Appendix A: Assessment guidelines

One major deliverable is done collectively by the team. Depending on grading resources and in-lab time availability, this varies by semester: it is either a written conference **abstract** (including a figure) or a **presentation**.

Grading Breakdown

The team project is worth 10% of your course grade. This is divided as follows:

Abstract OR Presentation – 8%. *(Graded as a team; may be individually adjusted based on team evaluations)*

Including initial draft (evaluated by TA) and final version (evaluated by TA and by peers).

Project Contributions – 2% *(graded individually)*

Your lab prep & checkout from project weeks.

Completion of peer evaluations (of presentations or of abstracts)

Completion of team evaluations

The scoring rubric we will be using is below. We share this with you to be transparent about where your grades are coming from.

These 6 questions are scored, each on a scale of 0 (**missing**) to 6 (**absolutely outstanding**)

1. Please evaluate the **Organization/Clarity**. (Did the story they presented flow nicely? Was their thinking clear? Was their data presented appropriately for its type?)
2. Please evaluate the **Experimental Process/Design**. (e.g. How well did they describe their research question & hypothesis; and, how well did their experimental design really test their hypothesis/question? Do the variables they chose make sense, and do you agree with how they chose/measured them? How did they handle having data collected at all different houses? How would you evaluate the experimental controls they chose? If they had to troubleshoot (which is totally fine, and shouldn't be penalized), was it specific and logical?)
3. Please evaluate the **Interpretation/Reasoning**. (e.g. Did they discuss their findings in the context of broader biology and/or other scientific methods/experiments? Did you understand and agree with the way they interpreted their data? Were they specific and targeted about the conclusions they made? Did they describe useful follow-up experiments, limitations to the study, and/or specific/logical next steps to improve the method? Note- don't penalize for unexpected results – instead, think about how they dealt with or interpreted these results.)
4. For abstracts only: Please evaluate this abstract's **Choice/usage of graphic.** (e.g. did they choose their graphs/diagrams well, to communicate their key finding? Is it formatted appropriately/clearly, including (if a graph) appropriate graph type, axes, caption, legend, error bars, etc?)
5. If you were in charge of the conference, how would you rate this, **overall**, out of 6?

<u>Assignment guidelines:</u>

The **conference abstract**:

The abstract will consist of a **short, written summary of the project, plus a single figure** (which can be a graph, or a diagram/model/flowchart to help communicate the work). The abstract has a **strict 300 word cut-off**. The word count does not include the figure title/caption nor the references list.

Abstracts are frequently used in science when we decide/attempt to share our work at conferences. You send in the abstract, and the conference organizers use it to understand your work, and to decide whether you will be accepted to present your work at the conference.

For our course, you can assume that your abstract was accepted by the conference organizers, and that you have been invited to present the work that you described. Abstracts are also used at the beginning of scientific publications as summaries of the work performed, so learning to write one is a very useful skill in science!

Your abstract should convey what you did, why you did it, and what you found. This is challenging to do in just 300 words! You really have to prioritize what things are most relevant to your audience to create a clear and concise summary.

The **presentation:**

This is a **4-5 minute talk** presented in person during your regular lab time, in Week 10. The rest of your lab section will be your audience. There will be time after that for people to ask questions of your team. You are allowed a **maximum of 5 slides total.** (This includes everything! Even your title slide!) You must use a **font size of at least 28**. Exception: graph axes and citations/references can be a smaller font. However, your graph axes still need to be visible to your audience!

Note that this isn't a completely unreasonable time-frame - at some conferences, researchers and graduate students are only given 10-15 minutes to present one or more years of their work!

Tips for making your slides and presentation:

- Don't put everything you want to say on the slide! Think of your slides as a visual aid, not a script for your presentation.
- Don't make images too small for us to see!
- Don't try to be too creative with fonts, colours, or animations. It can be distracting.
- Please put your names and team name on the first slide so we know who is presenting.
- References can be in small text on the bottom of the slide, rather than in a list at the end; but you can do whatever works for you.
- Practice presenting your slides so that you understand the mechanics of how they will be seen in real time. (e.g. do a trial run, and make sure your slides don't get cut off, and are visible in a full-screen view to the other people in the Bb collab room.)

For both assignments, you will need to explain your findings in the context of broader biology and research. Textbooks are appropriate reference sources, as are research papers (e.g. you can search PubMed for relevant articles that may help you explain your results). To appropriately cite your sources in both the presentation and abstract, you may use any modern referencing style. In your presentation, your references can be short form (Author, year, journal) and in a smaller font.

