(Boiling point temperature of solution) will be measured in °C using a thermometer
Constant Variables	(Amount of water, pot and stove used in the experiment, use of distilled water each time and the thermometer used)

Your Turn

In what increment will your independent variable change? Give units and the device to measure.

_____

How will you measure the change in your dependent variable? Give units and the device to measure. _____

What are the constant variables in your experiment?

_____

_____

_____

Worksheet 4 (cont.)

II. Control

Each experiment needs a "control" for comparison so that you can see how changing the independent variable affects your results and observations. The control is a standard to test your experimental results against. It will be set up exactly the same as all the other trials, but you will do nothing with the independent variable.

Example ~ Control

Control: The control is the boiling point temperature in °C of the solution without any salt added to it. This solution should contain only water.

Your Turn

What will the control be for your experiment?

_____

_____

III. List of Materials

List all materials and equipment you will need for this experiment. Make sure to specify the amount of each material that you will need.

Example ~ List of Materials

- Table Salt (1lb)
- Distilled water (4 gallons)
- Cooking pot (2 qt. size)
- Measuring Cup (1 cup size)
- Measuring Spoon (1T)
- Celsius Thermometer (0-150 °C)
- Stirring Spoon

Your Turn

Write out the materials list for your experiment.

Worksheet 4 (cont.)

IV. Step-by-Step Procedure

- Instructions should be written in clear, easy-to-follow steps.
- Describe how your control will be measured.
- Describe in detail how the independent variable will be changed and how the dependent variable will be measured.
- At least 3 trials of the experiment should be performed. The procedure that you wrote will be followed for each trial. The control should be measured in each trial.
- It is a good idea to have someone else read your procedure to be sure it is easy to follow!

Example ~ Experimental Procedure

Step 1: To measure the control, bring 4c of distilled water to a boil on the stove. Measure the temperature in °C of the boiling water. Record the highest temperature reading in the data table.

Step 2: Measure out 1T of table salt using the measuring spoon. Record the amount of salt with units in the data table.

Step 3: Add the measured salt to 4c of distilled water, stir, and bring to a boil. Measure the temperature in °C of the boiling water. Record the highest temperature reading with units in the data table.

Step 4: Repeat the procedure twice more for Trial 2 and Trial 3.

Step 5: Repeat the entire procedure using 2T, 3T, and 4T of salt.

Your Turn

Write out the step-by-step procedure to measure your control.

Worksheet 4 (cont.)

Write out the step-by-step procedure to describe how your independent variable is changed and how your dependent variable is measured. Make sure that it is clear and easy to understand. You may want to have someone else read it to be sure it is easy to follow.

Worksheet 5
Conducting the Experiment & Keeping Records

Explanation

In this section you will design a data table to help you to record the data you will measure in the experiment. You will also learn about making observations during your experiment. Collecting data and observations is very important. They will be valuable in helping you to draw a conclusion and locate any experimental errors. Below is a list of things to remember when conducting the experiment and collecting data and observations.

- Conduct at least 3 trials of your experimental procedure.
- Record all measurements in data table.
- Use the same units when recording data.
- Use the same materials and procedure for each trial.
- Use the same measuring device to record the changes.
- Record all observations during the experiment, things that happen, problems encountered and errors made.

Example ~ Data Table and Observations

Data Table

Independent Variable **Amt. of salt (T)**	Dependant Variable **Boiling Temperature (°C) of Solution**			**Average Temperature (°C)**
	Trial 1	**Trial 2**	**Trial 3**	
0 T (Control)	100	101	99	100
1T	101	103	102	102
2T	104	104	103	104
3T	105	106	106	106
4T	109	107	108	108

Observations

When the salt was added to distilled water it took longer for the water to reach a boil compared to the control. The water with salt in it also boiled more vigorously than the control. If the bulb of the thermometer rested on the bottom of the pot, it read a higher temperature. Heat from the stove burner makes the thermometer read higher.
In trial 2, we spilled some of the 1T. of salt before adding it to the water.

Worksheet 5 (cont.)

Your Turn

Use the data sheet below to record your data. The calculation of the average will be done in Worksheet 6.

Data Table

Independent Variable _____	Dependant Variable _____			Average
	Trial 1	**Trial 2**	**Trial 3**	
Control				

Record your observations in the space below while you are conducting the experimental trials. Make sure to include any problems your have or mistakes you make.

