Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Blk: \_\_

**Design Lab**

**Scenario – Earthquake Building Design**

**How earthquake-proof is a design?**

You will design a lab to determine if a particular change in the construction of a structure will change the resistance to shaking from an earthquake.

**Brainstorm**: What are some things you can change about the construction of your structure?

**Consider**: You need to be able to clearly and simply explain the **one change** you will alter in your structure design. Do you already know the answer to any of your ideas?

**Criterion B and C – Experimental Design and Analysis**

*(Filling out this package will only get you to a 3-4 level. Rewrite your work on other paper with more space for level 5-6 and higher!)*

1. **Describe the problem or question your experiment is trying to answer.**
2. **What is your experimental design organization?**

-Before writing your hypothesis, you must **describe** how you will manipulate your variables, and **describe** how **sufficient, relevant** data will be collected.

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| **INDEPENDENT VARIABLE**  What ONE thing you are changing (manipulating) in different groups. | My independent variable is: | How many trials?  How many groups? |
| **DEPENDENT VARIABLE**  What you are measuring. | My dependent variable is: | How I will measure this:  (What will you record as data? What units?) |
| **CONTROL VARIABLES**  What conditions you are keeping the **same** between all groups, to ensure a fair test. | My control variables are: | |

1. **Hypothesis**
   * This is often referred to as an “educated guess” or prediction, but it must be testable (which it will be if you include your independent and dependent variables!)
   * Follows the “If… then… because…” format.
   * If you need to do research to answer the “because” section, don’t forget to use proper in-text citation and add the source to your reference list in an APA reference page.
2. **Materials list**

-Make a detailed list of all materials you need for your experiment. Include amounts.

1. **Experiment set-up**

-Make a diagram of the apparatus you will be using to carry out your experiment. Label all parts.

1. **Procedure**

-This is a step-by-step NUMBERED list detailing exactly what someone needs to do to perform the exact same experiment as you. Remember that strong experiment design includes multiple trials in each group *(eg. There are 5 plants* (trials) *in each different soil type* (groups)*)*

*-* Include **safety** and **ethical** considerations in your procedure.

1. **Data collection**

-Quantitative: Design a **table** in which to collect your experimental data (include your independent variable on the side and your dependent variable on top.)

-Qualitative: take notes on what you are doing and what is observed. These notes can help you recall the experiment when you answer discussion question afterward.

1. **Create a graph showing the results of your experiment. Use graph paper.**

* Use pencil to correct any errors.
* Independent variable is on the X-AXIS
* Dependent variable is on the Y-AXIS
* Your graph needs a title.

1. **Results**

-**Summarize** your data (use numbers!) and then **explain** your results.

1. **Restate** your hypothesis and **describe** if your hypothesis is **supported** or **not supported** by your results.

Use specific data from your experiment as evidence to **explain** why.

1. **Discussion question:** **Evaluate** the validity of your procedure based on the outcome of the experiment. Discuss any errors or problems in your design procedure and make suggestions for how they can be fixed.
2. **Discussion question**: **Explain** improvements you would make to your procedure.
3. **Discussion question:** **Explain** extensions you make to your experiment. What other experiment can you suggest to investigate your problem?
4. **Communicate results**

-Share the results of your experiment with other people in your class. How did your findings compare to those of other students?

**Assessment Rubric**

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| --- | --- |
| **Level** | **Level descriptor Criterion B: Inquiring and designing** |
| 0 | The student does not reach a standard described by any of the descriptors below. |
| 1-2 | * **state** a problem or question to be tested by a scientific investigation, with **limited success** * **state** a testable hypothesis * **state** the variables * design a **method, with limited success** |
| 3-4 | * **state** a problem or question to be tested by a scientific investigation * **outline** a testable hypothesis **using scientific reasoning** * **outline** how to manipulate the variables, and **state** how **relevant data** will be collected * design a **safe method** in which he or she **selects materials and equipment** |
| 5-6 | * **outline** a problem or question to be tested by a scientific investigation * **outline** and **explain** a testable hypothesis **using scientific reasoning** * **outline** how to manipulate the variables, and **outline** how **sufficient, relevant data** will be collected * design a **complete and safe method** in which he or she **selects appropriate materials and equipment** |
| 7-8 | * **describe** a problem or question to be tested by a scientific investigation * **outline** and **explain** a testable hypothesis **using correct scientific reasoning** * **describe** how to manipulate the variables, and **describe** how **sufficient, relevant data** will be collected * design a **logical, complete and safe method** in which he or she **selects appropriate materials and equipment** |

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| --- | --- |
| **Level** | **Level descriptor Criterion C: Processing and evaluating** |
| 0 | The student does not reach a standard described by any of the descriptors below. |
| 1-2 | * **collect and present** data in numerical and/or visual forms * **accurately interpret** data * **state** the validity of a hypothesis **with limited reference** to a scientific investigation * **state** the validity of the method **with limited reference** to a scientific investigation * **state limited** improvements or extensions to the method. |
| 3-4 | * **correctly collect and present** data in numerical and/or visual forms * **accurately interpret** data and **describe** results * **state** the validity of a hypothesis based on the outcome of a scientific investigation * **state** the validity of the method based on the outcome of a scientific investigation * **state** improvements or extensions to the method that would benefit the scientific investigation. |
| 5-6 | * **correctly collect, organize and present** data in numerical and/or visual forms * **accurately interpret** data and **describe** results **using scientific reasoning** * **outline** the validity of a hypothesis based on the outcome of a scientific investigation * **outline** the validity of the method based on the outcome of a scientific investigation * **outline** improvements or extensions to the method that would benefit the scientific investigation. |
| 7-8 | * **correctly collect, organize, transform and present** data in numerical and/ or visual forms * **accurately interpret data** and **describe** results **using correct scientific reasoning** * **discuss** the validity of a hypothesis based on the outcome of a scientific investigation * **discuss** the validity of the method based on the outcome of a scientific investigation * **describe** improvements or extensions to the method that would benefit the scientific investigation. |