



Course analysis

Course title: Applied Gene Technology and Large Scale Data Analysis	
Course code: CB2040	Points: 7,5hp
Course is part of program: Master's program in molecular techniques in life science	
Semester: 3	Period: 1
Course responsible: Patrik Ståhl	Examiner: Patrik Ståhl
Number of registered students: 31	Number of passed students to date: 26
Reply frequency to course evaluation (%): 77%	

1. Description of applied changes before this course offering

Background

The course is running its first year as a free-standing course in the SciLifeLab master's program in Molecular Techniques in Life Science. It has been previously featured in a similar format in the KTH master's program in Medical Biotechnology, under a different course code (BB2255). Patrik Ståhl is the course responsible and examiner for CB2040.

The course is composed of three main parts: the main theoretical lectures, the project work and the bioinformatics part with its own lectures and labs.

Course analysis 2019

The course was run in 2019 for 31 students. The course evaluation form was distributed in paper, and was answered anonymously.

Below is a summary of the course evaluation given to the students, showing their scores to the different statements, as their general comments about the course at the end. For the first two parts of the course "main lectures and project work" the "My comments" paragraphs are written by the teacher of this part of the course, Patrik Ståhl, and for the third part of the course "bioinformatics" the "Our comments" paragraphs are written by the teachers of the part of the course, Stefania Giacomello and Olof Emanuelsson, together with the course responsible, Patrik Ståhl.

At the end there is also a section titled "Final comments and conclusions, and further plans" where we summarize our analysis and reflect on the course development for future course offerings. These comments constitute our course analysis.

2. Summary of the students' course evaluations

Course Evaluation CB2040 (HT-19)

Evaluate different aspects of the course by using grade-scale 1-5, where 1 is the lowest and 5 is the highest.

My comments: We have received 23 evaluation forms out of 30 students who attended the first exam where the forms were distributed. This is a response rate of 77%.

Presented below are the scores of the students to the different statements, at the end we have also collected the students' written general comments about the course.



Main lectures and project work (bioinformatics part follows on next page)

Average score Q1-Q15: 4,71

1. The course was interesting and I worked with interesting subjects

1 2 3 4 1 5 22

2. The course was challenging in a stimulating way

1 2 3 4 5 5 18

My comments to 1. and 2.: The students score on average 4,96 that they found the course interesting, and 4,78 that they found the course stimulating. I'm happy to see that the students liked the subjects and felt stimulated!

3. I explored parts of the subject on my own

1 2 3 3 4 7 5 13

4. I could learn by trying out my own ideas

1 2 3 6 4 7 5 9 No reply 1

My comments to 3. and 4: The students score on average 4,43 that they explored the subject on their own and 4,14 that they could learn by trying out their own ideas. This is the lowest scoring section of the course evaluation for the main lectures and project work. The course is focused on teaching key concepts and technologies from the field of gene technology to the students over a limited time period, this impacts the time for the students to explore on their own. The students were however allowed to wish which project, and focused subject, they would work in. One could try to increase the students' freedom by allowing them to incorporate a paper of their choice into the project work.

5. The atmosphere in the course was open and inclusive

1 2 3 4 2 5 21

My comment to 5: Before the course I made a decision to try hard and make everyone feel like they were participating, creating a welcoming atmosphere that would open up for questions and a sentiment of inclusion. I also explicitly set up rules together with the students during the first lecture to how we will behave and respect each other in the class room. I'm happy to see that the students' share my sentiment of an inclusive atmosphere. Mean score 4,91.

6. I understood what the teachers were talking about

1 2 3 4 5 5 18

7. What do you think about the teacher's pedagogic and scientific competence?

1 2 3 4 3 5 20 Evaluation form comment: Very very good!!!

8. I could learn from concrete examples that I was able to relate to

1 2 3 4 1 5 22

9. Understanding of key concepts was given high priority

1 2 3 1 4 2 5 20

10. The course activities helped me to learn efficiently

1 2 3 1 4 3 5 19

11. I understood what I was expected to learn

1 2 3 2 4 6 5 15



12. The teachers spent time to listen to my questions, answer them properly and comment my work

1 2 3 4 3 5 20

13. The project activity helped me to learn more effectively

1 2 3 4 4 5 19

My comments to 6, 7, 8, 9, 10, 11, 12, 13: Mean scores 4,78; 4,87; 4,96; 4,83; 4,78; 4,57; 4,87; 4,83. I'm very happy to see the students' high remarks regarding the pedagogics of this part of the course. I have strived to be very clear in my explaining of theoretical concepts, while listening to the students' questions and remarks and trying to adapt to create a flexible learning environment. I have also tried to be clear on the requirements on students' regarding what they should learn, however question 11 scored 4,57 in this evaluation and I will strive to make even clearer the requirements in the future, including oral and written reminders throughout the course. This will also be helped by the students having access to previous exams of this course in future course offerings.

