

Review Criteria: Learning Activities

Scientific Accuracy

1) Is an attribution provided that represents a credible source such as a university or government agency?

- yes
- no

2) Resource is free of scientifically out-of-date material.

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

3) Does the resource support an understanding of the scientific process?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no
- not applicable

4) Does the resource present valid/accurate concepts, models, and skills?

- yes
- no

5) Does the resource effectively address common preconceptions/misconceptions?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no
- not applicable

6) Are links to the original data sources provided?

- 4 definitely
- 3 somewhat

- 2 a little
- 1 no
- not applicable

7) Where appropriate, are references, bibliographies and other supporting material provided?

- yes
- no

Science Annotation - please include strengths and concerns (content to be used for catalog record):

Hidden: Guideline for writing Science Annotations

Statements from the following categories should be included in the science annotation if they help to characterize the activity:

- **Topic of the activity:** Summarize the major scientific ideas or content, comment at a more conceptual level about the outline of the activity (e.g. follows scientific process), or highlight important parts of activity, stress in which way a specific topic was addressed, or place the activity in broader framework of the scientific topic that is covered. Judgment statements (especially positive ones that stress a particularly well done aspect of the activity) should be included in this statement. Make sure that this is not repeating the description – focus on how the scientific topic is addressed through this activity and keep your statements at a more conceptual level and/or highlight especially good pieces of the activity.
- **Data:** Information on the type of data used in the activity (digitally available, real data), the quality of the data, the source of the data, and its credibility. Information how current the data is and if applicable where to find more current data. If you have concerns about the availability of data and judgments on the amount of data used by students in the activity (often not enough to be statistically significant) please give them here with a possible solution.
- **Background materials:** Comment on the quality, the amount or the lack of background materials that was provided. Highlight pieces of activity for which background material are sparse. Highlight some materials that were especially useful.
- **Scientific accuracy/Misconception:** Comment how well the science is covered. Address scientific shortcoming and list suggestions of how to correct this information. State if a lesson does an outstanding job in addressing misconceptions. Address if a piece of an activity could lead to misconceptions if not highlighted by a teacher. Mention if the activity a “teachable” moment to address a misconception presents itself.

- Rigor of activity: Comment on the depth that a topic was covered and/or the rigor, including judgment terms if they thought it is too simplified or too difficult. If specific pieces are missing in the explanation list them and possibly give supporting background materials.
- References: Comment on the quality and amount of listed references. If you know of additional sites or supporting journal articles list them in the annotation.

Don't include here:

- General statements: Comment on a misleading title of an activity, the type of activity (experiment, hands-on), what methods are used in this activity, lack of reference to solutions and a comparison of this activity to other activities. Conceptual comments - how this learning will actually also stimulate a different learning at a higher level.
- What students do: Summary of what students do in the activity to reach the learning goal often with more scientific spin.
- Learning outcomes: Comment on design of activity and projected learning outcome, the understanding that is build in students for a specific topic, and skills that are developed. Stressing the limitation of the learning outcome if activity is carried out as suggested.
- Connection to climate change: Comment if link between the content of the activity and climate change is very vague or needs to be strengthened.
- Pedagogy: Addressing pedagogy like: Comment on grade level of activity, assessment questions, scaffolding, teachers guide, prerequisite knowledge, background knowledge for teacher.

Overall Rating of Scientific Accuracy

- Meets highest scientific standards, up-to-date e.g. IPCC 4th report
- Scientifically sound but does not meet highest standards
- Minor scientific short-comings that can be addressed in annotations
- Has major scientific short-comings or even conveys misconceptions
- Can't answer this

Pedagogic effectiveness

1) Are learning objectives clearly stated?

- yes
- no

2) Do the instructional strategies build toward mastering the learning objectives?

- 4 definitely
- 3 somewhat

- 2 a little
- 1 no

3) Which of the following learning styles is addressed by this resource? (check all that apply)

- auditory
- visual
- kinesthetic
- tactile

4) Does the resource explicitly address the needs of underserved groups?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no
- not applicable

Comments on how this resource addresses the needs of underserved groups

5) Is the resource free from material that might interfere with effective use by a wide range of learners (e.g. negative stereotypes or insensitive treatment of sensitive subjects)

- 4 yes
- 1 no
- can not answer

Comments

6) Are prerequisite skills and understandings accurately indicated?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

7) Are effective assessment strategies suggested?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

