BNFO 300 Molecular Biology Through Discovery Spring 2016

Final Questionnaire

I am keenly interested in how the course worked for you
and how it might work better for others next time.
Future generations will thank you for the thought you expend now.

I. Goals of the course

You can look back for a detailed list but in brief:

- Make progress towards independence
- Distinguish observations from mere assertions
- Grasp the basics of molecular biology as a useful tool

Do you now have an understanding of these goals? Do you consider them worthy?

Your thoughts on independence?

- 1: i feel independent but i don't feel that i wasn't independent going in, but a lot of my classmates seem to not be independent
- 1: Independence is coming up to solutions to problems without just relying on the professor to give you the answer.
- 1: My thoughts on independence are that for starters it is crucial in knowing that what one is saying is actually correct. As in, reading something somebody else wrote or asking somebody else a question requires a certain amount of dependence on another individual to be correct. Through out the course I realized this to be more and more true in that everything that I am reading is only truly useful if I could prove what I'm reading.
- 1: This semester, I realized just how dependent I was. Reading the assigned articles was more than just an exercise - in the beginning it was a true chore. I'd spend so much time, just to wind up with the totally wrong idea of what was done and how they did it. To be honest, that much is still true. However, after taking this class, I don't feel as helpless as I did in the beginning - in the beginning I would simply wait for Jeff or one of my peers to enlighten and aid me in understanding. Now, I feel like I have more tools to help me help myself in understanding. The best tool this class helped me discover, was my ability to do my own experimentation! While I often ended up in the wrong place, it was exciting to test my own theories to try and grasp confusing material. I still have work to do - I've got to ensure my theories align with the work of those who came before, so I don't get lost as often - but my experiences here were enpowering.
- 1: This was a difficult one for me when it comes to education and setting my own pace. I am used to cues or people telling me what to do. This course did help a lot & (literally) pushed me

out of the nest. It was a necessary, embarrassing, ride on down. Overall, pushing towards independent thinking is very necessary and I am thankful for the experience.

- 1: This was the first course that truly forced me to be independent. It took a short period to get used to but the answers are so much more rewarding when you have to arrive at them on your own through a logical path. My biology major has only required me to memorize the pieces of the puzzle, not put them together. I'm glad that my bioinformatics major will actually require me to think logically about why things work the way they do. I feel more at home in that environment.

Your thoughts on observations/assertions (and paying attention to the experiments behind observations)?

- 1: i can do that, many of my classmates can't
- 1: Observations are vastly more important than assertions. Different papers can differ greatly in their assertions with practically identical observations.
- 1: This class taught me that methods + results > conclusions! Conclusions are fine, but without understanding the principles behind them, we are lost. Observation is the bedrock of science, and the framework from which we view those observations (the experiment) must be personally constructed within the mind of the viewer for complete comprehension.
- 1: This was definitely one of my major weaknesses at the start of the course. I think that I am much more capable of distinguishing between the two after this course. I hope that reflected in my research proposal. I think breaking down what happens in an agarose gel in class was a great example of that. Many people didn't even know that.
- 1: This was difficult at first to grasp. I found it very helpful that you addressed it again later as a reminder. It really helped me parse through research papers
- 1: To find the truth one has to observe and make assertions based off of those observations. I came to find that observing merely what is on the surface will lead to faulty assertions that are no better than arbitrarily jumble letters to gather to make words.

Your thoughts on molecular biology?

- 1: An understanding of molecular biology is important for bioinformatics, without a foundation of molecular biology you can't possibly understand any research papers.
- 1: Have improved, I liked that we looked at how foundational concepts came to be and how certain techniques were used (i.e.- centrifugation)

- 1: I don't know anything about it (well - that isn't true, but I know a lot less than I thought I did!)
- I never really pictured it as such an abstract thing, you know? After reading about proteins, DNA, RNA, and the like, after seeing those beautifully illustrated pictures and animations of each in lecture, I felt like I really had a clear picture of what was going on. In reality, we only know the basics about how these structures interact with each other.
  This class made me excited to do research, and inspired me to take my proposal to lab.
- 1: Molecular biology, for me, is useful in teaching how to get the right information out of the information that is out there.
- 1: Well my goal is to have a career related to molecular biology so I'm thankful that I understand the basics now. Or I at least understand how to understand the basics for anything that I missed.

