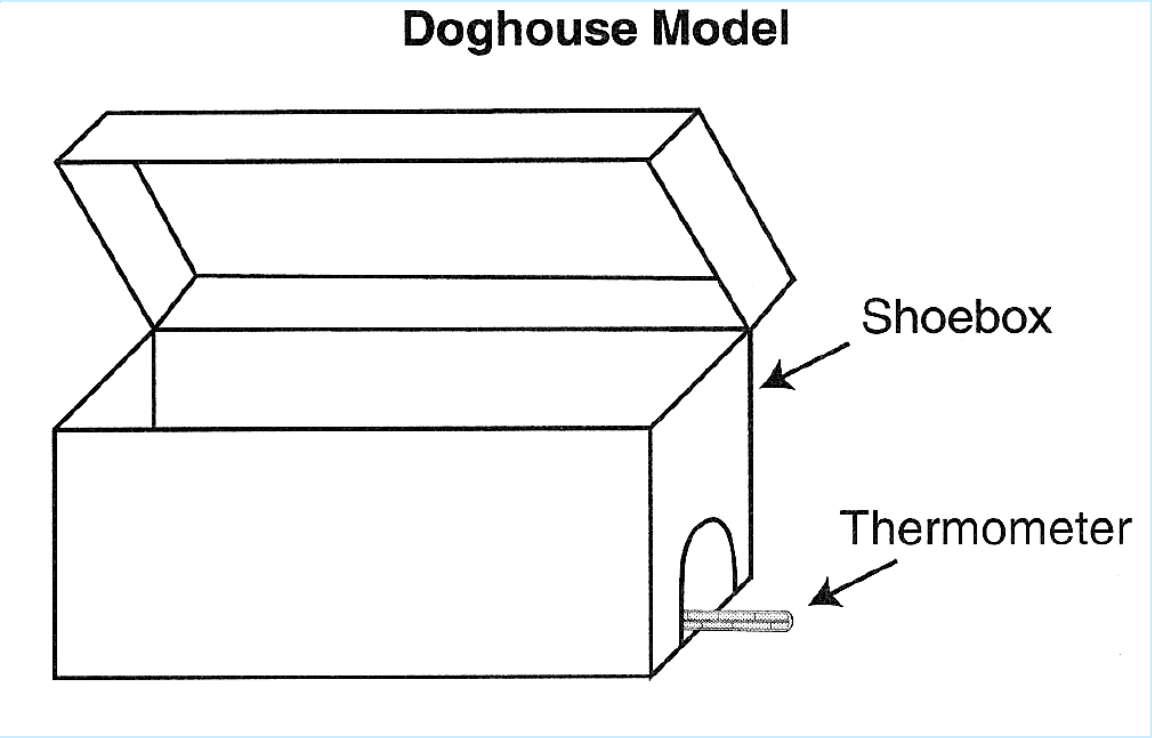
In the Dog House

MSP Preparation

4 Point Response

- Paul and Dalia live in eastern Washington. They want to build a new doghouse for their dog, Fido, that will keep him warm in the winter. They built a model of their doghouse using a shoebox as shown in the diagram below.

