

Heat: An Agent of Change

Survival!

STUDENT ACTIVITY

Name _____



The story of those three little pigs and that big, bad wolf reminds us that trade-offs are unavoidable in construction. Piggies wanting to create a house in the shortest time used less durable materials. The third little pig, whose house cost more in money and time, was able to survive the wolf's huffing and puffing. Whether it's cost vs. availability or construction time vs. durability, we must consider and evaluate many options and combinations of options in designing structures. The more knowledge we have, the more options we have.



Use the knowledge you have gained about heat movement through various materials to complete this final activity.

PROBLEM
How can our Design Team plan and build a container to keep material at a constant temperature for a predetermined time?

PROCEDURE

1. Your Product Design Team (PDT) contains members of different lab teams. This way you will be able to compare information about different materials gained by different teams during the "Activities with Insulators and Conductors." Your PDT will keep a designer's notebook. Your teacher will give you further instructions about this notebook.
2. Your teacher will give you the specifications of the material which must be kept at constant temperature, and the specific measurements for maximum external dimensions and maximum mass of your container. Any materials may be utilized and any structural design is permitted, as long as safety precautions and the stated limits on structural dimensions and mass are observed. The container must be a closed system; no additional energy may be added to or taken away from the system after the container is closed.
3. A **prototype** is the first product sample made, often with a specialized production process. It serves as a model for producing other copies, and for judging their quality. With other members of the PDT, discuss the possible materials that could be used to construct your prototype container. Collect the material you need. Construct your container.
4. In your laboratory notebook, record a summary of all decisions made by the PDT. Provide justifications for all decisions. List problems solved by the PDT.

5. Test the design of your container. Make modifications as necessary to your original design. Record all information in your laboratory notebook.
6. On the appointed day, your PDT's container will be tested and compared to the containers produced by all the other teams in your class. The container will be considered successful if the material contained in it is not at room temperature. The container that keeps its contents closest to the starting temperature will be considered the most successful.

CONCLUSION

With your PDT, discuss the risks and benefits of creating multiple copies of the product your group designed. Who would benefit from this design and who would suffer? How would this new product influence the quality of life of its intended audience? Write your conclusions as a report titled "Risk-Benefit Analysis" in your PDT's Designer's Notebook.

Design a method for communicating to the audience designated by your teacher. Your communication should include an accurate description of your PDT's container, the results of your tests of its efficiency, and your conclusions about its usefulness. You will need to think about what information this audience wants, the method for communicating with the audience, and how your messages will best be delivered.