8) Is the resource engaging and motivating for students? Does it provide compelling and relevant reason to jump into the activity?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

9) Are students engaged in inquiry, independent thinking or problem solving through this resource?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

10) Does the resource provide a vehicle for asking questions or seeking further information beyond the activity?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

Pedagogy Annotation - please include strengths and concerns (content to be used for catalog record):

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Hidden: Guideline for writing Pedagogy Annotations

Statements from the following categories should be included in the pedagogy annotation if they help to characterize the activity:

- Learning outcome: Comment on the design of the activity and summarize projected learning outcomes and skills that are being built through this activity (if

- necessary list what students do to reach this). Highlight if you see limitation of the learning outcome if activity is carried out as suggested.
- Type of lesson / didactics: Summarize what type of activity will be done (experiment, hands-on, worksheet-based) as well as the didactical approach (group/team work, project based).
 - Prerequisites: List special prerequisite skills of student to complete the activity, especially technical skills. Mention here if the activity doesn't list any prerequisite knowledge or skill.
 - Organization and quality of activity: Comment on the quality of the lesson design / organization of the activity in a whole and also in focusing on specific pieces of the lesson (worksheet, assignment, tutorial) and the quality or lack of visual appeal. Important is to notice the quality/lack of assignments. Comment on complexity of the lesson (intro, simple, complex etc) and highlight some challenging part of the activity. Suggest how the activity can be strengthened. Include (positive) judgment statements here.
 - Teaching sequence: Summarize the teaching sequence that is presented in the activity and/or reflect on the sequence, the effectiveness of it by using judgment statements. Highlight specific and useful extensions.
 - Teacher's guide: Comment on the quality or the lack of the teachers guide. Mention the time investment that is necessary to prepare the activity. Stress prerequisite knowledge that teacher needs. Highlight parts of the activity that need careful monitoring of students or additional clarification.
 - Diverse Learners: Summarize how the methods that are used in the activity engage students with different learning styles, how an activity will appeal to a specific subset of the student body and list challenges for special student groups (ESL, non-tech savvy students).
 - Engagement of students: Comment on how well an activity engages the students (either very positive or negative statement) and give suggestions of how to engage students more and at which part an educator might disengage the students.

Don't include here:

- Content: Summary of content of the activity at a more conceptual level about the outline of the content (e.g. follows scientific process) and quality of or the lack of a solution piece to the activity.
- Misconceptions: Addressing common misconceptions or "teachable" moment to address a misconception.
- Background materials: Comment on the quality or lack of background materials or references. Suggestion of additional background materials.
- Grade level: Comment on the target audience and how an activity could be adjusted to be used with other grade levels.
- Cost: Any direct cost associated with the activity (software licences)
- Materials: Special materials that are needed to complete the activity.

Overall Rating of Pedagogic Effectiveness

- Pedagogically very effective and carefully designed, well documented, suitable target audience
- Pedagogic design is good and resource is useful as a learning tool for target audience, minor pedagogic short-comings
- Pedagogical design does meet basic standards but has considerable shortcomings
- Poor pedagogical design, not recommended as a learning tool for target audience
- Can't answer this

Ease of use & technical quality

1) Is the resource free of distracting or off-topic advertising?

- yes
- no

2) Is the resource complete in scope and ready for use?

- yes
- no

3) Are the materials used in the resource commonly found in science classrooms?

- yes
- no
- not applicable

List uncommon materials or computer access needs here (content will be used for catalog record):

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4) Does the resource present the concept and content clearly?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

5) Will students be able to complete this activity without excessive additional instruction or technical support from the teacher?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

6) Does the resource provide a clear and comprehensive guidance for teachers to effectively teach the activity?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

7) Is necessary material available in printable hand-out form?

- 4 Yes
- 1 No
- not applicable

Annotation about Technical Quality and Ease of Use - please include strengths and concerns (content to be used for catalog record):

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Hidden: Guideline for writing Annotation on Technical Quality and Ease of Use

Statements from the following categories should be included in the usability annotation if they help to characterize the activity:

- **Data/Information accessibility:** Comment on the accessibility of the data used in the activity as well as the quality of instructions to access the data. Give information about external information/links and comment on the availability of relevant URLs. Report broken links and comment about the size of data files are needed (if applicable).
- **Technological requirements/software:** List required software and hardware, comment on how the technological requirements might be a barrier to conducting an activity in some school districts (if applicable).
- **Organization/Design of activity:** Comment on the quality/lack of scaffolding, organization, format, design, completeness and quality of the activity. Address the presentation style (e.g. cook-book) and parts that are missing to make it a complete activity.
- **Cost:** List any direct costs (eg. Software).