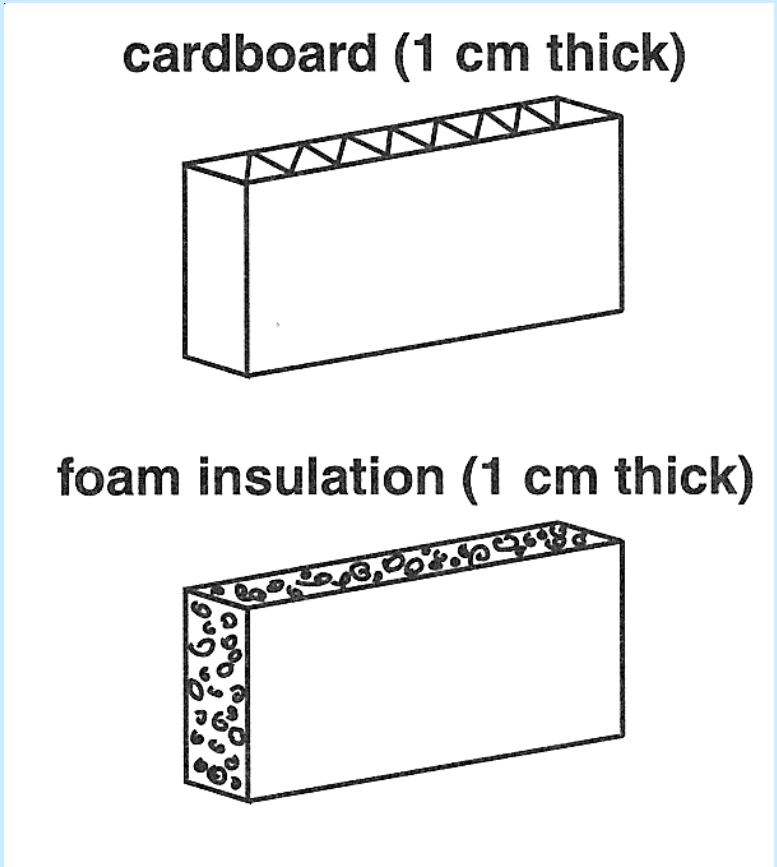


Paul and Dalia conducted the following investigation using their doghouse model.

- **Question:** How does insulating the walls and ceiling of a doghouse model with different materials affect the inside temperature of the doghouse model?
- **Hypothesis (prediction):**The inside temperature of the doghouse model will be warmest when insulated with foam insulation. The reason for our prediction is foam insulation is used when building houses for people.

Materials

- doghouse model
- timer
- thermometer
- freezer
- insulating materials
  - cardboard
  - foam insulation



Procedure:

- **1.** Measure the inside temperature of the doghouse model and record as “Before” temperature.
- **2.** Place the doghouse model in the freezer.
- **3.** After five minutes in the freezer, measure the inside temperature of the doghouse model and record as “After” temperature.

Procedure continued

- **4.** Remove the doghouse model from the freezer and let the model return to room temperature.
- **5.** Insulate the inside walls and ceiling of the doghouse model with cardboard insulation, then repeat steps 2, 3, and 4.
- **6.** Repeat step 5 using foam insulation.
- **7.** Starting at Step 1, repeat the entire investigation twice for Trials 2 and 3.

Data

Insulation vs. Inside Temperature

Insulation	Inside Temperature (℃)					
	Before Trials			After Trials		
	1	2	3	1	2	3
None	22	21	21	4	3	4
Cardboard	22	21	22	13	12	12
Foam	21	22	22	11	11	10

- Dalia wondered if a large, well-insulated doghouse would stay warmer in winter than a small one. She asked, “How does the size of a well-insulated doghouse model affect the inside temperature of the doghouse model?” Plan an investigation to answer Dalia’s question.

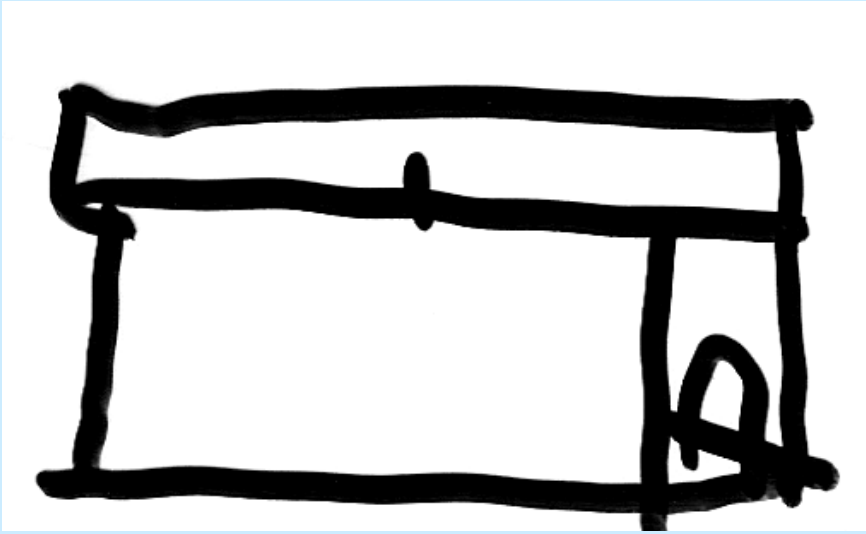
Question: How does the size of a well-insulated doghouse model affect the inside temperature of the doghouse model?
Design your investigation now. Include the following:

