

Experts' Mental Model of the Greenhouse Effect

You are receiving this assignment because you are an expert in climate science, climate literacy or climate education. We are studying the most effective strategies to teaching students the concept of the greenhouse effect. We would like to understand what experts' mental models are of the greenhouse effect to define a baseline of what students need to know about the greenhouse effect. We ask you to take 10-15 min to draw a concept sketch (instructions below) of the **Greenhouse Effect**. Please do NOT look up details even if you realize you don't remember some details but please draw your current understanding. Your responses will be treated completely anonymously.

In order for us to use your response in the research study please fill out the consent form below.

Title of research study: *Experts' Mental Models of the Greenhouse Effect. Investigator: Dr. Anne Gold*

Why am I being invited to take part in a research study? *We invite you to take part in this study because you are an expert in climate science or climate instruction. The University of Colorado considers the study a Human Research Study. What should I know about this research study?* *You are receiving an assignment to draw a concept sketch of the greenhouse effect. Whether or not you take part is up to you. You can choose not to take part. Your decision will not be held against you. You can ask all the questions you want before you decide.*

Who can I talk to? *If you have questions, concerns, or complaints, please talk to the researcher, Dr. Anne Gold anne.u.gold@colorado.edu or 303-735-5514. This research has been reviewed and approved by an Institutional Review Board ("IRB"). You may talk to them at (303) 735-3702 or irbadmin@colorado.edu if: i) Your questions, concerns, or complaints are not being answered by the researcher, ii) You cannot reach the researcher, iii) You want to talk to someone besides the researcher, iv) You have questions about your rights as a research subject, v) You want to get information or provide input about this research.*

Why is this research being done? *This assessment of expert knowledge to establish a baseline for knowledge that students should have after successful instruction about the greenhouse effect. How long will participating in the evaluation take?* *We expect that it will take about 15 minutes to complete the concept sketch. How many people will be studied?* *We are inviting up to 200 experts. What happens if I say yes, I want to be in this research?* *If you complete this informed consent form, you can complete the attached assignment. In this assignment you will be asked to complete a concept sketch about the greenhouse effect. What happens if I do not want to be in this research or if I change my mind later?* *You can leave the research at any time and it will not be held against you. Will being in this study help me any way?* *Your feedback will provide information that may help improve instruction about the greenhouse effect. What happens to the information collected for the research?* *The concept sketch will be considered confidential and coded anonymously. Statistical analysis of all expert concept sketches will be completed.*

Authorization: I have read this information about the evaluation study. I know the possible risks and benefits. I know that participating in this evaluation is voluntary. I choose to be in this evaluation study. I know that I can withdraw at any time.

Please enter your name below:

Do you agree to participate in the evaluation as explained above in this consent form? (Check "No" if you would not like to participate. By selecting the "Yes" checkbox below, you provide your electronic signature and agree to participate in this research study.)

Yes

No

Drawing a Concept Sketch and Example:

