|  |  |  |
| --- | --- | --- |
| **Goals Alignment** | **Research Goal 1:** | **Research Goal 2:** |
| **Student Learning Goal 1:** |  |  |
| **Student Learning Goal 2:** |  |  |
| **Student Learning Goal 3:** |  |  |

**Example Research goals:**

*Arabidopsis* example:

Research Goal 1:

* Identify and characterize the role of flavonoids in tolerance to herbivory of the model plant, *Arabidopsis thaliana*

Research Goal 2:

* Identify and characterize how herbivores respond to feeding on wild-type versus mutant *Arabidopsis thaliana*

Biochemistry example:

Research Goal 1:

* Identify a key amino acid residue in beta- galactosidase and introduce a mutation that can be expressed in *E. coli*

Research Goal 2:

* Express and purify the mutant enzyme and determine its effect on protein function

**Example Student Learning Goals**

* Design a well-controlled study that builds on prior knowledge and makes progress toward a research goal
* Make and defend decisions during experimentation (e.g., when trouble-shooting or determining how to proceed when data are ambiguous)
* Communicate about research progress orally and in writing
* Develop novel research questions using publicly available data repositories
* Formulate a testable prediction grounded in theory and previous research
* Gain expertise in molecular biology and biochemistry lab techniques
* Develop skills in collaboration and communication through teaching and learning from peers, as well as giving and receiving feedback on scientific writing
* Write a journal-style scientific paper
* Develop a scientific identity
* Increase confidence in STEM disciplines
* Develop a sense of project ownership

**Example of alignment in *Arabidopsis thalinana* CURE**

|  |  |
| --- | --- |
| **Goals Alignment**  **Step 3** | **Research Goal 1: Identify and characterize the role of flavonoids in tolerance to herbivory of the model plant, *Arabidopsis thaliana*** |
| **Student Goal 1:**  **Design a well-controlled study that builds on prior knowledge and makes progress toward a research goal** | **Summarize current, general knowledge about the role of flavonoids in herbivory based on 3 provided reviews**  **Describe the *Arabidopsis* life cycle**  **Use PubMed or Google Scholar to find at least 12 papers published within the past five years on the study of flavonoids and herbivory in *Arabidopsis***  **Distinguish between primary and secondary literature**  **Create an annotated bibliography of 6 primary lit papers most relevant to our research goal**  **Identify *Arabidopsis* genes that might play a role in herbivory by a specific organism (e.g., spider mite)**  **Explain what is meant by gain-of-function and loss-of-function mutations**  **Choose one herbivore and at least two mutants to study to address this research goal, and defend the choice with references to peer-reviewed literature**  **Outline a study design for at least one mutant and the selected herbivore to determine the role of the altered gene in herbivory, including specifics of how herbivores will be contained**  **Define what is meant by “a control” in an experiment**  **Identify appropriate control conditions with respect to the plant and the herbivore**  **Outline a timeline for the experiment, including how and when plants will be grown, infestation will take place, and data will be collected** |
| **Student Goal 2:**  **Make and defend decisions during experimentation** | **Briefly summarize the current status of an experiment**  **Make and defend a claim about the current status of an experiment (e.g., is it “working”? How do you know?)**  **Propose and defend the next step for the experiment (e.g., will you change what you are doing? If not, why not? If so, what will you change and why?)**  **Use references to defend experimental decisions**  **Gather and summarize feedback from others (peers, instructor) about proposed experimental decisions** |
| **Student Goal 3: Communicate about research progress orally and in writing** | **Prepare and present periodic group / class meetings about the research**  **Write brief progress reports, including descriptions of any issues or problems and how they were addressed / are being addressed**  **Prepare and present a poster about the research to audiences outside the group / class**  **Contribute to writing a paper about the research (e.g., draft methods and results)** |