Observations

Worksheet 6: Analyzing the Results

Explanation

After all of the data has been collected, it should be analyzed so that a pattern can be noticed and a conclusion formulated. Using your data and observations from Worksheet 5, complete the following:

I. Averages

Using your data from Worksheet 5, calculate the average value for each dependent value. Record the averages in your data table. Show your work below or on a separate piece of paper.

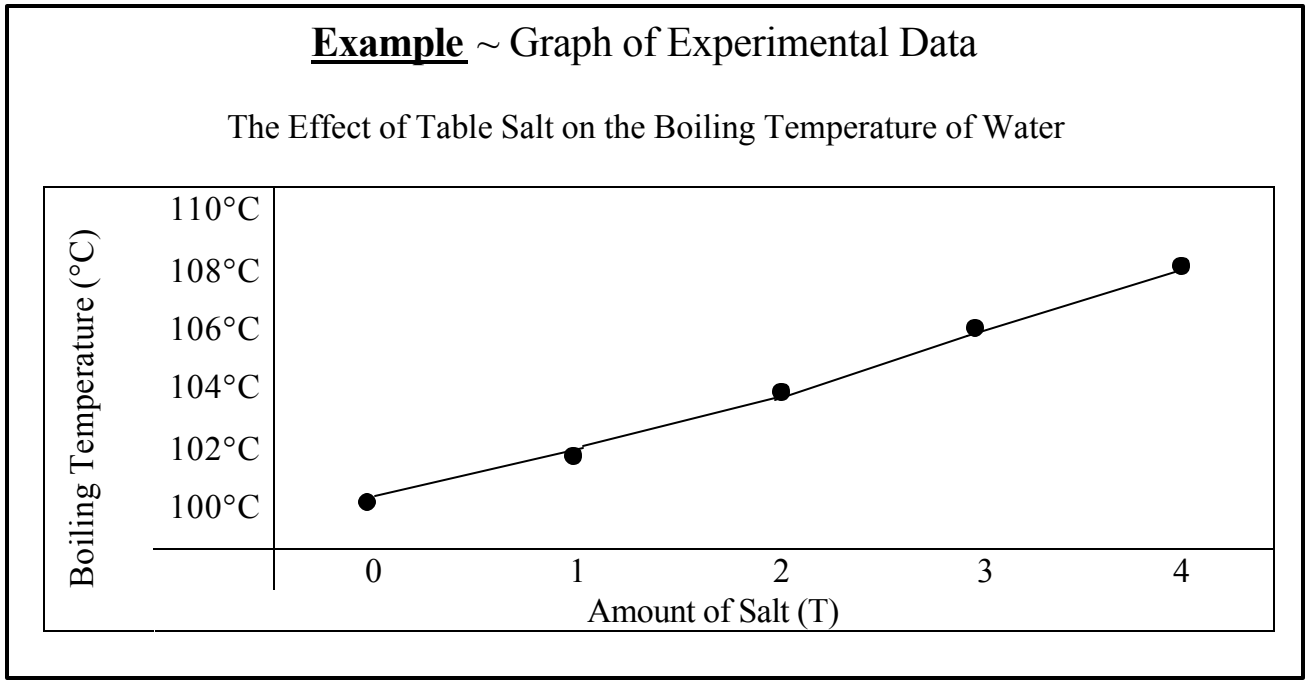
II. Calculations

Perform any other mathematical calculations on your data using the average values that were calculated. Show your work on a separate piece of paper.

III. Graph

Design a graph(s) for your data on a separate sheet of graph paper. Remember to choose the correct type of graph to display your data! Some possibilities include: a bar graph, line graph, or pie graph. Make sure to label horizontal (x) axis and vertical (y) axis. Don't forget units and a title for your graph! Here is an example graph.

Example ~ Graph of Experimental Data



Worksheet 7: Developing a Conclusion

Explanation

Using your data, graph(s), and observations you will develop a conclusion that addresses the hypothesis. You will use your data and observations to help explain your reasons. The conclusion represents what you actually learned by conducting the experiment. It should include a statement describing the importance of the experiment, as well as suggestions for improvement in experimental design. Here is an example conclusion.

