

HEAT TRANSFER BY CONDUCTION, CONVECTION, AND RADIATION

WebQuest Description: A WebQuest to explore three ways that heat is brought to equalization.

Grade Level: 9-12

Curriculum: Science

Keywords: conduction, conductors, insulators, convection, radiation, radiant energy

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WebQuest URL: <http://zunal.com/webquest.php?w=114844>

Introduction

Have you ever touched something hot and been burned? Or have you touched a metal object and a nonmetal object at the same temperature and noticed that the metallic object appeared much cooler to the touch? Have you ever seen a lava lamp and wondered what made the fluids contained within it to move? Or wondered why your car gets hotter on the inside than the temperature outside on a sunny day? All of these processes deal with the transfer of thermal energy through conduction, convection, or radiation. These processes can have an effect on you as an individual and can impact societies on a global scale.

Tasks

After completing this lesson and WebQuest students will be able to do the following:

Compare and contrast thermal energy transfer by method of radiation, convection, and conduction

Explain how each of the three processes function

Relate how insulators can be used to help reduce heat transfer rates from one place to another

Process

Read ALL of the following directions before beginning your WebQuest.

You will be organized into groups of three students to explore the information contained online.

View both of the videos in the resource section and spend some time discussing the experiments that you viewed within the group.

Open the Websites (#1-5) and read all information. Spend time with any interactives and make sure you understand the principles involved with thermal energy.

Once again, after viewing each of the websites discuss what you saw with the group.

Were any of you surprised by the experiments or understand the processes that transpired?

Website #2 may be of importance for the extension activity in the Conclusion section of the WebQuest so you may need to reference back to it before completing the Extension assignment.

Before starting the experiment for Website #5 discuss within the group what you expect to happen and why with the group then run the simulation.

Were your predictions correct? Why or why not?

Open the Worksheets (#1-4) and answer each of the questions on a separate piece of notebook paper for each worksheet.

You may discuss your responses in groups but make sure that each individual student records his/her own answers to turn in.

Evaluation

Each student will be assigned a grade for their own individual work which will involve group contribution. The following rubric will be used to assess individual grading.

Category and Score	Poor	Average	Good	Excellent	Score
Group participation and cooperation	No group contribution and/or stays off task	Contributes to group somewhat but must be reminded to stay on task	Contributes to group well and focuses on task	Actively involved with group and participation in all aspects	30%

Category and Score	Poor	Average	Good	Excellent	Score
Assignment/Worksheet completion	Doesn't view websites and/or has less than 50% completion of worksheets	Views some websites and/or has up to 75% of worksheets completed accurately	Views all websites and has up to 90% of worksheets completed accurately	All websites viewed and above 90% accurate on worksheets	35%
Concept understanding	No understanding of material/ cannot explain concepts	Shows some understanding of material and can explain some conceptual info	Shows understanding and can explain concepts	Shows detailed understanding and can explain concepts in great detail	35%
				Total Score	100%

Conclusion

Now that you have completed your research and assignments you all should have an understanding of the following:

- Conduction is the transfer of thermal energy by collisions between more energetic and less energetic particles.
- Conduction occurs in solids, liquids, and gases.
- Metals are the best conductors of heat.
- Convection is the transfer of thermal energy by the movement of warmer and cooler material.
- Convection occurs in fluids. Rising of warmer fluid and sinking of cooler fluid forms a convection current.
- Radiation is the transfer of energy by electromagnetic waves.
- Insulators are used to reduce the rate of heat transfer from one place to another.

For an extension assignment go to the website below titled Science-class.net Earth process

1. Read the introductory material
2. Work in groups of 3 to perform the experiment
3. Answer the questions following the experiment on notebook paper (NOTE: each student must turn in their own answer sheet but it would be alright to discuss answer responses and reasoning behind the answers within the group!)

Why is it important to understand heat transfer? The transfer of heat is an important part of the world around us. It can affect us as individuals and has a tremendous impact on our Earth. Climate is driven by heat transfer as well as plate tectonics, both of which play a great role in our evolution and further existence here on Earth.

Teacher Page

Target learners: 9th grade Subject Area: Physical Science Tennessee Curriculum Standards: CLE 3204.2.2: Explore pathways of energy transfer. CLE 3202.2.3: Examine the applications and effects of heat energy.

Standards

Credits

Other