**How to Grow Almost Anything (HTGAA) Class 1: Principles and Practices -**

**Homework Questions Feedback and Recommendations**

Version 1

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This document is intended as a supplementary guide to the HTGAA Class 1: Principles and Practices homework questions. After reviewing the responses so far, we thought it would be useful to provide some clarifications to help you develop and elaborate on your answers, and to provide ideas that you might be able to incorporate in your own labs.

As we strive to improve this class, we are trying to ask and develop questions that encourage thoughtful and detailed responses. As you answer these questions, we encourage you to include links, resources, pictures, or anything else that described helpful practices that you discover or implement as you set up your lab. Our hope is that this class can encourage sharing of ideas and best practices, and that the collective resources that you assemble via your class pages become a living repository to future classes and the wider community.

We consider this to be a living document, and welcome your continued feedback.

* **Risk/Safety Level: What is the Safety Level of Your Lab (e.g. BSL1, BSL2, other)? Do you have different spaces with different safety levels? If so, describe which activities are done in different spaces. Include a picture of your lab. For help on safety and risk levels see the**[**iGEM Risk Group Page**](http://2016.igem.org/Safety/Risk_Groups)

While most of your labs are likely to be operating at BSL1 or equivalent, it is essential to remain vigilant in ensuring a safe working space as your work evolves. This means promoting best practices, including adopting existing guidelines, and resolving issues where there may be gaps in the guidelines.

The CDC’s Biosafety in Microbiological and Biomedical Laboratories (<http://www.cdc.gov/biosafety/publications/bmbl5/bmbl.pdf>) and your own regions/country’s guidelines are useful for descriptions of concerns to watch out for as well as good techniques/methods to follow. Take a look at the microbiological practices and standard barriers discussed within Section 4 on Laboratory Biosafety Level Criteria. Are these mirrored in your own practices?

One important consideration is waste disposal of lab materials. Many chemicals are toxic or dangerous and may need special considerations, even if they can be used in a BSL1 lab.

You are designing your lab to be internally well without personal safety and environmental concerns. However you also must consider how your lab may be perceived externally. What steps can you take to show the community around you that your work is responsible and a safe and respectful part of the larger community?

* **Work Area: Which work areas do you use for handling biological materials? (e.g open benches, biosafety cabinet, fume hoods etc)? Include a picture of your work spaces.**

In answering this question, be specific about how you use each work area and why. Which spaces are used for bacterial work? For DNA work? How do you match the types of work you are doing with an appropriate work area? Not all work needs to be done in a biosafety cabinet, but some chemicals might be highly volatile and should be used in fume hoods. What practices do you use to prevent contamination or the spread of chemicals/biological materials to other areas of your lab? Beyond your lab? What barriers and precautions do you use and take with specific types of work? Setting up your work area will likely also include having a dedicated space to keep your belongings and research documents away from contact with lab reagents. Who has access to your lab?

* **Training: Have you received, or will you receive, any ethics and/or safety training? Who provides this training? Briefly describe any topics covered.**

One of the reasons we ask this question is so that we can share resources across our labs. Many of you have had different training experiences and come from different backgrounds. We’re eager to know what additional training materials you have found useful, especially any available online.

Here are a few resources to look to for training ideas:

* <https://counterculturelabs.org/wiki/BioSafety_Level_1_policies>
* <https://counterculturelabs.org/wiki/BioSafety_Level_2_policies>
* <http://www.cdc.gov/biosafety/publications/bmbl5/index.htm>
* <https://www.absa.org/eduonline.html>

If possible, please give specific citations of the courses that you have been able to take or elaborate on your own background of knowledge regarding safety concerns. We’re also looking for gaps where we might be able to help develop materials.

If you have questions about general research topics and ethics, edX is also a resource that offers free online courses designed by universities all around the world. These courses cover topics from bioethics, responsible and ethical research practices, as well as more in depth science that could be useful for your own work. It would be worth checking out to see if there are any courses you would like to take for your own knowledge: https://www.edx.org

* **Rules and Regulations: Which laws and regulations (locally, nationally and internationally) apply to your lab? Include links to any oversight institutions/organizations and policies, and describe which specific rules are pertinent to your lab and project and why.**

Here we are looking for evidence that you are aware of the responsibilities you have as a lab. Consider laws, regulations and guidelines having to do with waste disposal, environmental impact, biosafety, biosecurity, ethical research, and international transfer of materials (i.e. export laws). Look into workplace hazards, public health, and pathogenic concerns.