Team contributions

All team members need to contribute to the work, but you may split the work up amongst yourselves. In other words, not everyone needs to work equally on all parts of the process, but the total work does need to be split evenly across the group. Big picture: Everyone needs to contribute equitably, overall.

It is your team's responsibility to check in with each other about workload, and to be honest with each other about how things are going: during planning and as you go along (not just at the end). Remember that you are all getting the same grade, unless there are substantial issues that you have raised in advance, so you all need to contribute.

Appendix B: Team check-in prompts

Week 3 in-lab activity continued: Prompts for team check-in

Modern science is done in teams, who work collaboratively on projects. Team skills are not always easy, but they are super important: when we surveyed recent SFU science graduates, the number one skill that they wished they'd had more of in their degree was collaborative work skills. So, we're going to continue working on it here.

*Note that this group project requires **reasonably equal contribution from every team member, as you are all getting graded together**. For most teams, this is fine. However, if in your team there are substantial problems or differences in contribution/attendance, you need to first try and work them out – ie, the absent team member needs to be reached out to, and given a chance to explain and correct the problem. If you have been more of a slacker, you need to step up and communicate to your group. This is a team project, which involves building team skills as a core part of being a scientist. So, leaving your team to work individually on your own project is not meeting the learning goals of the course.*

Big picture: As a group, you have the responsibility for managing your project and your team relationships. If you're feeling frustrations, you need to try and resolve your group problems early on, not just at the end. If, during the project, after having tried several ways to address any issues, please check in with your instructor for ideas.

Note that you'll be evaluating each other at the end of the project. This peer evaluation can impact your individual grade on the project.

In your lab prep this week, you briefly self-assessed your contributions to the team. Today, you'll have conversations about your shared contributions. These can be difficult conversations to have, but they are also valuable – and it's more useful to have these open conversations now, rather than after-the-fact when nothing can be changed. Just like with our science experiments, we are all here to learn, and everyone needs to take ownership of how the teamwork is going. Celebrate the effective teamwork you have, and own the problems to solve them!

What is something you each think your group does really well, and you want to keep doing?

What is something you each think your group needs to improve on?

This project involves a lot of being accountable to yourself and each other. Have there been any issues with people not attending, or leaving early, or not equally contributing? If so, how have you (or how will you) resolve this problem, early on? Have this conversation in an honest but not judgey way.

What expectations do you have of each other, for the next few weeks on this project? These can be big ("come up with amazing ideas and share them with the group") or detailed/small ("show up on time, stay throughout the lab; reply to messages within a day; if you're going to miss a deadline, let us know rather than just not showing up")

As a team, where will you collect your data? How will you share it?

Know the reasonable things you're getting into: everyone has a life outside of this course and project, and we need to respect that. So, what constraints do each of you have, related to the project? (e.g. dates of midterms/schoolwork to work around; job or family care schedules; allergies/sensitivities to different reagents; access to materials or a place to work on your project.)

If you have time remaining at the end of lab today, you should start planning out a timeline of your project. This should include each major step of your experiment, and even distribution of work among teammates. Setting deadlines up front makes you accountable to your group and ensures you have a reasonably workable plan to get everything done in time.

Appendix C: Team and Self-Evaluation

Post-presentation questionnaire

Self- and team-evaluation for lab teams.

You'll be evaluating the members of your own lab team, including yourself. Please think back over the semester, including the project and the regular labs. Consider each person's 1) contributions to, 2) participation in, and 3) effective work within, the team.

Question 1: For each team member (including yourself), give a rating for their contributions.

Well below average   Below average   Average   Above Average   Well Above Average

Note *that the marks must even out to "Average" for your group. The "average" of your group is the "Average" - and (mathematically speaking) for every person above average, there must be someone below average.*

Not everyone can be "above average" even if a group itself is a strong group - I am pushing you to think critically about your and others' contributions.

So: If everyone did the same amount of work, then everyone gets "Average"

If one person contributed a lot, and another person contributed less, then you would have an "above average" person and a "below average" person.

Question 2: In your experience with this team, on this project:

Do you think that everyone on your team deserves the same grade?

True False

Question 3: If you answered False to the question above, explain your reasoning.