Example ~ Conclusion

The data shows that the boiling point temperatures of the water increased as more salt was added. When no salt was added to the water it boiled at 100°C, while the addition of 1T of salt increased the boiling temperature to 102°C. Salt was added one tablespoon at a time and the boiling point temperature was measured until when 4T of salt was added, a boiling point temperature of 108°C was observed. The data collected in this experiment supports my hypothesis, "As the amount of table salt added to water increases, the boiling temperature of the water increases." I also observed that the water with salt added takes longer to reach a boil and boiled more vigorously than water without salt in it.

This experiment is important because it relates to why we add salt to water while cooking. Many recipes ask for salt to be added to water before bringing it to a boil so the water will boil at a higher temperature and the food will cook faster.

There were some problems with my experiment. The temperature readings were hard to make because of the heat. I had to wear gloves to keep my hands from getting too hot. The heat from the stove burner gave a higher temperature if the thermometer was resting on the bottom of the pan. Next time, I would add a step to my procedure that explains how to take the temperature correctly. I would recommend holding the thermometer in the middle of the water so it is not resting on the bottom of the pan.

Your Turn

Complete the following questions to help you organize your information and develop your conclusion.

1. **Using your experimental data, graph(s), and observations, was your hypothesis correct?**

<u>Worksheet 7</u> (cont.)

2. **If yes, what data and observations support your hypothesis?**
   If no, explain what data or observations show that your hypothesis is incorrect?

3. **What problems did you encounter? What mistakes did you make?**

4. **How would you improve your procedure?**

Worksheet 7 (cont.)

5. **Why was this experiment important? Did you learn anything about what happens in the real world from conducting this experiment?**

6. **From your data and observations, what other things did you learn?**

7. **On a separate sheet of paper, re-write your conclusion in paragraph form. Look at the example if you need help. After you are finished with your first draft, have someone else read it and help you proofread it.**

Worksheet 8: Developing an Abstract

Explanation
The abstract is a short description of your experiment. It should include a statement of the problem being investigated, a short description of the procedure, and a statement describing whether or not the data and observations collected supported your hypothesis. You must support your conclusions using the data and observations collected during the experiment.

The abstract is written last, after you have completed the experiment. In your laboratory report, it should be placed before the statement of the problem as a way to give someone a preview of what you did in your experiment and what you concluded from it.

Example ~ Abstract

The purpose of this investigation was to determine if the amount of salt added to water would affect the boiling point temperature (°C) of the solution. This experiment was done by adding 1T of salt to 4 cups of water and recording the temperature at which the solution boiled. The amount of salt added to 4 cups of water was increased by 1T each time until a final amount of 4T was reached. The boiling point temperature of each solution was recorded.

The results of this experiment found that increasing the amount of salt added to water does increase the boiling point temperature of water. This finding does support my original hypothesis and can be seen by the data collected during the investigation. The boiling point temperature of the solution with 1T of salt added was 102°C, but an increase in boiling point temperature of 6°C was seen after 4T of salt were added. This data is also supported by my background research in which I learned that the addition of salt to water lowers the vapor pressure of the solution, causing it to boil at a higher temperature.

Your Turn

1. **State your hypothesis.**

2. **Give a brief description of the procedure that was followed.**

3. **Did your results support your hypothesis? Explain your answer using data, observations, and background information.**

~SAMPLE~

Will the Amount of Table Salt Affect the Boiling Point Temperature of Water?

By: Jane Doe

North Middle School
Mrs. Smith

Abstract:

The purpose of this investigation was to determine if the amount of salt added to water would affect the boiling point temperature (°C) of the solution. This experiment was done by adding 1T of salt to 4 cups of water and recording the temperature at which the solution boiled. The amount of salt added to 4 cups of water was increased by 1T each time until a final amount of 4T was reached. The boiling point temperature of each solution was recorded.

The results of this experiment found that increasing the amount of salt added to water does increase the boiling point temperature of water. This finding does support my original hypothesis and can be seen by the data collected during the investigation. The boiling point temperature of the solution with 1T of salt added was 102°C, but an increase in boiling point temperature of 6°C was seen after 4T of salt were added. This data is also supported by my background research in which I learned that the addition of salt to water lowers the vapor pressure of the solution, causing it to boil at a higher temperature.

Problem:

Will the amount of table salt affect the boiling point temperature of water?