- Usability: Give judgment of the overall usability of the activity.
- Background/Supplemental materials: Comment on quality or lack of background materials. List supplemental materials and their sources.
- Preparation time/Teachers guide: Comment on the prep time that is required for the teacher and the quality of the teachers guide.
- Other comments: Give information on the content of the activity, highlight especially useful pieces and comment on the pedagogy in a more conceptual way.

Don't include here:

- Pedagogy: Comment on the prerequisite knowledge, the quality of the worksheets, the amount of guidance students will need throughout this activity and the level of engagement of the students during the activity.
- Time required: Listed the time required for this activity.
- Materials needed: List materials that are not commonly found in science classrooms and where to find the materials for cheap or how to substitute them.
- Parent URL: List parent URL if activity is part of a larger collection, especially if intro and background pages exist.

Overall Rating of Technical Quality

- Technically robust and adequate for use in typical educational environment
- Technically good, minor shortcomings in technical aspects when used in typical educational environment
- Technically weak, minor problems when used in typical educational environment
- Technically weak, major problems when used in typical educational environment
- Not Applicable
- Can't answer this

Overall Rating of Ease of Use

- Very easy and intuitive to use for students and teachers, grade-level appropriate design
- Fairly easy to use for students and teachers
- Careful guidance of students through material needed
- Easy to get lost in material, counter-intuitive and/or not grade-level-appropriate
- Can't answer this

Teaching Tips

1) Teaching Tips (content will be used for catalog record):

2) Amount of time required for this activity (content will be used for catalog record - format example "three-four 45 min lesson periods"):

3) If the resource is part of a larger collection and there is a relevant parent URL please copy the URL here (format [URL]- content will be used for catalog record):

4) Is a scientific dataset used by students in this activity? **Yes**

5) Does this activity have a distinct regional focus?

- no regional focus**
- Islands and Territories** (Hawaii, Puerto Rico, US Virgin Islands)
- Northwest** (Washington, Oregon, Idaho, (Western) Montana)
- Southwest** (California, Nevada, Utah, Arizona, New Mexico, (Western) Texas, (Southwest) Colorado)
- Great Plains** ((Eastern) New Mexico, Texas, Oklahoma, Kansas, Nebraska, Wyoming, Montana, South Dakota, North Dakota)
- Midwest** (Minnesota, Michigan, Wisconsin, Iowa, Missouri, Illinois, Indiana, Ohio)
- Southeast** ((Southeast) Texas, Arkansas, Louisiana, Mississippi, Kentucky, Tennessee, Georgia, South Carolina, North Carolina, Virginia, Alabama, Florida)
- Northeast** (West Virginia, Maryland, Washington D.C., Maine, Vermont, New Hampshire, New York, Pennsylvania, Connecticut, Rhode Island, New Jersey, Delaware, Massachusetts)
- Coasts** (Maine, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, Mississippi, Texas, California, Washington, Oregon, Alaska)
- Alaska**

Please specify the state(s):

Essential Principles of Climate and Energy Literacy

Select the primary principle(s) that are addressed by the resource.

- GP Humans can take actions to reduce climate change and its impacts.**
- GP a Climate science improves informed policy and decision-making
- GP b Reducing human vulnerability to and impacts on climate requires multi-disciplinary, integrated understanding
- GP c Climate change affects global/national security
- GP d Greenhouse gas reduction and carbon dioxide sequestration to mitigate climate change
- GP e Strategies to reduce greenhouse gas emission (energy conservation, renewable energies, change in energy use)
- GP f Strategies of human adaptation to climate change
- GP g Actions taken by different levels of society can mitigate climate change and increase preparedness for current and future generations

- 1 The Sun is the primary source of energy for Earth's climate system**
- 1a Sunlight warms the planet
- 1 b Earth's Energy balance
- 1 c Axial tilt of Earth governs incoming sunlight and seasonality
- 1 d Milankovitch/orbital cycle
- 1 e Solar variability has no significant impact on Earth's current warming

- 2 Climate is regulated by complex interactions among components of the Earth system**
- 2 a World's climate definition
- 2 b Ocean as climate control, oceanic conveyor belt; abrupt changes in thermohaline circulation
- 2 c Greenhouse effect
- 2 d Biogeochemical cycles of greenhouse gases / Carbon cycle
- 2 e Role of aerosols in climate system
- 2 f Equilibrium and feedback loops in climate system