Appendix D: TA meeting notes

Experimental Design Week

- Understanding the overall project guidelines
- Project feedback
    - What should feedback look like?
        - Goal is to ensure they have a project that:
          - addresses their hypothesis
          - is reasonably well controlled
          - is of reasonable scope (not too ambitious)
    - To do this you will focus on:
        - Clarity (Do they understand what they are doing? Do you?)
        - Feasibility (Will they address the hypothesis?)
        - Controls/scope are OK.
        - Shared responsibility
      - Give as much direction this week as you can = prelim feedback
        - Students can tweak/add until next week
      - Next week, 10 min. drop in per group = full feedback
- Framing their experiences in the language of research to support their identity as researchers
    - Roles: Collaborators, project managers, lab team; you (TA) are a consultant but not an owner/author/manager
    - What to do about confounds: standardize, control, explain impact of, transparently describe as limitation
    - Challenges and benefits of a multi-site experiment
    - Reagent/equipment constraints (needing to find a different way to operationalize variables depending on grant/budget)
    - Incremental iteration; Troubleshooting and tightening up research question; Pilot experiment, preliminary data, multi-phase experiment
    - Re-framing results: advances in methods rather than impact on biology
    - Normalize imperfectness of every experiment/paper

Data analysis week

- This week - Project Data analysis!
    - In lab this week - lots of feedback!
        - Stop in and give feedback on analysis.
        - You (personally) need to know how to add custom error bars in excel, because they may have trouble with this.
        - Common issue #1: “our experiment didn’t work”
            - Talk about what they learned, what to do differently
            - “Bad data is still data”
            - “Future studies” - analysis of what to do differently (specifics, troubleshooting)
            - What does it mean for an experiment to fail? Rethink about methods
            - What biology are they trying to interpret? Focus on this.
            - “What do you mean by, it didn’t work?”
        - Common Issue #2: Many of them aren’t sure how to handle their data. It often is a series of qualitative observations over time.
            - One suggestion is to transform this into “how long did it take until we saw <a specific thing>?
                - how long until this sample had colour change/mold-growth/etc
                - Then their X variable is their IV (e.g. what type of flour, what type of juice, what concentration of solute, etc)
        - Common Issue #3: Replicates
            - Replicates to average together should be the same thing (no experimental differences, except possibly at another person’s house).

Appendix E: TA guide

BISC 101 TA Guide: Research Projects

General Issues with Experimental Design

For many students, this research project will be the first time they design and conduct an experiment and analyze and present their data.

Below is a list of issues with experimental design that students encountered in last semester:

1. **Designing experiments that do not address the research questions.** Students may write research questions that include variables and/or concepts related to their project that they do not necessarily test for in their experiment(s). May help to have an activity in tutorial where they critique different research questions or discuss their design during the laboratory session.

2. **Complicated and/or unclear hypothesis.** Many students have difficulty formulating a hypothesis! Generally, their hypothesis should include a prediction, rationale for their prediction, and their independent and dependent variables. "If …, then …" statements may help but are not required. Sometimes "if …, then …" statements make students' hypothesis unclear because they try to make their hypothesis work with a "if …, then …" statement. May help to have an activity in tutorial where they critique different hypotheses or discuss their hypothesis during the laboratory session.

3. **Having proper controls and understanding the importance of controls.** The topic of controls can be confusing to some students. They may find similar experiments conducted in previous lab exercises and use those as the control without knowing why they were considered proper controls for that experiment. It may be helpful to have a discussion with students on what their control is, what it is testing (controlling), and/or why their control is important.

4. **Having trouble with quantitative variables.** Students may have difficulty coming up with a quantitative dependent variable and/or may have too many! They can always collect several dependent variables, as a backup. Some of these can be qualitative (e.g., smell or colour), but they should be consistent with how they determine these. For experiments where time might be the dependent variable, consider endpoint and time-series. Endpoint is the final time point in which they measure their dependent variable while time-series is the time points in which they measure their dependent variable (e.g., checking on the experiment every 5 minutes would be the time-series while checking the

experiment after 40 minutes would be the end point). See Jello-setting experiment for example.

5. **Dependent variable(s) are qualitative (e.g., change in taste).** As some of the research topics use food (e.g., sourdough starter), it is very tempting for students to use dependent variables that are qualitative (e.g., comparing taste and texture). Students can collect dependent variables that are qualitative (on top of at least one quantitative dependent variable), but it needs to be done in a way where it is consistent. If students are struggling to understand why this is an issue, it may be a good idea to discuss some of the following points:

    - Subjectivity of these variables (e.g., what tastes different to one person may taste the same to another person). If you plan on collecting qualitative data, how will you standardize the way you measure the qualitative variable?