Independent Variable:	Amount of salt added to the solution. This will be increased by one tablespoon each time.
Dependent Variable:	Boiling point temperature (°C) of solution. This will be measured in °C using a thermometer.
Constant Variables:	Amount of water, pot and stove used in the experiment, use of distilled water each time and the thermometer used.

Review of Literature:

Addition of salt to water effects at what temperature water freezes and boils. Salt water will boil at a higher temperature than pure water. A liquid will boil when the vapor pressure of the liquid equals the atmospheric pressure. Dissolving salt in water decreases the vapor pressure of the water. The more salt you dissolve, the lower the vapor pressure of the water becomes. You'll have to heat the salt and water solution to a higher temperature to get the solution's vapor pressure to equal the atmospheric pressure.

Addition of salt to icy roads will melt the ice. In pure water, the process of freezing and melting can occur at the same rate. This is known as equilibrium. Adding salt to water will disrupt this equilibrium, so melting occurs faster than freezing.

Bibliography:

Coenders, A. The Chemistry of Cooking, New York: Parthenon Publishing Group, 1992.

McGee, Harold. On Food and Cooking: The Science and Lore of the Kitchen, New York: Scribner, 1984

Senese, Fred. "Why does salt melt ice?" General Chemistry Online. October 10, 2001. Frostburg State University. October 22, 2001.
http://antoine.fsu.umd.edu/senese/101/index.shtml

Hypothesis:

If the amount of salt added to water is increased, the boiling point temperature (°C) of the solution will increase. This is because the addition of salt lowers the vapor pressure of the solution requiring it to be heated to a higher temperature in order to come to a boil.

Control:

The control is the boiling point temperature in °C of the solution without any salt added to it. This solution should contain only water.

List of Materials:

- Table Salt (1lb)
- Distilled water (4 gallons)
- Cooking pot (2 qt. size)
- Measuring Cup (1 cup size)
- Measuring Spoon (1T)
- Celsius Thermometer (0-150 °C)
- Stirring Spoon

Experimental Procedure:

Step 1: To measure the control, bring 4c of distilled water to a boil on the stove. Measure the temperature in °C of the boiling water. Record the highest temperature reading in the data table.

Step 2: Measure out 1T of table salt using the measuring spoon. Record the amount of salt with units in the data table.

Step 3: Add the measured salt to 4c of distilled water, stir, and bring to a boil. Measure the temperature in °C of the boiling water. Record the highest temperature reading with units in the data table.

Step 4: Repeat the procedure twice more for Trial 2 and Trial 3.

Step 5: Repeat the entire procedure using 2T, 3T, and 4T of salt.

Data Table:

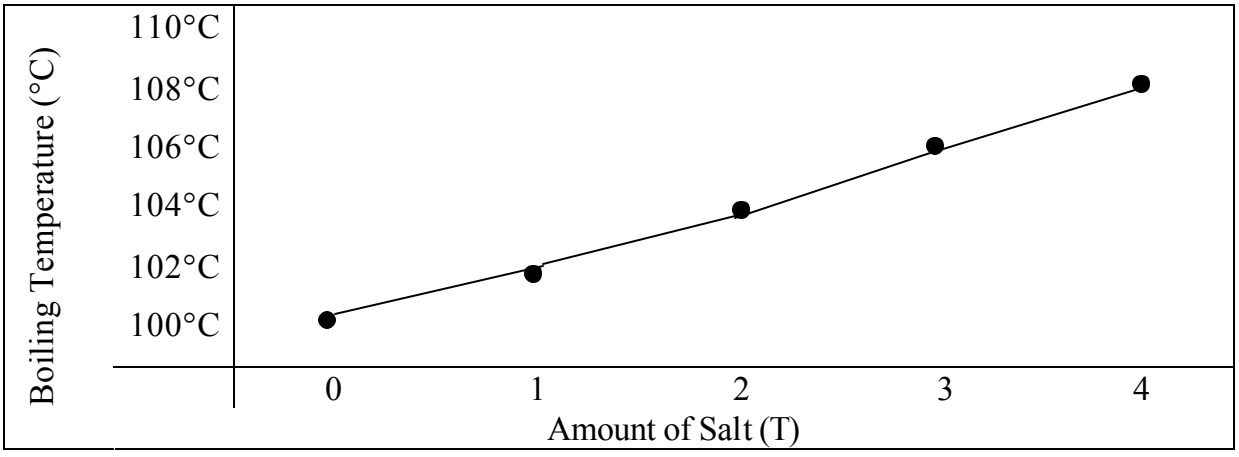
Independent Variable **Amt. of salt (T)**	Dependant Variable **Boiling Temperature (°C) of Solution**			**Average Temperature (°C)**
	Trial 1	**Trial 2**	**Trial 3**	
0 T (Control)	100	101	99	100
1T	101	103	102	102
2T	104	104	103	104
3T	105	106	106	106
4T	109	107	108	108

