**Overview**: The following rubrics can be used to assess the individual project: an evaluation of different solutions to minimize human impact on organisms. Each rubric is aligned to one section of the *Individual Project Criteria for Success*, located on the Culminating Project Student Instructions. \*If student provides no assessable evidence (e.g., “I don’t know” or leaves answer blank), then that student response cannot be evaluated using the rubric and should be scored as a zero.

Below we provide an alignment table that details the dimensions assessed for each criterion.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Student Criteria for Success** | **Science and Engineering Practice** | **Disciplinary Core Idea** | **Crosscutting Concept** |
| 1 | * A description of the problem facing all organisms, including:   + The criteria and constraints for solving this problem for all organisms | **Asking Questions and Defining Problems**   * Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. | **ETS1.A: Defining and Delimiting Engineering Problems**   * The more precisely a design task’s criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. | **N/A** |
| 2 | * Scientific background to help your audience understand the problem, including:   + The cause of the problem and the evidence that supports this cause-and-effect relationship   + Whether you think this problem was caused by a sudden change or gradual changes that have accumulated over time and why | **N/A** | **ESS3.D: Global Climate Change**   * Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth’s mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. | **Stability and Change**   * Stability might be disturbed either by sudden events or gradual changes that accumulate over time. |
| 3 | * An argument for why global warming poses a threat to organisms, including   + 1) How all the organisms’ behaviors or structures affect their probability for successful reproduction   + Describe examples from other group’s projects as evidence | **Engaging in Argument From Evidence**   * Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. | **LS1.B: Growth and Development of Organisms**   * Animals engage in characteristic behaviors that increase the odds of reproduction. * Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. | **N/A** |
| 4 | * An argument for why global warming poses a threat to organisms, including   + 2) How these behaviors or structures are being affected by rising temperatures   + Describe examples from other group’s projects as evidence | **N/A** | **ESS3.C: Human Impacts on Earth Systems**   * Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth’s environments can have different impacts (negative and positive) for different living things. * Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. | **Cause and Effect**   * Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. |
| 5 | * An explanation of your method to monitor or minimize the impact of your plant/animal | **Designing Solutions**   * Apply scientific principles to design an object, tool, process, or system. | **ESS3.C: Human Impacts on Earth Systems**   * Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth’s environments can have different impacts (negative and positive) for different living things. * Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. | **N/A** |
| 6 | * An evaluation of solutions:   + Which solution do you think will have the most impact (best meets the criteria)?   + Which solution seems to be the most feasible (best meets the constraints)?   + Based on your evaluation, which solution would you recommend and why? | **Engaging in Argument From Evidence**   * Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. | **ETS1.B: Developing Possible Solutions**   * There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. | **N/A** |

**Rubric 1**: Student defines the problem of human impact on organisms, including criteria of success and constraints that might limit possible solutions.

* Dimensions Assessed: SEP – Asking Questions and Defining Problems, DCI – ETS1.A: Defining and Delimiting Design Problems

|  |  |  |  |
| --- | --- | --- | --- |
| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student **does not** define the problem of human impact on organisms **and/or** includes **inaccurate or irrelevant** criteria of success and constraints that might limit possible solutions. | Student **accurately** defines the problem of human impact on organisms, including **accurate** criteria of success **OR** constraints that might limit possible solutions. | Student **accurately** defines the problem of human impact on organisms, including **accurate but partial** criteria of success **and** constraints that might limit possible solutions. | Student **accurately** defines the problem of human impact on organisms, including **accurate and complete** criteria of success **and** constraints that might limit possible solutions. |
| **Look Fors:**   * Student does not describe global warming threatening organisms as the problem. * And/or the student identifies criteria of success and constraints that are inaccurate, irrelevant, or unreasonable. For example, they might identify a criterion of success as reversing global warming so there is a decrease in mean global temperature. | **Look Fors:**   * Student accurately describes that global warming is posing a threat to all the organisms focused on in the projects. * Student accurately defines the criteria for success OR at least one constraint. See *Advanced Look-Fors* for options. | **Look Fors:**   * Student accurately describes that global warming is posing a threat to all the organisms focused on in the projects. * Student accurately defines the criteria for success. For example, student explains that maintaining or increasing organism population sizes would indicate a successful solution. * Student also accurately defines one, but not multiple constraints. See *Advanced Look-Fors* for options. | **Look Fors:**   * Student accurately describes that global warming is posing a threat to all the organisms focused on in the projects. * Student accurately defines the criteria for success. For example, student explains that maintaining or increasing organism population sizes would indicate a successful solution. * Student also accurately and completely defines any constraints. For example, unseen consequences of interfering in ecosystems, inability to mimic natural processes, limited amount of resources available, cost, buy-in from consumers, etc. |

**Rubric 2**: Student explains the cause of the problem, including whether it is due to a sudden change or gradual changes that accumulate over time.

* Dimensions Assessed: DCI – ESS3.D: Global Climate Change, CCC – Stability and Change

|  |  |  |  |
| --- | --- | --- | --- |
| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student **inaccurately** explains the cause of the problem. | Student **accurately but partially** explains the cause of the problem, **and may include** whether it is due to a sudden change or gradual changes that accumulate over time. | Student **accurately and completely** explains the cause of the problem, **but does not include** whether it is due to a sudden change or gradual changes that accumulate over time. | Student **accurately and completely** explains the cause of the problem, including whether it is due to a sudden change or gradual changes that accumulate over time. |
| **Look Fors:**   * Student inaccurately explains the cause of global warming. For example, student states it is caused by volcanic eruptions. * Student may describe global warming as an accumulation of gradual changes, or may inaccurately describe a sudden change, such as a volcanic eruption. | **Look Fors:**   * Student partially explains the cause of global warming. For example, student may reference human activities, such as the burning of fossil fuels OR student may reference an increase in carbon dioxide emissions, but student does not connect the two. * Student may or may not accurately describe global warming as an accumulation of gradual changes. | **Look Fors:**   * Student explains that human activities, such as the burning of fossil fuels, are causing an increase in carbon dioxide emissions, which is causing a rise in global temperatures. * Student does not accurately describe that global warming is caused by gradual changes (such as increased burning of fossil fuels) that accumulate over time rather than by a sudden event. | **Look Fors:**   * Student explains that human activities, such as the burning of fossil fuels, are causing an increase in carbon dioxide emissions, which is causing a rise in global temperatures. * Student accurately describes that global warming is caused by gradual changes (such as increased burning of fossil fuels) that accumulate over time rather than by a sudden event. |

*Note: An additional rubric is provided in the Task 1 Teacher Version to the SEP associated with this PE – Asking Questions and Defining Problems.*

**Rubric 3**: Student argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, supporting with evidence from their own and other groups’ projects.

* Dimensions Assessed: SEP – Engaging in Argument From Evidence, DCI – LS1.B: Growth and Development of Organisms

|  |  |  |  |
| --- | --- | --- | --- |
| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student **accurately** argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, but evidence from their own **or** other groups’ projects is **missing or inaccurate**. | Student **accurately** argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, **supporting with general scientific reasoning rather than evidence**. | Student **accurately** argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, supporting with **one source** **of** **relevant** evidence from their own **or** other groups’ projects. | Student **accurately** argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, supporting with **multiple sources** **of** **relevant** evidence from their own **and** other groups’ projects. |
| **Look Fors:**   * Student makes the accurate claim that there are plant structures and animal behaviors that affect the probability of successful reproduction. * No evidence from any projects is provided, or student uses an inaccurate piece of evidence. For example, student states that animals need to have bright colors for pollination student makes the inaccurate claim that there are no specific plant structures and animal behaviors that affect the probability of successful reproduction. | **Look Fors:**   * Student makes the accurate claim that there are plant structures and animal behaviors that affect the probability of successful reproduction. * While no specific examples are given as evidence, they do support their claim with general scientific reasoning. For example, student may generally state that these plant structures and animal behaviors help reproduction by attracting pollinators or helping with new offspring. | **Look Fors:**   * Student makes the accurate claim that there are plant structures and animal behaviors that affect the probability of successful reproduction. * Student supports their argument by describing one specific example, likely their own organism (e.g. animals that nest or migrate and plants that have bright flowers or sex pheromones). *See the Culminating Project Teacher Version for specific examples of organisms and their behaviors or plant structures.* | **Look Fors:**   * Student makes the accurate claim that there are plant structures and animal behaviors that affect the probability of successful reproduction. * Student supports their argument by describing multiple specific examples from other groups’ projects (e.g. animals that nest or migrate and plants that have bright flowers or sex pheromones). *See the Culminating Project Teacher Version for specific examples of organisms and their behaviors or plant structures.* |

**Rubric 4**: Student explains that global warming likely causes negative effects on many organisms, supporting with evidence from their own and other groups’ projects.

* Dimensions Assessed: DCI – ESS3.C: Human Impacts on Earth Systems, CCC – Cause and Effect

|  |  |  |  |
| --- | --- | --- | --- |
| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student **accurately** explains that global warming likely causes negative effects on many organisms, but evidence from their own **or** other groups’ projects is **missing, inaccurate, or irrelevant**. | Student **accurately** explains that global warming likely causes negative effects on many organisms, supporting with **general scientific reasoning rather than evidence**. | Student **accurately** explains that global warming likely causes negative effects on many organisms, supporting with **one source** of evidence from their own **or** other groups’ projects. | Student **accurately** explains that global warming likely causes negative effects on many organisms, supporting with **multiple sources** of evidence from their own **and** other groups’ projects. |
| **Look Fors:**   * Student accurately explains that global warming is the likely cause behind the negative impacts they are seeing in various organisms in this unit. * No evidence from any projects is provided, or student uses an inaccurate or irrelevant piece of evidence. For example, student states that one example global warming affecting plants and animals is hummingbirds becoming too hot to fly. | **Look Fors:**   * Student accurately explains that global warming is the likely cause behind the negative impacts they are seeing in various organisms in this unit. * While no specific examples are given as evidence, they do support their claim with general scientific reasoning. For example, student may generally state that global warming is often creating a mismatch between the timing of flower blooms and the arrival of pollinators and migrating animals. | **Look Fors:**   * Student accurately explains that global warming is the likely cause behind the negative impacts they are seeing in various organisms in this unit. * Student supports their argument by describing one specific example, likely their own organism. *See the Culminating Project Teacher Version for specific examples of how each organism is affected by global warming.* | **Look Fors:**   * Student accurately explains that global warming is the likely cause behind the negative impacts they are seeing in various organisms in this unit. * Student supports their argument by describing multiple specific examples from other groups’ projects (for example, rising temperatures cause flowers to bloom early, so hummingbirds arrive too late to breeding grounds for adequate food for their offspring). *See the Culminating Project Teacher Version for specific examples of how each organism is affected by global warming.* |