II. The Means of the Course

These goals were to be achieved through means you can review in detail.
Please consider whether they helped you achieve the stated goals of the course:

A. The classroom experience
   Look back on the on-line notes (example), companions (example), experiment simulations (example) -- all done (in theory) outside of class, followed by discussions in class driven by responses to questionnaires (example). Consider:

   - Few people bought into this idea. While I'm convinced that in theory it is a far better strategy to attain the goals of the class than lecture, in practice... well, it wasn't often put in practice.
   - There was a significant core fraction who came to class but it certainly constituted a minority. I take that as prime evidence that most people judged that going to class was not the best use of their time.
   - And long before the end of the semester, the number of meaningful questionnaire responses had dribbled to near nothing.
   - Few people took serious whacks at the simulations until the week of the exam. The name of this course is "Molecular Biology ***Through Discovery***" in large part because of these simulations.
   - I would very much like a theory that ***is*** put into practice, class activities that are so worthwhile that class ***is*** worthy of your time, and discovery simulations that actually promote discovery, because people actually engage in them and discover (or, failing that, some other route that achieves the course's goals). I wonder how to get there. Attempt to compel these activities? That would work against one of the ***main*** goals of the course. Besides, you should know better than I the best use of your time.

   Your thoughts?

- 1: I actually found that the simulations and discussions were very good use of my time because they helped me answer "Why" and "how" in molecular biology. I know if we had just did lecture and then I was forced to take an exam, I would have fallen back into the cycle of "memorize this" and in the long run, wouldn't have learned anything.

  The coming to class part wasn't as exciting because the group discussions were not as helpful. Not everyone would do the work and I would have to wait for everyone to be on the same page.

- 1: I don't think it's your job to teach students personal responsibility. I'd wager a majority of the people who never came to class or never did any work ended up failing, hopefully they'll have a more healthy respect for the material when they encounter it again next spring.

- 1: I feel like students stop coming to class later in the semester because attendance and homework were not mandatory so they focused on their other courses late in the semester when it became more difficult. I'm not sure how you could fix this to be honest, maybe if you made the class later in the day more students might come.

- 1: I find that the class time is important, which is why I did go most of the time, however the class activities out of class were less helpful than being in class. For some reason I find lecture to more helpful, but then again everyone learns differently. I think that there should be some more lecture, and perhaps the exams should be in class. I understand that this course is meant to be different than a traditional lecture class, but some sort of middle ground would potentially be more successful, but then again there are always going to be varying opinions.

- 1: I wonder if your conviction that any "attempt to compel" students into putting your theory into practice is truly robbing them (us) of our scientific independence?

  Let me use myself as an example. I made it to (roughly) half of the classes. Here's why I did that:

  1): Each day/week represented repetition of previous material - and yeah, it was often really hard material that I NEVER understood the first time I saw it, but it is easy to overestimate yourself, believing you'll get it the first time.

  2): The schedule for certain class periods looked more appealing than others. "Oh, we're going to get an overview of XXX today? Good thing we already looked at that when I was there on Tuesday."

  3): Honestly - Jeff. You were a college student at one time. Do you truly believe that college students, in general, know the best way to utilize their time? Many adults struggle with this

too. People, as a rule, are lazy. Unless they are driven by something (an intense desire, burning intellectual curiosity, or a true need to survive), most people prefer the path of least resistance. I won't be dishonest - I make that choice sometimes too. I don't think I am alone in this though. When a person has no internal locus of control, and there are no external forces pressuring them to act, then the natural state of being is to standby.