Observations:

When the salt was added to distilled water it took longer for the water to reach a boil compared to the control. The water with salt in it also boiled more vigorously than the control. If the bulb of the thermometer rested on the bottom of the pot, it read a higher temperature. Heat from the stove burner makes the thermometer read higher. In trial 2, we spilled some of the 1T. of salt before adding it to the water.

Graph:

The Effect of Table Salt on the Boiling Point Temperature of Water



Conclusion:

The data shows that the boiling point temperatures of the water increased as more salt was added. When no salt was added to the water it boiled at 100°C, while the addition of 1T of salt increased the boiling temperature to 102°C. Salt was added one tablespoon at a time and the boiling point temperature was measured until when 4T of salt was added, a boiling point temperature of 108°C was observed. The data collected in this experiment supports my hypothesis, "As the amount of table salt added to water increases, the boiling temperature of the water increases." I also observed that the water with salt added takes longer to reach a boil and boiled more vigorously than water without salt in it.

This experiment is important because it relates to why we add salt to water while cooking. Many recipes ask for salt to be added to water before bringing it to a boil so the water will boil at a higher temperature and the food will cook faster.

There were some problems with my experiment. The temperature readings were hard to make because of the heat. I had to wear gloves to keep my hands from getting too hot. The heat from the stove burner gave a higher temperature if the thermometer was resting on the bottom of the pan. Next time, I would add a step to my procedure that explains how to take the temperature correctly. I would recommend holding the thermometer in the middle of the water so it is not resting on the bottom of the pan.

WESTERN UPPER PENINSULA SCIENCE FAIR

Tuesday, March 30, 2004
Memorial Union Ballroom
Michigan Technological University, Houghton, MI

SCHEDULE (All times are EST)

3:30 to 4:30pm	Students set up projects
4:30 to 7:00pm	Judging of projects. Students will be scheduled for an interview with two judges during one of the time periods: 4:30-5:45pm or 5:45-7:00pm
7:15 to 8:00pm	Science Fair open to the public.
8:00 to 8:30pm	Awards Ceremony
8:30 to 9:00 pm	Removal of science fair projects by students and parents.

JUDGING OF PROJECTS

- On the day of the fair, each project will be assigned a number. The judges will refer to each project by number, so that the judges do not know the identity of the student(s).
- Two judges will score each project independently of each other. Judges will be volunteers from Michigan Technological University and other educators from the community.
- The judges will determine whether the project meets all the requirements listed in the Student Planning Guide.
- Students *should be available next to their project* during their scheduled interview time. The students' interview with each judge will be part of the total score for their project. Projects will receive a composite score from the two judges.

Parents should pick up their children after the judging time is over.

WHAT THE JUDGES WILL BE LOOKING FOR

- Does the project meet all the requirements given in the Student Planning Guide?

Scientific Thought

- Does the project have a title, problem to be investigated and hypothesis clearly stated?
- Does the project represent sincere study and effort?
- Does the project form conclusions based on the data or information gathered?
- Does the project show that the student is familiar with the topic?
- Does the project follow the scientific method?
- Is the experiment designed to test the stated hypothesis?
- Does the project illustrate controlled experimentation?

Originality

- Does the project demonstrate ideas arrived at by the student?
- Does the project show a high degree of accomplishment? Is the degree of accomplishment consistent with the student's age level?
- Is the project primarily the work of the student?

Thoroughness

- Does the project tell a complete story?
- Are all the parts of the project well done, including the visual display and the interview with the judges?

Technical Skill and Neatness

- Does the project show effort and creativity by the student?
- Are the display unit and written report clear, neat and easy to read?

