

Session One

Research Presentation & Student Questions

A. Fellow's Presentation of Research Topics

Presentation should take probably no more than 20 min. Each Fellow should decide the general topic(s) on which students should base their future projects. Although the topics should be pretty broad, it is up to you regarding the direction you want to go. For example: Jessica has decided to use current scientific topics for her students but others may wish to stick with the topic of their research. You decide how you want your class to proceed; however, realize that the topics you choose will determine the course of the rest of the semester.

B. "What I Would Like To Know"

After the Fellow's Presentation, students should be asked to write down questions they have and may like to investigate. Each student should be given up to 5 strips of chart paper (the greater number of strips you give each student, the greater number of questions available later for student research groups to consider). Have the students write their questions as big as possible so that everyone will be able to see the questions when they are posted around the classroom. At this point, I would not limit the students to "good" scientific questions as that will come in later group discussions. Just let the students write down what has made them curious.

C. Discussion of What Makes a Good Scientific Question

After students have finished writing down their questions, collect the strips of paper. If there is remaining time for this session, it may be a good time to talk about what makes a "good" scientific question if you have not already done so. If you have already had this discussion, it may be worth doing a review (making sure you write on the chalkboard the main points so that students remember what was covered last time). This talk will prepare them for the next session.

Changes:

“What I Would Like To Know”

In previous training sessions, we have suggested that Fellows take time to group the student questions during class. In thinking about how to increase general order in the classroom, I have come up with an alternative suggestion. Notice that this series of events takes place over several days.

1. Have students turn in their question strips.
2. Group questions outside of class. (By grouping the questions outside of class you have more time to think about how you want to organize the questions. Plus you might decrease the possibility of students becoming disengaged if you were to try to group questions during class time.) You need to create at least as many question groups as future student research groups.
3. Create a banner for each group topic. Write down the topic you have chosen for each group of questions. Make sure that what you write down will be clear to all students.
4. Meet with your teachers to discuss how you have grouped the questions and the general topics available to students for investigation.
5. Ask the teacher to place the banners (and all questions associated) around the classroom. Questions should be taped under their associated banners and banners should be placed so as to allow students to view the questions as they move around the room (i.e. place questions around eye level and space the question groups).
6. Allow students approx 15-20 min (may take longer) during class to look over all the questions as they mill about the room. If you are certain that the teacher understands how you have grouped the questions, you may not need to be present for this part. Students should look over the questions and chose which group they are most interested in (have them write down 1st, 2nd, and 3rd choices). Have students turn in their choices.
7. Meet again with your teachers to assign students into their research groups.

Session Two

Developing Student Research Questions

- A. Have students organize themselves into their research groups.
- B. Give each group the associated questions.
- C. Have students discuss which questions they would like to use as research questions. Students need to make sure they modify questions as to be “good” research questions if necessary. Also students may chose to come up with alternative questions if they are better suited to be research questions as long as they still lie within the general topic assigned.
- D. Remind students that they have to choose questions that can be answered given whatever limitations your class might have (i.e. the questions have to be answered within travel, resource, and time limits).
- E. Students should probably pick more than one question to research. Let students know that their research project should contain several high success parts (low to moderate difficulty; able to completed in a short amount of time) and perhaps one or two parts of moderate success (higher difficulty). Also let students know that research projects constantly evolve and that they may alter their questions/chose new ones as situations arise.
- F. At the end of the session, students should turn in their research questions along with a list of the Fellow(s)/Teacher(s) that assisted them. This is so that if the primary Fellow has any concerns, they can get further clarification from the people that assisted the group.

** I would recommend that each Fellow has their partner to help them during the next couple of sessions as well as Vic/Michelle/other Fellows.

Session Three

Developing Student Research Projects

**This part may intermingle with part two.

- A. Have students get into their research groups.

- B. For each research question they have chosen, students should start to write out the materials & methods they will use. Let students know that they should list needed materials clearly so that we can start to collect what they need. Remind students that while we can purchase some things they should try to limit themselves to what can be easily created or materials that are readily available (i.e. small tanks, rulers, etc.). Students should ask Fellows if materials might be available if they have any doubt.
- C. Students should include drawings of experimental designs, maps, and charts or graphs as necessary. I definitely recommend each group draw out what they plan to do.
- D. Remind students of replication and sample size. Make sure this is included (and clearly stated) in their methods.
- E. Groups should be able to discuss the possible results (hypotheses and alternative hypotheses) they will obtain from their research.
- F. At the end of the class period, all groups should turn in proof of progress.

Sessions Four & Five

Developing Student Research Projects Cont..

I believe it will take two sessions for students to develop their research projects fully. However, as you monitor your class, you may decide that an additional session is necessary. Groups will go through this process at different paces. If a group finishes, have them start to organize how they will meet to start their project, create a time line, or allow them to start setting up.

** Make sure you have students turn in proof of progress at the end of each session.