- **Hypothesis**
- **Materials**
- **Procedure**
  - **logical steps to do the investigation**
  - **one controlled (kept the same) variable**
  - **one manipulated (changed) variable**
  - **one responding (dependent) variable**
  - **how often measurements should be taken and recorded.**

Answers appear next

0 Point Response

- **Hypothesis (prediction)**: *The bigger it is the colder it would get*
- **Materials:** *large shoe box, foam, thermometer, ice*
- **Procedure:** *Put ice around the box then put it in the freezer, the ice will be like snow + the freezer*
- *Will be like the cold air*



0 point response because:

- The hypothesis should be stated in the "IF…THEN…BECAUSE…" format (the BECAUSE is missing)
- No freezer on materials list
- Procedure is vague, not nearly enough detail given to replicate the investigation
- No logical steps
- Variables are not identified
- No data recorded
- Not repeated for 3 trials

1 Point Response

- **Hypothesis (prediction)**: *I think the bigger the better for a well-insulated doghouse model because It traps more heat inside.*
- **Materials:** *Doghouse models (big) (small) w/insulation , thermometer, timer*
- **Procedure:** *1) Place a thermometer in the big doghouse model. 2) Put the model in the freezer. 3.) Set time for 4 hours. 4.) Repeat steps 1-3 for small doghouse model.*

1 point response because:

- "*the bigger the better"* doesn't say anything about the inside temperature
- The reason for the prediction is good
- No freezer on the materials list
- Control and manipulated variables are identified, but not the responding variable- nothing is measured
- Nothing is recorded
- There is only one trial
- Since nothing is recorded, the steps are not logical