2004 WESTERN UP SCIENCE FAIR CHECKLIST
~ Grades 6-9 ~

WRITTEN REPORT

____ Is there a title page that includes the problem in the form of a question, first name of student(s) and grade only.

____ Is there an abstract including hypothesis, brief description of procedure and brief description of the conclusion?

____ Is the independent variable correctly stated and relate to the problem?

____ Is the dependent variable correctly stated and measure the change of the independent variable?

____ Are the constant variables defined and relate to the problem?

____ Is the problem written in the form of question using the independent and dependent variables?

____ Is the hypothesis written as a prediction of the experimental result using the independent and dependent variables?

____ Does the background research relate to the problem and hypothesis?

____ Does the research represent a diversity of sources, at least 3 sources cited in a bibliography using the standard format ?

____ Are all the materials used in the project listed clearly?

____ Are specific amounts of each material given with appropriate units in the procedure?

____ Are the steps in the procedure listed in logical order and easy to follow?

____ Was a control used in the experiment?

____ Is the experiment designed to test the hypothesis?

____ Were two trials of the procedure conducted?

____ Were the observations and data recorded with appropriate units in a clear and concise manner?

____ Are graphs, charts or pictures used to present the results or observations?

____ Does the conclusion address the hypothesis and is it supported by observations and data?

____ Are experimental errors, problems encountered and areas of improvement in the procedure addressed in the conclusion?

____ Overall, is the written report clear, neat and easy to read?

DISPLAY (includes the exhibit materials)

____ Is the statement of the problem neat and easy to read?

____ Is the hypothesis neat and easy to read?

____ Is the procedure and materials summarized and easy to read?

____ Are the results and conclusions clearly stated and easy to read?

____ Are there photographs, charts, graphs or drawings that support the information in the project? Are they neat and attractive?

____ Does the display show original and creative work of the student?

____ Is the display of the project self explanatory and logical?

STUDENT INTERVIEW

____ Can the student explain why he/she chose the topic to research and did the student gain new knowledge from the project?

____ Can the student describe how he/she formulated the hypothesis from the research of the topic?

____ Can the student explained why he/she chose the procedure to test the hypothesis?

____ Can the student explain why he/she chose the particular graphs, pictures, etc. in their report to represent the data?

____ Can the student explain how he/she formulated the conclusion?

____ Does the student see where improvements or changes can be made?

WESTERN UPPER PENINSULA SCIENCE FAIR

Tuesday, March 30, 2004
Memorial Union Ballroom at Michigan Technological University, Houghton, MI

~ PROJECT REGISTRATION FORM ~

Deadline- Thursday, March 4, 2004

- **SUBMIT ONE FORM PER PROJECT ONLY!**
- **For group projects, be sure to give the name, complete home mailing address, phone number and signed parent consent form for *both* students.**

Student Information (please print clearly)

1. Student's Full Name _____

Home Mailing Address _____

City _____ MI Zip _____

Phone Number _____ Email _____

2. Student's Full Name _____

Home Mailing Address _____

City _____ MI Zip _____

Phone Number _____ Email _____

School Information

School _____ Grade _____

Electrical power outlet needed? ____ Yes ____ no

Teacher's Consent

Teacher's name _____

Teacher's signature _____

Return registration and parent consent forms by **Thursday, March 4, 2004** to:
Loret Roberts, Western UP Center for Science, Mathematics and Environmental Education
P.O. Box 270
Hancock, MI 49930
Fax- 906-482-5031

WESTERN UPPER PENINSULA SCIENCE FAIR

Tuesday, March 30, 2004
Memorial Union Ballroom at Michigan Technological University, Houghton, MI

~ PARENT CONSENT FORM ~

Deadline- Thursday, March 4, 2004

I give my consent for _____to participate in the Western UP Science Fair on Tuesday, March 30, 2004 at Michigan Technological University. I will make sure that their science fair project will be transported to MTU Memorial Union Ballroom on the day of the fair for set up between 3:30 and 4:30pm EST. I will join my child at 7:00pm EST after the judging is complete. I will also make sure that my child's project is removed by 8:30 pm EST from the MTU Memorial Union Ballroom. My child will follow all of the general rules in the Student Planning Guide.

Parent's name_____

Parent's signature _____ Date _____

Return registration and parent consent forms by **Thursday, March 4, 2004** to:

Loret Roberts, Western UP Center for Science, Mathematics and Environmental Education
P.O. Box 270
Hancock, MI 49930
Fax- 906-482-5031