

Module evaluations- Yeast complex colonies

1) *In general, what parts of this module did you enjoy the most? What parts promoted the most learning for you?*

- Learning to apply programming to microarray data-III
- Exposure to R-III
- Active learning activities-III
- Lectures-I
- Demonstrations/mini presentations of students- I
- Workbook-II

Representative answers:

“I liked the use of R and all the interactive learning activities because I find it easier to understand a topic by practicing the concept rather than talking about it”

“I thought it was good to break up the R sections and the other activities to enhance our learning. It was also helpful to have simple activities that show the basic significance of the following R activities”

“Using R. Plotting heatmaps”

“The workbook and associated activities were really well-presented and organized. I love the students got some programming experience in addition to the gene expression analysis”

2) *In general, what suggestions do you have for improving this module in the future? What parts did you think did not promote your learning?*

- Information thrown in intro lectures was sometimes hard to connect to the larger picture-I
- Improve paper discussion-II
 - Jigsaw where students each figure out one graph and then share that with other students?
 - One student suggested a lecture to convey the information.
- Review of Day 1 material was too long on Day 2 – I
 - already changed
- Improve wording and clarity of questions on worksheets and decrease the number – II
- Complex and simple trait vs. complex vs simple colony terminology is confusing-II
- Talk about biological pathways more-I
- Talk about biology less and the programming/stats more -I

- Have an overarching schematic to keep the ideas of genes/allele frequency straight-I
- Upload lecture notes before class for students to read through before class-I

3) *Were the goals of the module clear? Do you feel like those goals were accomplished?*

Everyone said these were clear and that we successfully accomplished them

“Going through a summary at the start and end of class helped a lot”

“I appreciated that the goals were visible on the board throughout class”

“Yes, I feel like I got a good in the trenches look at how micro arrays are analyzed”

“I liked that the overarching goals and the daily goals were visible on the board”

4) *List 3 concepts that you will take away from this module that you did not know before.*

- Colony morphology has epistatic interactions
- Bioinformatics is essential in biology
- Some R intuition-III
- Visualizing data with various types of charts
- Knowledge of how heat maps are organized and how to read them-III
- How distance measures can be calculated- II
- How to analyze data from a microarray with R-III
- Determining relationships between colony morphology and allelic variation in the genes of interest
- Difference between statistical significance and importance
- I know too much about CYR now!
- Hexa and octospored yeast exist!

5) *How did you feel about the balance of time spent on various activities- lecture, R workbook, activities, discussion? Would you increase or decrease the time allocated on any of these?*

Balance is good as is- III

Overall good but recommended a change-III

Extensive changes recommended-none

Recommendation:

- Decrease, break up or refocus paper discussion-III
- “I felt it was pretty well balanced. However we were often not allowed enough time to read everything in the workbook before moving onto other activities”
- Do first (tedious) part of enrichment activity on the computer or replace with lecture
- “Maybe less discussion, or if you keep the same length of discussion less questions”

- “I think the ratio of time spent is appropriate. Although it is probably more efficient if explanations are done after the R-workbook work rather than having the instructor go to the different groups individually during the session”

6) Fill out the table below:

Activity	Effectiveness of implementation (1-5, one being the lowest)	Importance for your learning (rank 1-4, 1 being the least important)
Lectures	3.5	2.8
Discussion of paper	3.5	2.6
Active learning activities	4.25	3.6
R workbook	4.25	3

7) Did you find the active learning activities to be useful (bulk segregant, calculating distance measures, and functional enrichment)? Which ones were most effective and why?

Bulk segregant -III

Calculating distance - III

Functional enrichment -II

- “Yes because it is an experience to draw upon that shows how, at least in theory, the computer spits out the answer”
- “ I found the bulk segregant and distance measures to be the most effective. The functional enrichment one took too long to make a simple point”
- “The functional enrichment was most useful to me alongside the distance measures because it lined up most closely with the workbook and was easier to follow”
- “I did find them useful. The most effective was the distance measures because it gave a simple picture of what the program was doing”
- “ I think they were very useful for learning concepts but at times tedious- Most effective was the bulk segregant analysis for seeing how the data was sorted”
- “I think they were very effective tools for teaching the methods by which researchers manipulate and analyze their datasets. I think I learned the most from the bulk segregant and the functional enrichment”

8) After this module, how comfortable do you feel with R? On a scale from 1-5 how likely do you think it is that you will take a programming class in the future. Did this module increase or decrease that likelihood?

Likelihood of taking a programming course (5 the most likely): 4,5,5,3,3,3

It increased three students interest in taking programming in the future. This question was not relevant for two student that already have programmed

Specific comments:

- "I feel like I got a good introduction to R and the things it can do. I know I will be taking a stats course in the future so the R component of this module will be useful to me"
- "I feel moderately comfortable with R, however this module seems to be mostly retyping what was in the workbook. We weren't given the tools to do the work but rather told exactly what to type"
- "Still not entirely comfortable but would like to learn more because it is a powerful tool"
- " I am curious to learn more but would not attempt anything on my own yet"

9) *Did you feel like you had a voice in the classroom? Did anything about the module structure make you uncomfortable?*

Everyone one said yes they had a voice and nothing made them feel uncomfortable

Extra bits:

- "You forced all of us to be interactive which was good. It kept us on our toes and made sure we were following along"
- "Accessibility of instructors for questions was good"
- "Atmosphere was slightly informal, facilitating discussion"

10) *Any other thoughts you would like to share?*

- One person thought that sometimes Colin and I came across as competing rather than co-teaching. This is an interesting observation-but it could just be how comfortable with each other. Something to consider?
- More a food associated activities
- More focus on coding and analyzing big datasets rather than the biology because that is the novelty in the module
- "I thought you both had a through understanding of the material, and although there were some first time learning curve/logistical errors- that is to be expected. Great Job and most of all: thank you!"