- 3 Life on Earth depends on, is shaped by, and affects climate**

- 3 a Climate's role in habitats ranges and adaptation of species to climate changes
- 3 b The Greenhouse effect supports the water cycle and makes life possible
- 3 c Climate impacts ecosystems and past species extinctions
- 3 d Holocene is unusually stable – human infrastructure vulnerable to change
- 3 e Biosphere drives the global carbon cycle

- 4 Climate varies over space and time through both natural and man-made processes**
- 4 a Definition of climate and climatic regions
- 4 b Climate is not the same thing as weather – defining difference
- 4 c Climate change vs. climate variability and patterns
- 4 d Changes in climate is normal but varies over times/ space
- 4 e Global warming and especially arctic warming is recorded in natural geological and historic records
- 4 f Evidence is that human impacts are playing an increasing role in climate change
- 4 g Natural processes of CO₂ removal from atmosphere is slow; Long residence time of some GHG

- 5 Our understanding of the climate system is improved through observations, theoretical studies, and modeling**
- 5 a Climate system is subject to the same physical laws as the rest of the Universe
- 5 b Observations are the foundation for understanding the climate system
- 5 c Observations, experiments, and theory are used to construct and refine computer models
- 5 d Meteorology and climatology are related but different sciences, and their processes are modeled and forecast differently
- 5 e Climate models are robust enough to be used for guiding decision and actions as response to climate change

- 6 Human activities are impacting the climate system**
- 6 a Global warming is "very likely" caused by human greenhouse gas emission
- 6 b Increased GHG concentrations in atmosphere will remain high for centuries and affect future climate
- 6 c Human activities have increased GHG levels and altered global climate patterns
- 6 d Evidence shows that human-caused global warming have impacted ecosystem

resulting in reduced biodiversity and ecological resilience

- 6 e Negative impacts of global warming outweigh positive
- 7 Climate change will have consequences for the Earth system and human lives**
- 7 a Sea level rise and resulting impacts is due to melting ice and thermal expansion and increases the risk
- 7 b Effects of climate change on water cycle and freshwater availability
- 7 c Increased extreme weather events due to climate change
- 7 d Increased acidity of oceans and negative impacts on food chain due to increasing carbon dioxide levels
- 7 e Ecosystems on land and in the ocean have been and will continue to be disturbed by climate change
- 7 f Human health and well-being will be affected to different degrees from the impacts from climate change

- Addresses Energy Awareness**
- A. Energy drives the Earth System
- B. Primary sources of energy used by society are non-renewable and renewable sources
- C. Humans' use of energy has consequences on the environment
- D. Distribution of energy sources varies around the planet, resulting in distribution and transmission costs
- E. Human use of and access to energy result in social, political and equity issues
- F. Informed decision-making, technological and societal innovation and improved efficiency needed to reach sustainability

- Addresses CLEP/Energy Solutions (this is superseded by the energy terms above)

Audience Level

Please select the grade level for which this material is most appropriate (in your judgement) Check all that apply.

- Primary (K-2) (note that this grade range is out of scope for CLEAN)
- Intermediate (3-5) (note that this grade range is out of scope for CLEAN)
- Middle (6-8)

- High School (9-12)
- College Lower (13-14)
- College Upper (15-16)
- Graduate or Professional
- Informal Education (museums, park displays)

Grade level notes (content will be used for catalog record):

Creator (Lastname, Firstname or the organization. semicolons to separate multiple entries. If creator is an organization with commas in the name put it in the publisher field instead.)

Publisher (Not same as creator, use for organization)

When was the webpage of the activity last updated? (Specify date if available and if necessary add comment)

Overall Rating of Relevance to CLEAN

- High Priority (Resource likely to be included in CLEAN collection of excellent resources)
- Medium Priority (Resource meets basic CLEAN standards)
- Low Priority (Resource meets basic CLEAN standards but is of lower priority)
- Hold for Later Review (Keep in pool for another review at later stage)
- Excellent but Incomplete (Excellent and relevant but needs improved activity sheet)
- Do Not Include (Resource doesn't meet basic CLEAN standards)
- Review in process (not yet complete)
- Unvetted (Review not yet complete)

Other Reviewer Comments (for internal use only - not used for catalog record)