2 Point Response

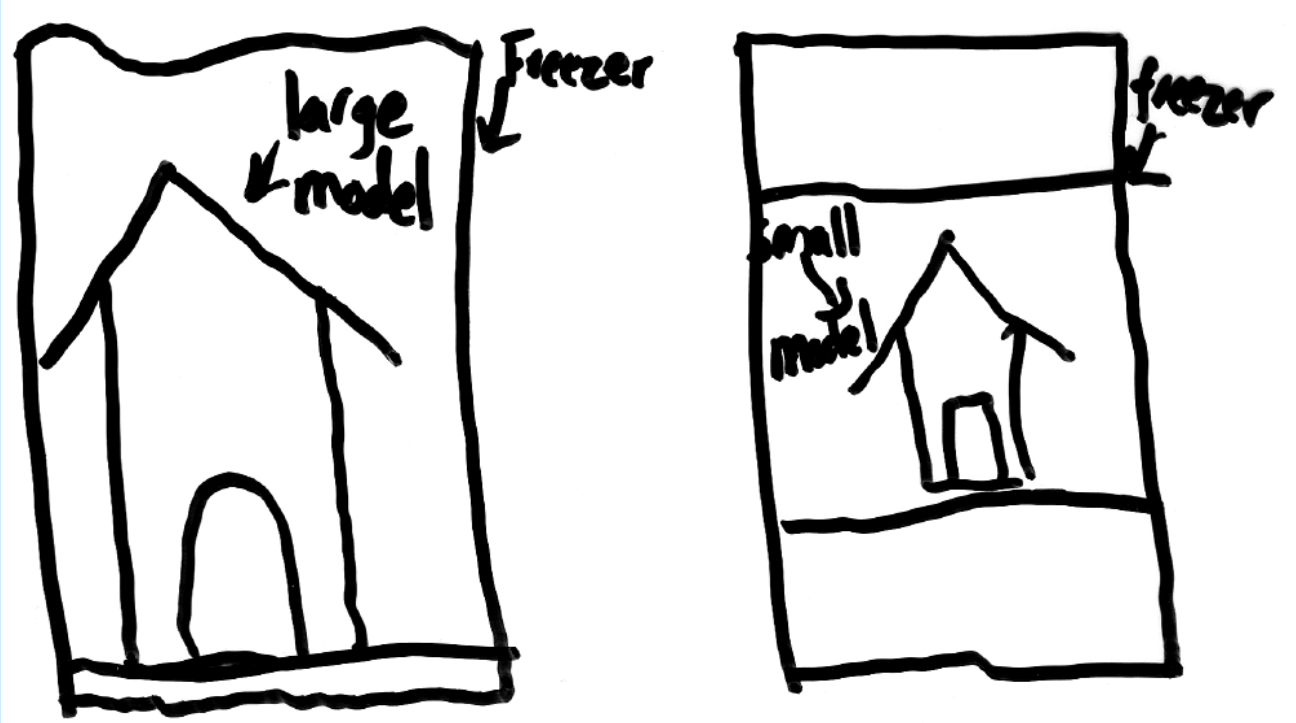
- **Hypothesis (prediction)**: *I think it would effect the dog house.*
- **Materials:** *1 dog house (small), 1 thermometer, 1 dog house (large), 1 lamp, ice cubes (about 10)*
- **Procedure:** *1.) with the small dog house, place a lamp over it and put a thermometer in it (do the same with the large one). 2.) Record temperature 3.) Place the large and small dog house on ice. 4.) Follow step 2.*

2 point response because:

- No specific prediction or reason (BECAUSE...) for the prediction given
- No timer on the materials list
- All variables are present
- Data is recorded
- Only one trial
- Steps are too vague to repeat. No times are given.

3 Point Response

- **Hypothesis (prediction)**: *I think the less space in a doghouse the warmer it will stay.*
- **Materials:** *Small doghouse model, large doghouse model, timer, thermometer in ˚f, freezer,*



3 Point Response continued

- **Procedure:** ***Build both doghouse models constructed of the same material, record temperature before placing in freezer, place in freezer for 20 minutes, record temperature after taking out of freezer. Repeat 3 times. – controlled variable – temp in freezer - manipulated variable – The temp before being placed in freezer. – responding variable – Temp of doghouse after taken out of freezer.***

