**Problem Posing Template for Individual Activity**

**Evie Brahmstedt**

**Module Overview**: A problem posing session before Gen Bio lab students develop hypotheses for a literature review they need to write with a partner.

**Setting**:

General Biology lab (first semester freshman, primarily) – Ecology/Evolution semester

Learning Outcomes for the activity-

hypothesis development, communication (writing skills), collaboration, literature searching and citing

How does data acumen align with this learning outcome? Place an “X” in the column next to the skills practiced in this activity

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Quantitative Pillars** |  | **Data Life Cycle** |  | **Social/Pedagogical Concepts** |  |
| Mathematical |  | Data import | X | Communication | X |
| Computational |  | Management | X | Equity, Diversity, Inclusivity | X |
| Statistical thinking | X | Curation | X | Universal Design for Learning |  |
| Reproducibility | X | Analysis | X | Ethics | X |
|  |  | Sharing/ Reporting | X |  |  |

**Activity/Module**:

Course type: lab

Pedagogy: research project

Tools: Peer reviewed studies; associated search engines; open databases – potentially; each other!

Incorporation of problem posing: This research project is an existing exercise in the lab curriculum, but problem posing in an organized manner could be a very useful consideration at the early stages of the project. Students work with a partner to write the report and develop a hypothesis, which is a challenge for their interpersonal and communication skills and is a section of the course that we often see conflicts arise between students. The first step of the project is determining a hypothesis with a partner. This is typically a very awkward step because A) students must talk to someone else, B) students have to communicate their ideas with someone else, C) they have to formulate a hypothesis. The problem posing session would fit in well because it would take minimal time to run and potentially save time later as it streamlines the brainstorming process.

Incorporation into activity: The way the project starts, or has in the past, is students will pair up and pull the name of an organism out of a hat and they will have time to brainstorm hypotheses for the a literature review they need to write over the course of several weeks. The brainstorming session is often a struggle (as described above) but structuring it via problem posing would assist in the process. So, they students have an organism and the alteration would be to then have them take 5-10min to write down any and all questions they have, without second guessing or altering. I think this is also key because then they are released from the pressure to feel like they need to have the first thing they say or write be the final, well thought out hypothesis. And, it can help break the ice, in a sense where both students can easily contribute, rather than one taking over. Especially after, when they pick a question or maybe narrow down a couple and can work together to alter it or expand it. Then the task would kind of flip, in a sense, and instead have them write down any possible answers to their chosen question they have. After, they would pick one or a couple and hash them out more to finally create an “if… then” statement as a hypothesis. Many students come into Gen Bio first semester with a range of skills, so having a streamlined problem posing activity to develop the hypothesis would engage students with any range of skills. Lastly, a final “problem posing” session would occur in which students would make a list of possible data, data types, categories, or any sort of quantitative analysis that they would search for in/apply to their primary literature search, to help answer their hypothesis, (e.g. students may pull data from studies on concentrations of mercury in Lake Trout and synthesize it in a way to inform their hypothesis). The quantitative analysis would also require students to dig into studies a bit more, rather than just reading them and getting the take-away conclusions.

**Assessment**:

After each group has their hypothesis, they must run it by their TA for approval before moving forward. This is also an opportunity for editing and revisions. Each student pair must outline the problem posing process that occurred and highlight the resulting hypothesis along with the quantitative analysis that will be conducted using primary literature.

The learning outcomes (hypothesis development, communication (writing skills), collaboration, literature searching and citing) will all be used again in higher level courses (and careers… hopefully!) and will be shown in the form of a final report.

**Extra information**:

Students do not need much prior knowledge, other than the research project design and expectations.