While it can be daunting to navigate and consider all of the potential rules, this is a question where looking at what has been identified by other HTGAA or community labs labs (especially those in your country/area) can be useful to affirm what you find. This is also a good opportunity to think about the rationale behind some of these laws and regulations, engage in discussion on how they might be better implemented/enforced, and decide the best approach for your lab. As you find websites or other documents representing the guidelines and rules that govern your work, we ask that you record those links and upload them with your responses to provide a resource for other students and yourself to look back upon to reference and review. Finding local experts in established labs or contacts in regulatory enforcement can help you get advice more efficiently and provide a point of contact if any issues arise.

* **Organization and Practices: How do you enforce these rules? Who is responsible for ensuring safety in your lab/space? What happens when safety issues are raised?**

Membership in labs can vary widely across different establishments, but any lab would benefit from awareness of who is responsible for safety. Your labs’s organizational structure may differ, and in the end safety is everyone’s responsibility, but having one or a few particular people who are responsible for overseeing safe practices is important for responding to any issues. If your lab does not already have an individual doing so, consider who might have the background, experience, or an interest in developing best practices for your lab. Your plan for how rules will be enforced can be simple to start and can evolve in time. This is yet another area where it can be helpful to review each other’s lab pages to get ideas of governance models being used. Are there elements from those models that you would like to emulate or execute? We would appreciate any idea on which models work best, and where problems arise.

* **Uncertainties:** Are there any areas where you are uncertain about how to apply these rules, and whether they are relevant to your lab and/or work?

We ask this question to give you an opportunity to raise issues that you haven’t yet fully worked through. The HGTAA instructors - or your fellow classmates - might be able to help you resolve these issues, especially if we’re seeing similar questions across many labs. Of course, there will always be issues you haven’t thought of, which is why we ask you to reflect on this question weekly.

* **Getting Help: Who can you work with to resolve any problems or uncertainties (both to figure out how you can adhere to standards and update them if needed)? How difficult are they to contact?**

There will always be new issues so we encourage you to also think about what steps you might take to resolve uncertainties over time. If you do not have any uncertainties right now, what steps can you take to identify uncertainties, prepare for them, or seek out others who can help identify them? It is difficult to anticipate new issues, but it is beneficial to engage in conversations with local academic partners, class instructors, or anyone you know with background experience who can flag issues you may not have thought of. Establish these relationships early so that they can help give critiques and feedback and be points of contact to get rapid feedback in the event of an unexpected problem.

* **Beyond the Rules:** **Are there activities in your lab/project that you think may have ethical, safety or security concerns that are not fully covered by current rules and standards? If so, please briefly describe them.**

This question is similar to the ‘uncertainties’ question, but we’re asking you to think a little broader. This is a good place to brainstorm potential ethical/safety/security issues and raise them with other lab members as topics for discussion. Science and technology is constantly changing, and the work being done in labs can sometimes outpace current rules. Consider potential projects you might be interested in pursuing in the future and think about concerns that could be present in those. Make sure to keep your weekly response to this question updated so that we can continue to help you monitor the scope of your project and help address any concerns that come up.

* **Other Information: Is there anything else we should know about your lab?**
* **BONUS: Designing for Safety and Ethics: Do you think the design of current regulations is sufficient to ensure safe and ethical practices? If not, how else could you approach the design? We’re interested in your ideas for strategies that could be used to promote safe and ethical practices as it becomes easier to grow almost anything (i.e. monitoring people or information, building safety into the design of equipment, etc). Can you think of any useful examples from other fields? This class is still very much in a growing and developmental stage, as we try to refine the class to better serve you and future students. Can you help us help you and others like you in the future with your ideas for promoting best practices, safety, and ethics?**

We realize that sometimes the purpose of rules and regulations can get lost. We’re eager for your ideas on what we need to update in our current approaches**.**