***Science Fair: Idea Development and Research Plan (Due: Oct 22, 2012)***

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Question ideas:** *Brainstorm* 3 possible questions that might be answered through experimentation: e.g. *“What is the most effective way to bake bread in a solar cooker?”*

From the list of question ideas you generated above, **select one question** that you want to develop further. **Circle** that question.

**Variables (factors) that might influence the question being studied:** Refer to the question you circled above. *Brainstorm* as many factors as you can that might be explored in your investigation of the question. e.g. *“Shape of the cooker”, “roughness/smoothness of the surface”, “Size of the cooker”, “Type of bread being baked”, “time of day”, “brightness of the sun”,* etc, etc, etc.

In a single investigation or experiment, the effect of only one factor (**variable**) should be studied at a time. All other factors must be **controlled** (kept constant). From the list of variables you generated in the previous section **select and circle one variable** to investigate in relation to your research question.

***Independent* and *Dependent* Variables**

(summarized from: <http://nces.ed.gov/nceskids/help/user_guide/graph/variables.asp> )

An **independent variable** is a variable that isn't changed by the other variables you are trying to measure. For example, someone's age might be an independent variable. Other factors (such as what they eat, how much they go to school, how much television they watch) aren't going to change a person's age. In fact, when you are looking for some kind of relationship between variables you are trying to see if the independent variable causes some kind of change in the other variables, or dependent variables.

A **dependent variable** is something that depends on other factors. For example, a test score could be a dependent variable because it could change depending on several factors such as how much you studied, how much sleep you got the night before you took the test, or even how hungry you were when you took it. Usually when you are looking for a relationship between two things you are trying to find out what makes the dependent variable change the way it does.

Many people have trouble remembering which is the **independent variable** and which is the **dependent variable**. An easy way to remember is to insert the names of the two variables you are using in this sentence in they way that makes the most sense. Then you can figure out which is the independent variable and which is the dependent variable:

***“(Independent variable)*** *causes a change in* ***(Dependent Variable)*** *and it isn't possible that* ***(Dependent Variable)*** *could cause a change in* ***(Independent Variable)”.***

***For example: “****(Time Spent Studying) causes a change in (Test Score) and it isn't possible that (Test Score) could cause a change in (Time Spent Studying)”.*

We see that "Time Spent Studying" must be the independent variable and "Test Score" must be the dependent variable because the sentence doesn't make sense the other way around.

In the **solar cooker example,** the first variable under consideration is derived from the research question itself. The research question makes clear that we are concerned specifically with *bread baking*, rather than other possible questions about solar cookers, such *cost effectiveness*, or *convenience of use*. Since baking bread requires that a specific oven temperature be maintained over a period of time, ***sustained*** ***oven temperature*** is the ***dependent variable*** in this investigation. A possible ***independent variable*** that the researcher might choose to investigate is the ***colour of the reflecting surface*** of the solar cooker.

In the experiment, only the colour of the reflecting surface should be varied and tested against oven temperature. All other factors must be maintained as constants (e.g. shape of the cooker, brightness of heat source/sun, location within the cooker where the thermometer is placed, etc, etc). In this way, the researcher will be able to determine whether or not the oven temperature depends on the colour of the reflecting surface.

**Research Plan for Your Science Fair: Controlled Experiment**

1. In one or two sentences, state your ***Research Question***:

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1. What is the ***Dependent Variable*** in your investigation?

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C) What is the ***Independent Variable*** in your investigation?

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D) List the variables (factors) that you need to keep **constant**:

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E) **Hypothesis:** What do you think the results might be? Explain your reasons (why do you think the results might turn out this way?)

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F) **Measurement and Observations:**

***Quantitative Observations:*** What quantities will you measure, in order to explore your **research question** in relation to the **variable** circled in the previous section?

***Qualitative Observations:*** What **other observations** will you make?

***What equipment*** will you need?

G) How will you ***represent your data***? (data tables, charts, graphs, diagrams, photos, etc etc etc)

H) ***Risk Factors:***

|  |  |
| --- | --- |
| List the risks and safety considerations associated with your experiment | Explain how you will minimize the risks and potential safety hazards |
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G) How will you ***set up the experiment*** in order to ensure that your results are consistent and accurate?

Draw a diagram of your experimental set-up: