|  |
| --- |
| Local Adaptation of Milkweed – *Monarch Population Decline Debate* |
| Introduction |
| This lesson will revisit the information students already know about monarch butterflies and common milkweed plants. Using excerpts and summaries of research papers on the declining monarch population, students will debate the most likely cause of the decline and compare arguments from experts in the field.  This lesson plan is a component of the *ELABORATE* stage of the 5E Learning Model for the overall curriculum. |
| Objectives |
| After this lesson, students will be able to:   * identify multiple potential causes for the monarch population decline, * compare the strengths and weaknesses of each potential cause, and * understand that biology is an ever-changing field; there is not always one “right” answer, and biologists disagree and use evidence to argue about explanations for phenomena, like the decline of monarch butterflies |
| NGSS Performance Expectations Addressed |
| Standards  Middle School:   * MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]   High School:   * HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]   Science and Engineering Practices   * Asking Questions and Defining Problems * Engaging in Argument from Evidence   Disciplinary Core Ideas   * LS2.C: Ecosystem Dynamics, Functioning, and Resilience   Crosscutting Concepts   * Patterns * Cause and Effect * Stability and Change |
| Information for Classroom Use |
| Approximate Duration for the Task  50-60 minutes or one class period.  Assumptions  Students should know or be familiar with:   * Their individual and class lists of factors that might be related to monarch population decline   Teachers should know or be familiar with:   * The Claim, Evidence, Reasoning framework (see <https://www.youtube.com/watch?v=fkpZfpNWjWY> for a detailed example)   Additional Materials Needed   * Previous class list of potential reasons for monarch decline (either electronic or hard-copy)   Supplementary Resources   * Activate Learning: <http://www.activatelearning.com/claim-evidence-reasoning/> |
| Classroom Task |
| Context  In this activity, students will explore the differing opinions among experts in the field as to the cause of monarch decline. Students explore the nature of science as they see that science is not always as cut-and-dry as their textbooks make it appear. Students will use the “Claim, Evidence, Reasoning” framework to structure their debates. This framework encourages good science literacy, and can be applied to many scientific disciplines.  Task Components  *ENGAGE*   1. Review the list of possible causes for monarch population decline that students compiled in Lesson 1. If students have come up with more, add them to the list.   *EXPLORE*   1. Assign students to one of four groups and give students the Lesson 2 Handout; each group should read their assigned selection and discuss it with their group. Provide enough time for them to read each excerpt or summary individually. 2. Alternatively, this can be given as homework for students to complete by today.   *EXPLAIN*   1. Have each group present their research summary to the class; students should include the hypotheses researchers believe, and the ones they explicitly state they do not. 2. Explain the “Claim, Evidence, Reasoning” framework that the students should use for their debates. 3. Give students the Lesson 2 Worksheet; allow 10-15 minutes for them to fill out their worksheet based on the research summary their group read.   *ELABORATE*   1. Create small groups comprised of four students, each one having read a different research summary. Have students debate the possible causes. They may add to, or change, their worksheet throughout the debate.   *EVALUATE*   1. Have groups share their conclusions with the class. |
| Alignment and Connections of Task Components to NGSS Performance Expectations |
| Standards  Middle School:   * MS-LS2-4. *This standard is addressed by having students use research papers on potential causes of monarch decline to debate how the monarch population is affected.*   High School:   * HS-LS4-5. *This standard is addressed by having students use research papers on potential causes of monarch decline to debate how the monarch population is affected.*   Science and Engineering Practices   * Asking Questions and Defining Problems – *This practice is addressed by walking students through the “Claim, Evidence, Reasoning” framework for scientific debate.* * Engaging in Argument from Evidence – *This practice is addressed by having students debate which potential cause(s) of monarch decline has/have the biggest impact on monarch populations, based on existing research papers.*   Disciplinary Core Ideas   * LS2.C: Ecosystem Dynamics, Functioning, and Resilience – *This idea is addressed by having students debate different factors in the monarch ecosystem which could impact their population.*   Crosscutting Concepts   * Cause and Effect – *This concept is addressed by investigating potential causes that impact monarch populations.* * Stability and Change – *This concept is addressed by discussing factors that change monarch populations.* |