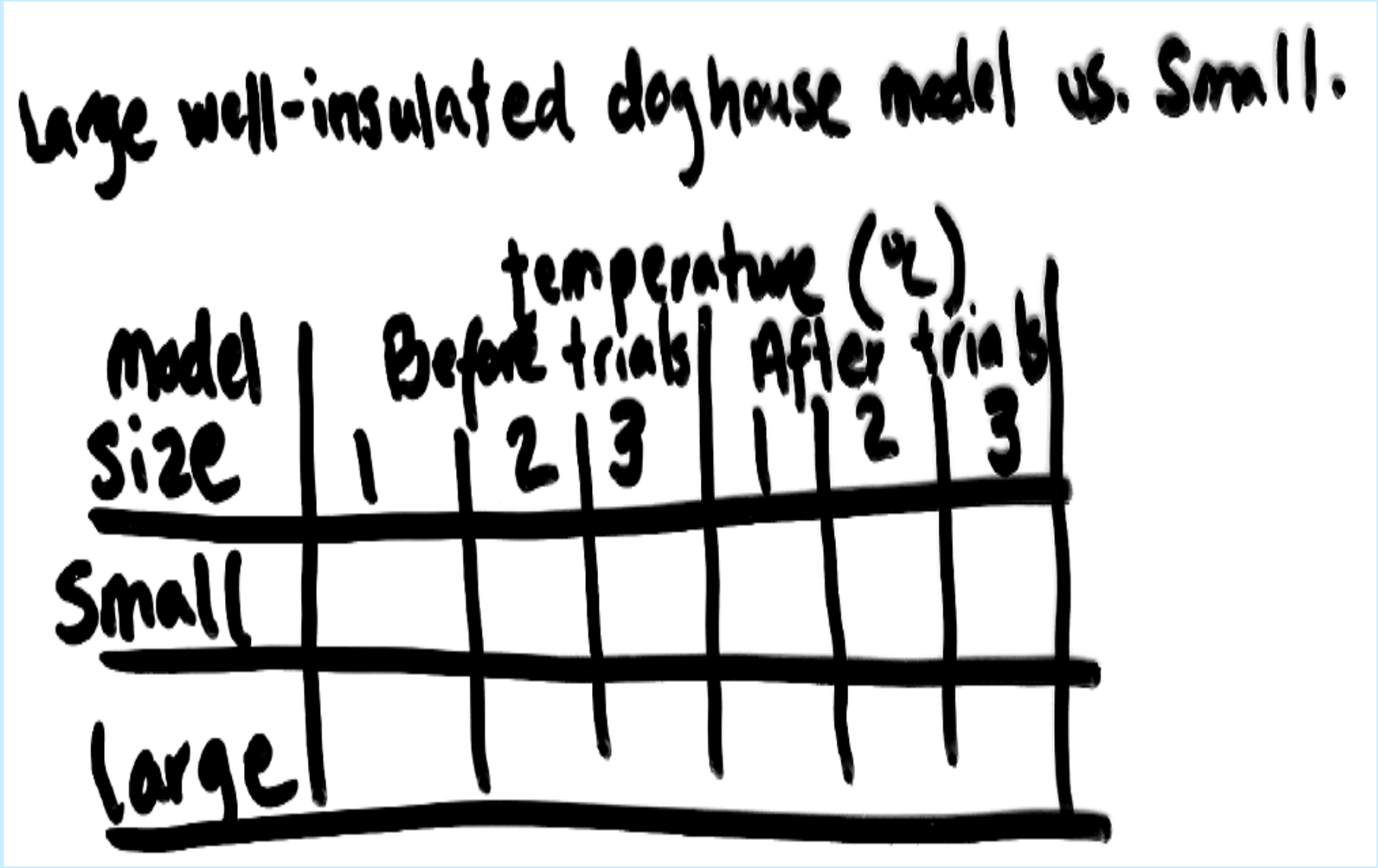
3 point response because:

- Good prediction, but missing the reason for the prediction (BECAUSE…)
- Minimum required materials are listed
- Controlled and responding variables identified
- Manipulated variable not identified
- Data is recorded
- Steps are logical
- Trials are repeated

4 Point Response

- **Hypothesis (prediction)**: *the inside temperature of a large, well-insulated doghouse would stay warmer in the winter than the small one. the reason for my prediction is because the larger Doghouse has larger walls, therefore having more insulation to trap the heat.*
- **Materials:** *large doghouse model (1), small doghouse model (1), timer (1), freezer, thermometer (1), foam insulation*

4 point response continued:



4 point response continued:

- **Procedure:** *1. Insulate the walls and ceiling of the small doghouse model with foam insulation. Repeat with large doghouse model. 2. Measure the inside temperature of the small and large doghouse model and record as the "Before" temperature. 3. Place the doghouse models into the freezer. 4. Use timer to time, after 5 minutes in the freezer, measure the inside temperature of both doghouse models and record as "After" temperature. 5. Starting with step 1, repeat the entire investigation two more times, recording the results each time. 6. Clean up.*

4 point response because:

- Prediction is well stated, including reason
- All materials are listed
- All variables are identified
- Data is measured and recorded
- Three trials- “repeat two more times”
- Steps are logical and can be followed