After completing my proposal, and getting that email from my mentor, telling me that "this is really great work, and it is nearly ready for the lab," everything changes. Suddenly, I understand. Suddenly, I feel important and driven. This class doesn't create those feelings out of nothing. I believe that the students who really enjoyed their area of research are the ones who feel like the course was worthwhile. All of the students who I've talked to who took your class told me "Jeff cares most about Exam 2 and your research proposal," and now I now why. The problem is, that mindset REALLY kills the enthusiasm people have coming into the class. Students think to themselves "oh okay, I'll try my best to do all that extra work, but it doesn't really matter because I just need to focus on those two things..."

The absolutely best way to ensure we aren't wasting our own time through our own lack of self-awareness and lack of self-identity (both are more common than you'd think), is to ensure that we enjoy our research. The best way to do this, in my eyes, is to force students to meet with several mentor prospects. Talking science with somebody is the best way to get inspired, and really enjoying your research area is how you start making the right choices in becoming scientifically independent. Hence, I'd consider a more detailed/rigorous proposal schedule/assignment. I think students will become more involved with the class in general in this way.

And deadlines for an enhanced proposal project (even early ones) need to be mandatory. Students who aren't interested feel like the mountain is a lot steeper than it is. Force us to evolve - the metamorphosis will still be real.

- 1: we don't have time to fill out 20 question guides once a week so that when we get the exam we can answer one question about it, I feel like more people would have done study questions and companions if they were shorter since we also had problem sets due once a week and were working on a research proposal and had other classes. And class time didn't really feel valuable since it was mostly spent talking about the few questions received by other students who maybe weren't even in class when we could have been doing the work in groups and "doing the experiment"

B. Results vs conclusions

The focus on primary research articles throughout the semester, supplemented by exercises in class, the summary of an experiment, the research proposal, and constant harping throughout the semester, were all attempts to help you see the difference between results and conclusions and the importance of understanding the experiment that led to a result. There were also many guides to help you develop strategies to cope with confusion, an inescapable part of science.

The research proposal will be considered in a moment, but besides that, your thoughts?

- 1: Going over it in class was quite helpful. Sometimes, I didn't see the connection or if something was a result leading to the conclusion. I think that was more on me though...
- 1: I have a better understanding of the necessity to differentiate result and conclusion, and in order to do that it is also important to better understand the experiment itself. I was surprised just how much detail is to be understood before a true understanding is achieved; and of course the confusion associated with that process.
- 1: I liked that you made the distinction. It definitely helped me in formulating a (hopefully) solid methodology for my proposal. Sadly I think some people failed to understand what you were getting at but I also believe that those people would ignore it regardless of the format. It was helpful for those of us that were listening. The summary of an experiment and proposal critiques were very useful in reinforcing the idea.
- 1: I mentioned all of this a few boxes above, but yeah - I get it.
- I don't want to repeat the sentence you wrote above this box, but yeah, I pretty much am going to do it anyway:

  The understanding of an experiment leads one to an understanding of the results. The results are what happened. Knowing what happened is not always easy, but is necessary to understand what it all means.
- 1: In class exercises could have involved more working with peers to understand experiments and work on problem sets more
- 1: Results are WAY more important then conclusions.

C. The research project

I saw this as an opportunity to view research as something more than science fairs, to see how questions are raised by prior experimental results, and -- most important -- to engage in a scientific dialogue with a mentor who sees science not as a classroom lecture but rather a lifelong calling. I tried to spread the activity over the semester, but for many this didn't appear to happen.

- What did you gain from the written research proposal and from the presentations?

- What did you gain from the panel discussion of your proposal?
- Few people mounted a sustained effort starting from January to the end of the semester (see the time line). Most relied on a burst of creative activity during the last week or two.
- More than a few mentors commented on the scarcity of meetings suggested by their mentees.

Your thoughts?

- 1: Although I think I've already bored you about what I gained from the research proposal (and that I think it needs to be made even more of a central focus of the course) I am probably one of the people on that last bullet point!

  I didn't want to waste Dr. Valerie's time, and, to be honest, I was pretty irritated that he didn't return any of my emails for +5 weeks. Your advice in dealing with that was invaluable, Jeff.