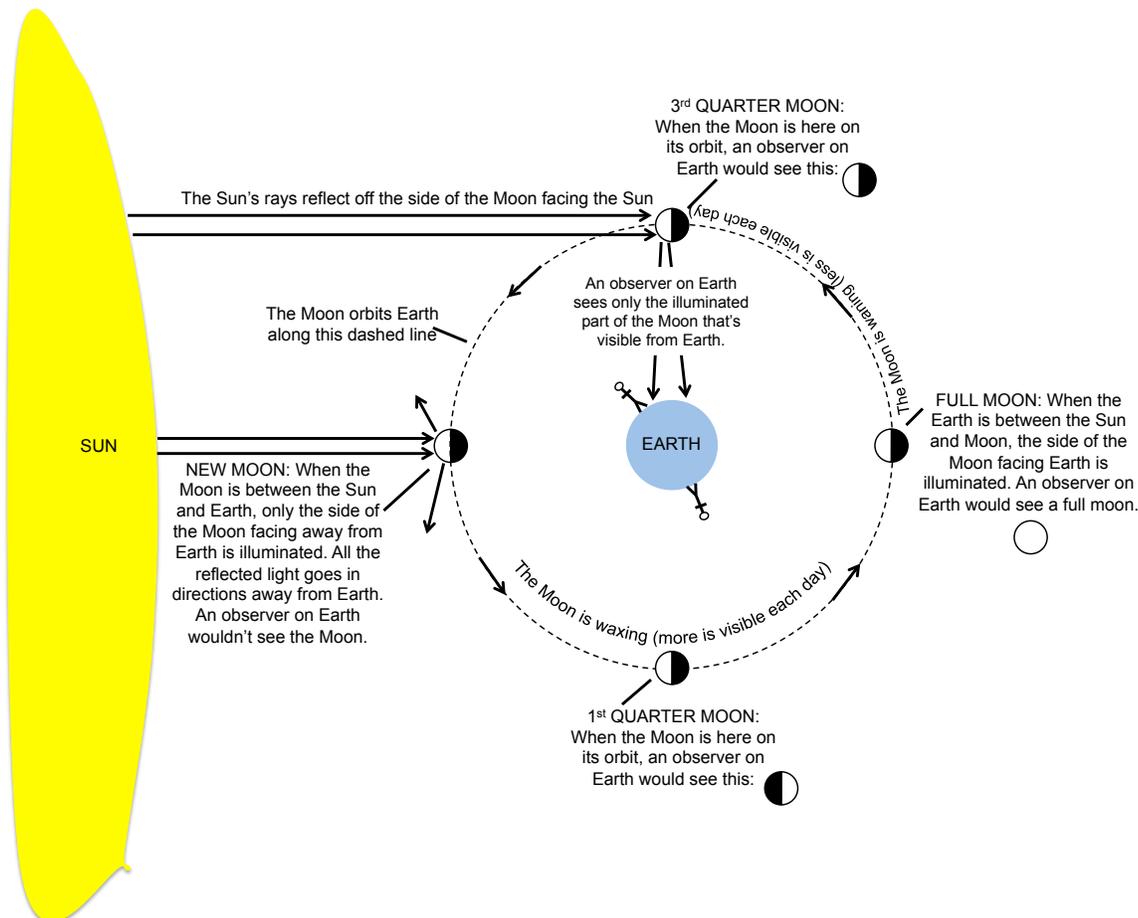
- A concept sketch is a simplified sketch illustrating the main aspects of a concept, annotated with concise but complete labels that (1) identify the features, (2) depict the processes that are occurring, and (3) characterize the relationships among features and processes.
- A concept sketch is more than a labeled diagram. It includes full-sentence captions explaining important processes and relationships, rather than merely labeling parts.
- In concept sketches, concept captions are connected to particular parts of the sketch with what are called *leaders*, which are short straight or curved line segments. Arrows should be reserved for places in the concept sketch where movement occurs.

How to create a concept sketch:

1. List what you think are the key features and processes, versus those things that you observe but that are not essential,
2. Decide how various aspects are related,
3. Draw and annotate the sketch.

Key components of a concept sketch:

- Clear drawing of key elements of concept or system.
- Indication of processes that occur and relationship among features and processes
- Concise labels connected to sketch by leaders (straight or curved lines)



Credits: Steve Reynolds, Barb Tewksbury, and Julia Johnson.

RESEARCH STUDY – ASSIGNMENT (please complete):

1) How would you best characterize yourself (check all that apply)?

- Climate Scientist*
- College/University Instructor*
- Graduate Student (field: _____)*
- Undergraduate Student (field: _____)*
- K-12 educator (subjects: _____)*
- Informal educator (subjects: _____)*
- Decision/Policy Maker*
- Climate Literacy Professional*
- Other please specify: _____*

2) How would you rate your expertise in climate science on a scale from 1-10 (1=lowest to 10=highest): _____

3) CONCEPT SKETCH: Sketch, label, and describe how the greenhouse effect works. Identify the key features you decide to include. Explain the processes that happen. Indicate how the features and processes are related. Use clear, complete sentences and leaders. (PLEASE DO **NOT** LOOK UP ANY DETAILS.)

Earth's surface

PLEASE SEND CONSENT FORM AND THIS PAGE TO: anne.u.gold@colorado.edu or Fax: 303-735-3644 or Anne Gold, University of Colorado, Research Lab 2, UCB 449, 1540 30th Street, Boulder, CO, 80303