Grades 6-8
Objective: To prepare students for the eclipse observation by introducing them to the science of eclipses and helping them formulate hypotheses about insect and plant behavior during eclipses.

- Introduction to Eclipses:
    - Eclipse Overview: Begin by explaining the concept of solar and lunar eclipses to the students. Provide a clear and concise overview of what eclipses are, emphasizing that they involve the alignment of the sun, moon, and Earth.
    - Science Behind Eclipses: Dive into the science behind eclipses, with a particular focus on how they affect natural light and temperature. Explain that a solar eclipse occurs when the moon passes between the Earth and the sun, temporarily blocking the sun's light. Discuss how this can lead to changes in the environment that impact both insects and plants.
        - Visual Aids: Use visual aids such as diagrams, videos, or animations to help students visualize the eclipse phenomenon. Show images of the sun, moon, and Earth in alignment during an eclipse.
    - Study Insect and Plant Behavior During Eclipses:
        - Discussion on Insect and Plant Behavior: Engage students in a discussion about how eclipses might influence the behavior of insects and plants. Encourage them to think about how sudden changes in light and temperature can affect these organisms.
        - Research Assignment: Assign students to research and gather information about insect and plant behavior during eclipses. Provide them with resources such as books, articles, and online sources to aid in their research. Encourage them to consider how different species of insects and plants might react to the same eclipse event.
            - Insects, particularly bees, exhibit noticeable changes in behavior during solar eclipses. A study conducted by the University of Missouri and involving elementary school students used microphones in flower patches to record bee activity during the 2017 total solar eclipse across the United States. This study revealed that bees, which are normally active during daylight, abruptly stopped flying and became silent at the moment of totality, when the moon completely blocks the sun and it becomes dark. This sudden cessation of activity was unexpected, as it was like "lights out" for the bees, indicating a sharp reaction to the sudden darkness.
    - Forming Teams and Assigning Roles:
        - Divide the class into small field study teams.
        - Assign roles: Recorder, Observer, and Data Collector.

- Ensure each team has necessary equipment: notebooks, eclipse glasses, thermometers, and stopwatches.

- Research and Hypothesis:
  - Encourage students to research insect behavior during eclipses.
  - Each team should formulate hypotheses about how they expect insects to behave during the eclipse.
    - Formulate Hypotheses:
      - Hypothesis Formulation: After conducting research and gaining a basic understanding of eclipse-related insect and plant behavior, have students formulate hypotheses. They can work individually or in small groups.
      - Hypothesis Guidelines: Provide guidelines for formulating hypotheses. Emphasize that hypotheses should be specific, testable, and based on the research they've conducted. Encourage students to make predictions about how certain insect and plant behaviors may change during a solar eclipse.
    - Example Hypotheses: Share example hypotheses with the class to provide guidance:
      - "I hypothesize that certain nocturnal insects, like moths, will become more active during a solar eclipse as they confuse it with nighttime."
      - "I predict that sunflower plants may temporarily close their blooms during a solar eclipse as a response to reduced light."
  - Peer Review (Optional): If time allows, consider organizing a peer review session where students share their hypotheses with classmates. This can promote discussion and refinement of ideas.
- Setting Up the Observation Area:
  - Choose an open space with a clear view of the sky and access to insect-attracting areas (like gardens or fields).
  - Ensure each team has a designated observation spot.
  - Conducting Observations:
    - Recording Time: Note the start and end times of the eclipse, as well as the times of different phases.
    - Observing Insects: Pay attention to changes in activity, flight patterns, and interactions.
    - Use the notebook for detailed descriptions and any notable behaviors.
      - Time and Phase of Eclipse:
        - Record the exact time the eclipse begins, reaches totality, and ends."
        - "Note any significant changes in insect activity during different phases of the eclipse (partial, total, post-eclipse)."

- Insect Behavior:
  - "Describe any changes in the movement patterns of insects. Are they more active, less active, or showing no change?"
  - "Observe and note any specific behaviors like flying, resting, or feeding."
  - "Do you notice any changes in the way insects interact with each other or with their environment during the eclipse?"
- Environmental Changes:
  - "Record the temperature at regular intervals. Note any correlations between temperature changes and changes in insect activity."
  - "Describe any changes in the environment, such as light levels, sounds, or the behavior of other animals."
- Species-Specific Observations:
  - "Identify and note the types of insects you observe (if possible)."
  - "Record any species-specific behaviors you notice before, during, and after totality."
- Comparative Observations:
  - "Compare the behavior of different insect species. Do they react similarly or differently to the eclipse?"
- Personal Reflections and Hypotheses:
  - "Reflect on your initial hypotheses about insect behavior during the eclipse. Were they supported by your observations?"
  - "What surprised you the most about the insect behavior during the eclipse?"
- Photographic or Sketch Records:
  - "If possible, take photos or make sketches of insects and their environment for additional records."
  - "Annotate your photos or sketches with the time and observations related to the behavior."
- Post-Eclipse Behavior:
  - "After the eclipse, continue observing for a while. Do insects return to their normal behavior immediately, or is there a gradual change?"
- Temperature Recording: Use thermometers to record the temperature at regular intervals (e.g., every 5 minutes).

- Safety: Constantly remind students to use eclipse glasses when looking towards the sky.

- Post-Eclipse Activities
    - Data Compilation:
        - Collect all data from each team.
            - Create a centralized database or chart for all recorded observations and temperature readings.
    - Data Analysis Session:
        - Analysis Session: Conduct an analysis session where students compare their observations with their initial hypotheses. Guide them to identify patterns, similarities, and differences in insect behavior during the eclipse.
            - Compare observations against initial hypotheses.
            - Discuss patterns and anomalies in insect behavior and temperature changes.
            - Encourage students to use graphs or charts to represent their data visually.
- Creative Writing Prompt: a creative writing prompt that encourages students to express their understanding and imagination based on their eclipse observations.
    - Provide a choice of prompts, such as:
        - "Write a short story or poem from the perspective of an insect experiencing the solar eclipse. Describe its thoughts, feelings, and interactions with other insects and plants during this extraordinary event."
            - Guidance: Encourage students to imagine the sensory experiences of an insect during the eclipse. How would the sudden darkness affect it? What might be its concerns, confusions, or delights?
        - "Imagine you are a scientist studying animal behavior during eclipses. Write a journal entry describing your most interesting findings from today's eclipse observation."
            - Guidance: This prompt allows students to synthesize their actual observations into a narrative form. They can express their findings, hypotheses, and reflections on the day's events.
        - Creative Writing Session: Allocate time for students to work on their creative writing pieces. Encourage them to incorporate scientific knowledge and actual observations into their narratives.
            - Provide resources like field notes, photos, or diagrams they made during the observation for reference.
    - Sharing and Discussion:
        - Organize a session where students can voluntarily share their writing with the class. This can be done in a single session or spread over several days, depending on class size and time availability.
        - After each reading, facilitate a discussion that connects their creative work to the actual eclipse observations.

- Discussion points can include:
  - How did the creative piece reflect real insect behavior observed during the eclipse?
  - What imaginative elements did the student add, and why?
  - How does combining scientific observation with creative writing enhance our understanding or appreciation of natural phenomena.