  Also - the evolution of my proposal from something that made no sense into something that could be accomplished in lab was less so due to a burst of creativity, and more so due to a strong effort to communicate with my mentor as I realized I knew a lot less about my subject than I thought I did.

  The remedy to this is: to show students that they don't know anything about their subject! How? Do a round of proposal presentations way, way earlier. An outline of an outline is better than nothing - maybe just a 3-4 minute presentation. Trying to speak about your work and realizing what you are talking about makes no sense is a huge wake-up call.

- 1: From the proposal and presentation I gained a massive amount of scientific and academic independence. My mentor didn't have much experience in working with lipid mediators or negative pressure therapy. He gave me the general subject and I had to scour through a large amount of research articles to find which question to ask. After that he recommended a few methodologies and explained the general principles behind them so I could decide what was appropriate. I think this was a blessing in disguise because other people in the course who seemed to have their question and methodologies handed to them didn't seem to get as much out of it and it showed in their presentations/proposals.

  The panel discussion went in the general direction that I thought it would, there wasn't anything brought up that I wasn't able to at least engage with. The take home from the panel was mainly that my sampling was unrealistic. That was a problem I was aware of, making me very glad that I don't actually have to follow through and do the research.

  I didn't meet with my mentor many times because he didn't have much experience with the subject of my proposal. I just didn't want to bother him by showing up and asking to be spoonfed information that he may or may not have had. I was the one going

through all these articles to find things out, I wouldn't expect him to have the time to go through them with me. As stated above, I think this helped me with my independence in the long run.

- 1: I came to realize the importance of starting early, as it leads to a less stressful, and potentially a better research proposal. From the panel discussion I released that I am by no means an expert, however, that does not mean I have no capability. I learned that I should have met my mentor more gain a better understanding as it would have lead to me creating a more efficient proposal, and thus a better understanding of exactly what i wanted to do. Being part of the group that relied on a burst of creative activity during the last few weeks, I came to the realization that this is something that isn't going to be possible in the future, and that it is imperative to start early to account for the potential mishaps that always occur. If anything, I learned what I will incorporate in all of my future classes, and hopefully in my life in general.
- 1: I learned a lot from this proposal, like how to find articles describing a certain technique or how to interpret from a paper how these techniques work. The panel was particularly helpful, they asked questions I would have never thought of, I researched their questions after the presentations to find the answer.

  People probably meet so few times with their mentors because they waited to long to work on their papers, making more mandatory rough drafts earlier in the semester will help this.
- 1: I liked the research proposal as a project but i thought that there could have been more in class to prepare me to write a proposal and how each sections should function in the paper, all the papers i reviewed seemed completely wrong and like they had no idea what the assignment was. Most people seemed to not know the amount of sources they would need and research that needed to be done over the semester since we never talked about it in class or even in groups where students could catch on that they should be doing more to have a good proposal.
- 1: The research proposal helped me practice reading research articles and parsing through them, looking for important bits like results and conclusions. Also learned about different experimental methods and what they were for. I also got practice on how to write more concise sentences in a different way (i.e.- different from an english paper)

  I liked meeting with my mentor. When I was lost or didn't even know I was lost, she got me centered. She would explain difficult concepts or experiments and she also helped me get my proposal and presentation together.

D. Help and feedback

Most problem sets you turned in resulted in extensive feedback from either Akhil, Vince, or me. Akhil and Vince also had regular (and often extra) help sessions. I met with you individually during each of the last two exams. There was also written feedback for the first two exams (but not the last), your summary of an experiment, and drafts of your proposals and presentations. Some feedback came from your peers. There was also feedback during class. How did this work for you? Did you feel you had adequate opportunity to get the help and feedback you needed?

Your thoughts?