    - Having people who conduct the experiment also being the ones determining whether there are changes in a qualitative variable. This may come off as bias – students conducting the experiment are also saying there is a change in a qualitative variable (e.g., taste or texture).

6. **Details associated with dependent and independent variables.** Students may write dependent and independent variables in a very broad sense (e.g., decrease in X will result in an increase in Y) and not include how they will measure the dependent variable (e.g., height in mm) or how the independent variable may differ (e.g., may just say high vs. low concentrations rather than specific concentrations).

7. **Balancing experimental size with practicality.** For every new treatment or control, they double or triple the number of samples (because each condition or control has replicates). This may make their experiment more costly and/or they will need to spend more time on their experiment.

8. **Wanting to test many variables and/or take on a really big research project.** Some teams may want to go all out for the research project, but not recognize the amount of time this may take. In addition, the experiment(s) they propose may be impractical given the resources and time they have to complete their project! You could suggest planning for a multi-step experiment. First hypothesis/objective tests your first independent variable. If this experiment works, then they could use a similar setup to ask a 2nd research question using a second independent variable. In this case, the subsequent experiment(s) are bonus. They should try to get the first experiment done so they have data to present and can submit a complete research project.

9. **Running the experiment at different houses.** Due to COVID-19, students will need to run the experiment at their own homes. This is fine as they will be running a “multi-site” experiment, where each student can run all replicates of one of the treatment groups or one replicate of each treatment group. It is up to the students to decide what they want to do!

10. **Scheduling.** Students are asked to create a schedule for when they plan on conducting the experiment, analyze data, write the abstract, and put together the presentation. One thing to pay attention to when looking over each team’s schedule is to ensure they are not conducting experiments up to the last minute (if possible). Some teams may plan on starting experiments a week or two before the deadline if it only takes a few days to conduct the experiment. However, experiments do not always work perfectly the first time! If teams are cutting it close with data collection, make a recommendation to start running experiments earlier!

11. **Getting material(s) for experiments.** Students may come up with a list of materials they need to get for their experiment(s), but will often times leave out the amount of each item they need. Encourage them to think ahead and work out how much of each item they need to run all replicates in their experiment (and a bit extra in case their experiment does not workout the first time). Another potential issue if this course is taught online is that students may not be in B.C. or Canada! Students may not be able to get the same brands of material(s) they use for experiments. The source in which food items (e.g., eggs or plants) come from may also differ if they are outside of B.C.! This is okay, but they may need to talk about this in their graphical abstract and presentation if they notice differences between the results from experiments conducted within B.C. and results from experiments conducted outside of B.C. or Canada.

Choosing a Research Topic

Here are the project themes! Students received these descriptions in their lab prep and exercise for this week. Under each project theme, there are some common issues students from previous semesters encountered while planning for and running their experiments and some questions that came up during the planning process.

<u>Seed Germination and Plant Growth</u>

Description:

In this experiment, you will investigate the impact of environmental variables on seed germination and/or seedling growth – whether in soil, or in a Ziploc bag. From growing these seeds, you will investigate rates of germination and/or growth in your treatment conditions. These conditions could be intended to support seed germination (sun, temperature, etc.) or deter it (irradiation of the seed, heating, treatment with chemicals such as peroxide). What affects the direction/speed of growth? The best seeds for this project are radish, marigold, tomato, bean, mung bean, black mustard

You might instead be interested in the further growth of already-sprouted plants, and how they can be affected by hormones. For example, mint plants are fast-growing, and can be treated with plant hormone. Could you design an experiment to make them branch out rather than grow taller?

Potential Issues and Concerns:

- Some students in the fall semester were not able to purchase seeds from stores as they send their seeds back due to season changes.

- May not indicate how they plan on measuring growth (e.g., height of plant).

- Some students may try to buy fruits and get the seeds from it rather than buy a pack of seeds. This is okay, but one recommendation for them may be to get all the seeds from the fruits first and divide the seeds up.

<u>Fruit Enzymes and Jello Jigglers</u>

Description:

Gelatin, an animal protein, is the component of jello that gives it firmness/structure. Some fruits, such as pineapple, have enzymes that may break down the gelatin and prevent it from "setting." This project theme encourages you to characterize something about either the enzyme, or the gelatin itself. For example, what can you learn about the enzyme? Is it heat-sensitive? Is it pH-sensitive? Does the amount of enzyme make a difference? Is it found in the fruit juice, or only in intact fruit?   Does the enzyme also work on gelatin substitutes such as fruit pectin?