**Rubric 5**: Student describes their solution to monitor or and minimize human impact on their chosen organism.

* Dimensions Assessed: SEP – Designing Solutions, DCI – ESS3.C: Human Impacts on Earth Systems

|  |  |  |  |
| --- | --- | --- | --- |
| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student describes their solution **that does not** monitor or minimize human impact on an organism. | Student describes their solution to monitor and minimize an **irrelevant** human impact on their chosen organism, **which** **is not related to global warming**. | Student describes their solution to monitor and minimize the **relevant** human impact on their chosen organism, **using partial detail**. | Student describes their solution to monitor and minimize the **relevant** human impact on their chosen organism, **using sufficient detail**. |
| **Look Fors:**   * Student describes a solution that does not monitor or minimize the human impact on their chosen organism*.* For example, student describes a plan to build small wooden houses to protect each Finnish Farm Bird nest. This contributes further to deforestation, which does not minimize global warming overall. | **Look Fors:**   * Student describes a solution that monitors and minimizes the human impact on their chosen organism, but it does not specifically relate to the problem of global warming. For example, student describes a plan to create a protected wildlife area for shorebirds that prevents human hunting of the shorebirds. | **Look Fors:**   * Student partially describes a solution that monitors and minimizes the human impact on their chosen organism, specifically caused by global warming. *See the Culminating Project Teacher Version for more examples.* * Student is lacking some detail, so there is some ambiguity as to how the solution would work and how exactly it addresses the problem. | **Look Fors:**   * Student describes a solution that monitors and minimizes the human impact on their chosen organism, specifically caused by global warming. For example, student describes a specific plan to irrigate drier areas for the Magpie Lark to increase the amount of mud available during nesting season. *See the Culminating Project Teacher Version for more examples.* * Student provides sufficient enough detail that the reader can completely understand how the solution would work and how it addresses the problem. |

**Rubric 6**: Student evaluates different solutions by identifying solutions that best meet the criteria and/or constraints of the problem and providing rationales.

* Dimensions Assessed: SEP – Engaging in Argument From Evidence, DCI – ETS1.B: Developing Possible Solutions

|  |  |  |  |
| --- | --- | --- | --- |
| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student evaluates different solutions by identifying **irrelevant** solutions that do not meet the criteria **and** constraints of the problem. | Student evaluates different solutions by identifying **relevant** solutions that best meet the criteria **and** constraints of the problem, but **rationale is missing**. | Student evaluates different solutions by identifying **relevant** solutions that best meet the criteria **and** constraints of the problem and providing **some** rationale. | Student evaluates different solutions by identifying **relevant** solutions that best meet the criteria **and** constraints of the problem and providing **detailed** rationales. |
| **Look Fors:**   * Student identifies an irrelevant solution they think will make the most impact. The solution they identify would not logically best meet the criteria of the problem. * Student identifies an irrelevant solution they think is most feasible. The solution they identify would not logically best meet the constraints of the problem. | **Look Fors:**   * Student identifies a relevant solution they think will make the most impact (meets criteria). No rationale is provided. * Student identifies a relevant solution they think is most feasible (meets constraints). No rationale is provided. * Identification of solutions will vary depending on the solutions that groups come up with. Student may also choose one solution they feel best meets the criteria and constraints. | **Look Fors:**   * Student identifies a relevant solution they think will make the most impact (meets criteria). Student writes a rationale for their choice that leaves some ambiguity about why the solution best meets the criteria. * Student identifies a relevant solution they think is most feasible (meets constraints). Student writes a rationale for their choice that leaves some ambiguity about why the solution best meets the constraints. * Identification of solutions will vary depending on the solutions that groups come up with and the reasoning individual students use in their evaluation. Student may also choose one solution they feel best meets the criteria and constraints. | **Look Fors:**   * Student identifies a relevant solution they think will make the most impact (meets criteria). Student writes a detailed rationale for their choice. * Student identifies a relevant solution they think is most feasible (meets constraints). Student writes a detailed rationale for their choice. * Identification of solutions will vary depending on the solutions that groups come up with and the reasoning individual students use in their evaluation. Student may also choose one solution they feel best meets the criteria and constraints. |