14. My background knowledge was sufficient to follow the course

1 2 3 3 4 3 5 17

My comments to 14: Mean score 4,61. The SciLifeLab master's program attracts students with varying backgrounds where some are likely to have been more exposed to the subjects of the course in their previous studies than others. Yet the main lectures and project work part of the course is built so that the main lectures cover the essential topics, but with added depth compared to less advanced level courses, adding skills even for students with background knowledge in the subject area. And the project work covers state of the art technologies which most students in the master's program do not have any previous detailed knowledge about. In this way the course tries to allow for varying backgrounds without losing momentum and allowing for advanced level learning.

15. I regularly spent time to reflect on what I learned

1 2 1 3 2 4 9 5 11

My comment to 15: Mean score 4,30. The students have reflected on their learning to a high degree, however they could be encouraged to do so even more. Since time is limited for the course and the students have other courses in parallel, allowing more time for reflection also needs to come from the students' own scheduling. The students are already tasked with formulating opponent questions for the project work presentations, however this concept could perhaps be expanded to allow the students to formulate questions individually instead of in groups.

Bioinformatics part of the course

Average score Q16-Q25: 4,16

16. I worked with interesting subjects

1 2 3 4 4 4 5 14 No reply 1

Our comments to 16: Mean score 4,45. We are happy to see that the students found the bioinformatics topics to be interesting! To further improve we will aim to cut down a bit on content in the early lectures to allow a deeper dive into the most important topics.

17. The course was challenging in a stimulating way Our interpretation: Was the course too easy? Was the course stimulating?

1 2 1 3 2 4 11 5 8 No reply 1

Our comments to 17: Mean score 4,18. We perceived that the background knowledge of the students group varied quite a bit. It is important to take measures to counteract this variation as it could otherwise



lead to stress. To try and mitigate this we will look into adding an extra preparatory lab on the basics of R, as well as cutting down on some topics. The goal is to adapt to the students' needs.

18. The atmosphere in the course was open and inclusive

1 2 3 5 4 5 5 12 No reply 1

Our comments to 18: Mean score 4,32. The students perceive the climate as inclusive, however it is important that all students share this sentiment. To further underline the goal of inclusiveness and openness in this course we will clarify throughout the course our core values including an open and equal discussion climate in the course, and our openness to any concerns, questions or comments. To exemplify this we will state on first lecture and throughout the course that we are aware of the students' varying bioinformatics backgrounds and happy to help out.

19. I understood what the teachers were talking about

1 2 3 7 4 10 5 5 No reply 1

Our comments to 19: Mean score 3,91. It is of utmost importance that the key points in the course are conveyed adequately to the students. Given the varying bioinformatics backgrounds of the student group, we need to adjust the information content, as well as plan for reiteration of this content throughout the teaching. We need to make sure that all students are able to follow what is conveyed during and outside classes.

20. The teachers (and course assistants) spent time to listen to my questions, answer them properly and comment my work

1 2 1 3 3 4 7 5 11 No reply 1

Our comments to 20: Mean score 4,27. To improve on the pedagogics and efficiency of communication between teachers and students we will switch to doing the computer labs in a lecture room instead of a computer room. Almost all, if not all, students use their own laptops to follow the labs, and the lecture rooms will allow teachers and teaching assistants to use the blackboard or slides to convey pedagogical replies to questions to the whole class instead of answering common questions from the student group to each student individually (as is most often the case when in a computer room). We expect that this measure will allow more time for pedagogical interaction that will benefit all students in the room, which will equal more efficient teaching time.

21. My background knowledge was sufficient to follow the course

1 2 1 3 9 4 4 5 8 No reply 1

Our comments to 21: Mean score 3,86. This is the lowest scoring question. Because of the varying background of the students it is crucial that we adapt the bioinformatics part of the course to meet the varying demands. To do this we will cut some content to free up time to go deeper into key topics. We will also look into adding an extra preparatory lab on the basics of R. Other means of being better prepared for the students' background is to coordinate with earlier courses in the master's program, as well as to make sure key topics are reiterated throughout the course.