Potential Issues and Concerns:

- Endpoint vs. Time Series
    - May want to do a preliminary experiment where they figure out how long jello takes to set (i.e., what is the cutoff time for a reasonable endpoint)
        - Then, (say it takes 40 minutes), they can either do an 'endpoint test' or a 'time series'
            - Endpoint: Check all samples at 40 minutes to see which treatment groups have set

        - Time series: Check each sample every 5 (or so) minutes to see which treatment groups have set.
    - Other cool ideas for this one: at a certain point, running the jellow down a plate, seeing how far it goes. Or measuring the liquid volume left over after it was expected to have 'set'.

Sourdough Starter

Description:

Microbes live all around us, and can be harnessed to help make our food. In this project, you will grow your own sourdough starter from scratch just by mixing flour and water. For ~2 weeks, you will measure some characteristics of your starter culture to track the growth of your "microbial zoo" over time. You'll also choose independent variables to see what might impact the growth. Following the project, you may be able to use your starter to make your own bread!
More details/ideas here: http://robdunnlab.com/projects/wildsourdough/ (this project can connect with community science, outside our course!

Potential Issues and Concerns:

- The control(s) for this experiment may depend on the independent variable the students choose. For example, students in the past have chosen to test the type of flour on the height of sourdough starters. A possible control for this situation may be the type of flour that is commonly used for sourdough starters (e.g., all purpose flour). If students are having a difficult time figuring out the control for their experiment, here is a list of questions and things to discuss with them that could help them figure out their control(s):
    - What are you controlling for? What do they see as a baseline?
    - Ideas for controls:
        - Evaporation? Water is a good control.
        - Presence of microbes? They can heat-kill some flour (bake it in an oven for a while) and use that.
        - Could buy some yeast from the store and use it as a positive control
    - It is totally fine if their data points for treatment groups end up being higher or lower than their positive control (just want their control to be expected to show some kind of signal/output/measurement).

- Students may choose to measure the height of their starter but may not select specific and consistent time points to measure height.

- Some students in the Fall semester that tried this experiment had mold grow on their sourdough starter. Some groups who had team members do all of one treatment had to toss out most starters they did (don't think there was one group that had to toss out an entire treatment, but it may happen). May be good to recommend that each team member do one of each of the control and treatment groups so an entire group does not need to be tossed out if mold grows on a set of starters by one team member.

Preventing Microbial Growth

Description:

In contrast, maybe you're interested in preventing microbial growth. Microbes grow on our food (for example, growing on berries) or can be cultivated (on home-made agar plates). In this theme, you'll design an experiment to test the impact of environmental conditions or applied treatments on the growth of microbes. For example, some websites say that aloe vera will prevent mould growing on blueberries. Does it make a difference if the berries are in the fridge? Or, maybe you're interested in testing out the effect of cleaning supplies or kitchen materials on the growth of bacteria in a dish?

Potential Issues and Concerns:

- Depending on the independent variable(s) and experimental conditions (e.g., temperature and humidity), microbes may take a while to grow and/or become visible so student may want to consider starting their experiments early.

Osmosis / Diffusion in Plant (Potato Tubers) or Animal (Eggs) Models

Description:

In this experiment, you will use root vegetables (e.g. potatoes) to investigate osmosis. The cell membranes of these sticks are selectively permeable and allow water but not all other molecules to cross. Your team will design an experiment using common kitchen reagents (root vegetables, sugar, salt) to investigate rates of osmosis, and membrane permeability, in potatoes or other root vegetables. A detailed overview is here:
https://docs.google.com/document/d/1M_rOpkncqCkNeaH2DoKdvvk8lazEjzsyCqJoMGOoNIg/edit?usp=sharing

Instead, you could use eggs to investigate osmosis and diffusion. You can remove the shell through 'decalcification' and then soak the eggs in varying solutes to understand egg physiology. Or, you can use food colouring to and other conditions to measure the rate of diffusion through the egg.

Potential Issues and Concerns:

- Teams seem to be really excited about this experiment, but some teams may have difficulty with fully understanding this experiment and/or how to measure the rate of osmosis and membrane permeability. May have to discuss how to conduct this experiment with teams that are interested in choosing this project theme.

<u>Capillary Action in Plant Stems</u>

Description:

In flowers, liquids move from the base of plants up to the flowers through the plant's vascular system. Using white flowers such as carnations, with food colouring, you can test hypotheses about what factors affect the rate of fluid movement. Does the size of stem matter? What about temperature, tonicity, size of the food colouring molecule, other chemical characteristics? Does the liquid always move the same direction, or can it go in either direction?