- 1: I feel I had very helpful feedback from you and Akhil/Vince. Neither of my reviewers for my proposal draft gave me any feedback and there wasn't much feedback for my summary. That could be because my summary was good but I suspect that is not the entire story. I met with you multiple times to talk about my proposal and that helped narrow down the question to something manageable, so that was also very helpful.
- 1: I found the feedback very helpful. The most helpful feed back was the individual meetings with Jeff, and also the feedback from the mock proposals. I certainly agree that there was an adequate amount of feedback and opportunity provided by the course.
- 1: I got my feedback from exam 2 very late. I realize this isn't your fault. There were a lot more students than usual, so I mustn't fault you for that.

  Yet, for such useful, enlightening criticism, there was scarcely a time to put it into practice!

  Exam 3 was frustrating because I was seriously dissatisfied with 3/4 of my answers. I was so busy that week - I simply ran out of hours to think about the experiments and my responses. I wasn't even being lazy, I worked on it every day excluding that Friday.

  Unfortunately, the Exam 2 feedback was the only feedback that was truly useful. That is because, you told me, specifically, where I was going wrong. Other feedback more-so was along the lines of "yeah, good job with this" (green) "something here isn't quite right" (yellow) or "this is just totally wrong/insufficient" (red). Not that helpful.
- 1: It helped a lot. The TA's were very helpful and I was glad you were in your office so much
- 1: The feedback from akhil was great, i rarely recieved feedback from vince, i never got feedback for my summary of experiment and the feedback for my proposal draft was kind of pointless

since by the time i received feedback and even presented my proposal had been revised and improved

- 1: Yes, there was plenty of feedback and it was very helpful.

III. Bottom line

A. What advice would you give someone entering the class?

- 1: Do all the practice problems and START WRITING THE RESEARCH PROPOSAL EARLY SO YOU DON'T END UP IN ALL-NIGHTERS HELL
- 1: DO THE EXPERIMENT. Seriously though, knowing what the authors are measuring & what their results mean is more useful than just skimming the paper and hoping that knowledge to just come into your life.

  Do the work

  Find the important concepts and focus on understanding those first. Google is your friend.
- 1: Enjoy your research. Make it go somewhere. WANT to do something with it. That, + good class habits will = a better understanding of exam questions.
- 1: I would urge that finding a mentor as early as possible is crucial, and if they haven't found a mentor after a week or two, to then seek aid from either Jeff or teaching assistants as the mentors will be able to aid in creating better proposals. More to that, it might be more beneficial to finding a mentor that has an office on the monroe park campus as it will be easier to see that mentor more often.
- 1: Pay very close attention to the observation vs assertions. While writing my proposal and critiquing the proposals of others I made sure to remember that. After every assertion that I could identify, I asked myself "why?". This is extremely helpful in finding weaknesses in your understanding or someone else's understanding of the subject they are speaking of. In addition to that, just show up to class. It's not rocket science, but it is molecular biology. If you don't make an effort to understand it, you won't.

B. Three things you'd advise that this class never to do again?

- 1: Calling out students to answer questions by name.
- 1: I cannot think of three things to get rid of but definitely get rid of:

  Alien world, for the life of me I could not grasp this addition.
- 1: I think exam 1 should be more material focused. It seemed to be pretty basic and then exam 2 hit like a freight train and required exponentially more effort to complete. That would give people a better idea of what the course requires earlier on.

- 1: Never? There is nothing I'd NEVER try again. Everything in this course was useful to somebody, hands down. It would be far too selfish to tell you to NEVER do something again just based on my experience.

  I might suggest that you avoid admitting that the majority of the classwork is optional? What you don't know can't hurt you! THAT IS ABSOLUTELY TRUE.

  (no, it is not).

- 1: the timeline for the third exam was pointless since it just ensures that the student won't put forth their best work since not only is there a proposal draft due shortly after, but it falls right when a bunch of classes have final tests and since the exam has such a short time window most of the time in the exam period has to be dedicated to the exam to answer the questions correctly which is unrealistic for undergraduate students

C. Three things you'd advise that this class keep doing at all costs?

- 1: #1: Enforce mentor meetings

  #2: Keep the proposal AT LEAST as important as it is (or enhance it, as I think would keep students more enthusiastic and focused).

