**Eco-Friendly Underwater Robot for Ecosystem Protection**

**Phase 1: Identify**

* **Text**:
  + **Problem Statement**: "Traditional underwater robots can disturb marine ecosystems due to noise, physical interference, and pollutants. Sustainable power sources are also limited, often relying on battery replacements that may contribute to environmental waste."
  + **Research Findings**:
    - Marine ecosystems like coral reefs and seagrass beds are sensitive to noise, vibrations, and pollution.
    - The need for low-impact exploration tools that prevent harm while collecting valuable data on ecosystems.
  + **Objective**: "Develop an eco-friendly underwater robot powered by sustainable energy, minimizing disturbances to marine habitats and reducing pollution."
* **Images/Visuals**:
  + Diagrams or photos of fragile underwater ecosystems (e.g., coral reefs, kelp forests).
  + Icons representing common robot impacts, like noise pollution, physical interference, and waste.
  + A map of zones where ecosystem protection is especially critical.

**Phase 2: Design**

* **Text**:
  + **Eco-Friendly Features**:
    - **Propulsion**: Bio-inspired fins instead of traditional propellers to reduce noise and turbulence.
    - **Sensors**: Proximity sensors to detect and avoid sensitive marine life and habitats.
    - **Power Supply**: **Solar Panels** on the robot’s surface for shallow, sunlight-exposed regions, and **Wave Power** to harness energy from underwater currents for deeper zones.
  + **Sustainable Materials**: Constructed with non-toxic, biodegradable, or corrosion-resistant materials.
  + **Team Collaboration**: "Our team collaborated to brainstorm, research, and plan an eco-conscious design that minimizes environmental impact."
* **Images/Visuals**:
  + Concept sketches of the robot with labeled eco-friendly features: fins, sensors, and solar/wave power systems.
  + Diagrams showing how solar and wave power will be harnessed.
  + Timeline or flowchart of the project phases, showing design progression.

**Phase 3: Create**

* **Text**:
  + **Prototype Development**: "Our prototype includes soft, bio-inspired fins, sensors for obstacle avoidance, and dual power systems using both solar and wave energy."
  + **Innovative Power Solutions**:
    - **Solar Panels**: Positioned on top of the robot for capturing sunlight in shallow regions.
    - **Wave Power Generator**: Converts kinetic energy from ocean waves and currents into electricity, providing a continuous power supply.
    - **Energy Storage**: Onboard rechargeable batteries store power from solar and wave generators to ensure uninterrupted operation.
  + **Testing Environment**: "The prototype was tested in a controlled water tank with simulated sunlight and wave conditions to assess power efficiency and environmental compatibility."
* **Images/Visuals**:
  + Photos of the prototype with close-ups of the solar panels, wave generator, and eco-friendly fins.
  + Diagram illustrating the power system with solar and wave power flows into a storage battery.
  + QR code linking to a short demo video of the prototype in a test environment (optional).

**Phase 4: Iterate**

* **Text**:
  + **Testing Adjustments and Feedback**:
    - "Initial tests showed areas for improvement in power efficiency and sensor sensitivity. We adjusted the solar panel angles and enhanced wave generator responsiveness for higher energy yield."
    - **Key Improvements**:
      * Optimized solar panel orientation for maximum exposure in sunlight.
      * Modified wave generator design for greater power efficiency in varied wave intensities.
      * Enhanced sensor accuracy to improve obstacle detection and minimize potential disturbance to marine life.
  + **Testing Outcomes**: "Post-adjustment tests revealed a 25% increase in power efficiency and a 40% improvement in obstacle detection accuracy."
* **Images/Visuals**:
  + Before-and-after photos of prototype adjustments (e.g., solar panel angle changes, wave generator modifications).
  + Graph or chart comparing power efficiency and detection accuracy before and after iterations.
  + Photos of team members working on adjustments in the testing environment.

**Phase 5: Communicate**

* **Text**:
  + **Project Impact and Applications**:
    - "Our robot provides a low-impact, sustainable solution for marine ecosystem exploration and monitoring, promoting long-term ecological preservation."
    - "By minimizing noise and physical interference and using renewable energy sources, this robot can support scientific research without harming marine life or habitats."
  + **Future Applications**:
    - "Future enhancements could adapt this design for deeper underwater environments, expanding the scope of eco-friendly exploration tools."
  + **Team Reflections**: Brief quotes from each team member on their role or key takeaway (e.g., "Working on sustainable power systems taught me the importance of eco-friendly design in robotics").
* **Images/Visuals**:
  + Infographic summarizing the eco-friendly features and benefits to marine ecosystems.
  + Group photo or team picture celebrating the project.
  + QR code linking to a video of the robot in action or a team presentation (optional).