Potential Issues and Concerns:

- May not indicate how they will measure rate of fluid movement.

- Selecting time points to take measurements. Could potentially take measurements everyday or at one timepoint, but they need to be consistent across control and treatment groups. For example, if they are taking a measurement at one timepoint, all team members should try to take measurements around the same time.

<u>Another Project Idea You Have</u>

Description:

You'll need to think this through, and it has to meet the overall project constraints/goals.

<u>Note:</u> Any project idea(s) students come up with and would like to pursue for their research project must be approved by the Lab Instructor and/or Lab Coordinator.

Potential Issues and Concerns:

- Teams may come up with projects that will not be completed in time for the laboratory session where they analyze their data.

Data Analysis and Conclusions

For the purposes of this course, we will be using overlapping error bars (standard deviation) as an indication of significance. If error bars overlap, there is no significant difference while there is a significant difference if there is no overlap between error bars. It may be helpful to discuss the advantages and disadvantages of this method of statistical analysis during tutorials.

Some potential issues and concerns students may run into as they analyze their data and write their conclusions:

1. **Error bars are really wide and do not look "good".** Some students may have really wide error bars for their control and/or treatment groups. This is fine – remind them that they had really small sample sizes so it is not uncommon for standard deviation to be large. If they are really concerned about how the error bars look, they can present just the top part of the error bar.

2. **The results look weird, so the experiment did not "work".** If the results do not look good or if students get weird looking graphs, they may think that their experiment did not "work". It may help to have a discussion with students about what may have caused their experiment to not "work" (e.g., are there confounding variables they did not think of). Remind students that conditions were not entirely controlled despite their best efforts to control experimental conditions and it's not uncommon for the results to look a little weird with small sample sizes!

3. **Drawing broad conclusions or drawing conclusions without referring to the data.** Students may have difficulty writing conclusions based on the results of their study. They may write conclusions that are too broad. For example, if they are conducting the seed germination experiment using radish seeds, they may write a conclusion about radish seeds in general when they've only tested radish seeds from BC. Another issue may be that they write conclusions without referring to their data. In their conclusions, they should discuss a bit about their results and why it supports their conclusion(s).

4. **Using their data to make figures and tables.** The link for a video on how to make graphs on excel is included in their lab exercises. Some of the issues

students run into with making graphs on excel has to do with how they format their data on their spreadsheet.

Graphical Abstract and Presentation

Some potential issues and concerns students may run into as they work on their **graphical abstract**:

1. **Information to include in the abstract.** The lab exercise contains more detailed information for what students should include in their abstracts. The abstract should include background information, hypothesis and/or objective, materials and methods, results, and their conclusion(s). Students only have 300 words for their abstract so it is up to them to decide how detailed each section of their abstract needs to be (e.g., some may choose to focus more on results as they do not have as much background information).

2. **Figures unclear.** Teams often have graphs for their figure in their graphical abstract. The main issue teams run into with these figures are small font size for the numbers on the axes and/or axis title and may not have a clear figure caption. A few teams may have drawings in their graphical abstract. The main issues teams have with this are that the drawings are not clear (e.g., as a reader, I would be unsure what they are trying to show with their drawing) and/or their writing is illegible.

Some potential issues and concerns students may run into as they work on their **presentations**:

1. **Information to include in their presentation.** The presentation is 4-5 minutes and should contain a maximum of 5 slides (including intro and reference slide). Generally, the presentation should include some background information, materials and methods, results and discussion/conclusions. In most cases, students will have a lot of information and 5 minutes and 5 slides is not enough to go through all this information. Therefore, students need to decide the main points they want to get across. It may be good to remind students that they do not need to include every detail of their experiment. For example, students do not need to go into extreme detail about the methods they did.

2. **Transitioning between speakers.** Some teams struggled with using the virtual classroom when transitioning between speakers. If teams would like to have two or more team members present, that is okay. However, it would be good to remind them to practice presenting as a team in a virtual classroom (e.g., in the virtual classroom for their tutorial).

3. **Too much information on one slide.** While students only have a maximum of 5 slides, they do not need to put everything they want to say on a slide. If there is too much information or too many figures on a slide, it becomes difficult to pay attention to what the presenter is saying.

4. **Small font size on slides and figures.** Some teams had a lot of information on their slide so they had to make the font size really small to fit everything on there. With figures, the font of the axes and titles were difficult to see for some teams' presentations. It would be good to remind teams to try and practice in a virtual classroom so they can see what their slides look like during the presentation.