  #3: Encouraging the use of the software programs that allow us to design our own little mini-experiments (BioBike, looking at you)! It was definitely the most fun and stimulating part of the non-proposal coursework.

- 1: 1. DO THE EXPERIMENT

  2. Really though. I'm not kidding

  3. Get some pencils and draw some diagrams of the experiment

- 1: Emphasize the proposal draft feedback from reviewers. People treated it like it was optional (which I suppose it was) and/or not important. Critiquing the proposals of others helped me in asking questions about my own proposal in an objective way.

- 1: Mentors

  Mandatory meetings with Jeff

  Mock panels

- 1: Practice problems in groups, polling students to pick the best exam times (like for exam 2), TA sessions and the humor.

E. Three ideas that would make the course better for those that come after you? (I know... make shorter questionnaires)

- 1: 1): See above about proposals2): You know, do you really need so many questionnaires? I mean, I am so, so sorry I just wrote that, but actually though.

  The pure VOLUME of questionnaires is what I'm talking about here. The length isn't the issue - when I have something to say I have something to say - but all of the questions that you ask us to deliver to you via questionnaire are questions that, I think most students would ask via email, or even face-to-face at office hours. Do we need to answer them every single class period?

  Especially early in the semester, when students are still getting accustomed to the 'correct' way to ask questions, the sheer number of questionnaires is such a slog. Like, I'd spend just as much time doing the questionnaire as I was doing actually reading the companion to the article!

  3) There is no #3

- 1: 1. If a student keeps asking the same question and they don't get it, please point them to a resource that will give them a more clear, concise answer. (hint: its probably in the experiment)

- 1: I don't know about three ideas but I think it would be helpful to have a module on how to create your own graphics for your proposal. Or perhaps work that into exam 2 or 3.

- 1: more class time on group work

  more class time on proposal and general goals for it

  shorter questioning for companions

- 1: More paper drafts, a class dedicated to using bio bike, and maybe asking students to keep you updated every few weeks with mentor meetings (could help with II c).

- 1: Perhaps mandatory meetings with the TA's in addition to the meetings with Jeff, to elaborate, there should be a quote, perhaps at least 5 or 6 meeting with TA's throughout the semester.

E. Did you get what you wanted out of the course? If so, what? If not, what did you miss?
Do you feel more proficient in some way? If so, how?
What if anything do you think will still be with you from the course in five years?

- 1: I addressed this pretty early in the questionnaire.

  If I pursue my research in lab, then, just like we talked about a few days ago Jeff, I hope that I will have the memory of a

successful research meeting, and the connections that go along with it. That is my goal now.

Thanks, for a really entertaining semester.

- Gus

- 1: i feel proficient but just because i can do the work for this class doesn't necessarily mean i'm independent because of this course and many of my classmates definitely aren't. I'm better are reading papers no since i read so many.

- 1: I gained a lot of scientific independence and research abilities from the course. I didn't know I would gain these but I am glad I did. In 5 years I think what will stick with me the most is knowing what question to ask in order to better understand a big picture. I suppose that all goes back to asking "why" at every assertion. I can now break things down into little pieces and make logical sense of them by following up on each piece.

- 1: I honestly did not know what I wanted out of this course, as it was nothing like any class I had ever taken, nor was anything I expected as the semester went on.

  However, I know that I did pick up a few things along the way. I've gained an appreciation for the detail necessary when reading, or even merely observing, before coming up with some sort of response. I also learned that there is a lot that I still have to learn before I can perfectly grasp what I require from articles and what is fluff, but I at least have a start. Lastly, I learned the importance of carefully crafting assertions, in that they require a sufficient amount of evidence to prevent them from being branded as nonsense.

- 1: Mostly, there were a lot of questions I asked that didn't get answered & it wasn't till the exam that I got an answer, it at all. I did get more proficient in reading research articles. I got what I put in. I have no regrets.

  In five years: how to best figure out what an experiment is doing. "Do the experiment" aka draw it out, write it out-- thanks for the idea

- 1: Yes, I am better at finding the meaning of research papers and understanding the experiments, as well as understanding molecular biology.