22. The teaching approach (i.e. blackboard instead of slides) was effective

1 2 1 3 8 4 3 5 10 No reply 1

Our comments to 22: Mean score 4,00. To improve on the pedagogics we will use slides in addition to the blackboard. The slides will serve the purpose of background information, as well as a document for the students to refresh their memory throughout the course.

23. The study material was exhaustive **Our interpretation: Did the study material cover the lecture content?**

1 2 1 3 6 4 9 5 6 No reply 1



Our comments to 23: Mean score 3,91. We will clarify the question for coming years as proposed above. We also think it is important that the study material well matches the lecture content, to this end we will add lecture slides for background information and reference for the students throughout the course, as well as a summary to keep in the future. It is our aim that this together with the scientific papers that are distributed will make a full circle of study material.

24. Computer labs covered practical examples of the bioinformatics aspects treated during the course
1 2 3 5 4 3 5 14 No reply 1

Our comments to 24: Mean score 4,41. We are happy to see that the students mostly found the labs relevant in relation to the rest of the course. We will make sure that the topics treated stay relevant and we will cut back on some topics as discussed above and requested by students (see below in general comments).

25. Computer lab instructions were clear
1 1 2 3 4 4 4 5 14 No reply 1

Our comments to 25: Mean score 4,30. The students find the instructions mostly clear. One student gave the instructions a 1 in score. As discussed above, the students have very varying background knowledge, and since it is our utmost goal to be inclusive and create an optimal platform for learning in the course, we will try our best to identify individuals that want more assistance. We will invite students upfront to let us know their background in bioinformatics. We will state on first lecture and throughout the course that we are aware of varying backgrounds and that we are happy to help out.

Please, reflect your thoughts on positive/negative parts of the course. What can be done to improve the quality of the course?

The gene technology part is the best course on the master's in my opinion.

The bioinformatics part is very useful and interesting but the contents of lectures 2-4 should be adjusted in order to cover a more reasonable amount of material in order to understand and learn it better.

Going through the concepts in different ways (lecture, papers, presentations) really helped me to establish the knowledge acquired. Although, maybe we had too many papers to read.

I LOVED the course I wish my whole masters was similar to that. The only big problem is that the course was too intense (should be 2 courses separated) and the fact that I had never used R before. It took a lot of personal effort and time to be able to follow the very interesting labs.

I think we have too much and many times for the paper discussion. Its good that I can review but we have read it too many times. I think if you can organize a better schedule for presentation may be better. I would suggest to have longer time for opponent revision. Second, having presentations on different day would allow us to ask more. Anyway, so appreciated with this course. Well done instructors. "THUMBS UP DRAWING". PS. I wish to have more time with bioinformatics part. I think Olof and Stefania have a lot to say more.

It would be beneficial to provide slides for the bioinformatics lecture. The topics have been covered greatly and additional labs, presentation and activity controls have helped the preparation for the final exam greatly.

ABOUT THE R LABS:

We definitely need more TAs for the computer labs. It was one of the most stressing experience of my life and I barely learned anything. In many occasions we just didn't have the knowledge needed to write the codes and the assistant would just tell you what to write without explaining anything. You cannot expect students who never used R to just guess how to write a code that uses very specific packages. We needed lectures on each single package at least. It was incredibly frustrating and time-wasting.

Interesting exam, but very, very, very long.



Loved Stefania's classes.

Computer labs great, but I found it hard for the level of bioinformatics I possess. My great lab partner helped me a lot to get most out of them.

My favorite course so far in this master's!

Found projects super interesting, but a bit too repetitive at the end.

More introduction to R in the course/programme.

More online material to look at before lab.

Great course, both "sequencing methods" – part and bioinformatics-part. I wish we would have had this course 15hp for more labs in R and deepening further in both course parts!

This is why I chose this programme!

The course was great overall, really enjoyed it. Would have liked to delve into and spent more time on the bioinformatics part, some of the lectures were a bit rushed, and wish we had more computer labs. But there is not really enough time for that, especially since we have other courses, so I'm not sure how this would be done. For the articles, it could be nice to focus on the bioinformatics parts too, to bridge wet lab with dry lab more, since that is a focus of our master's program.

This was, without a doubt, the best course during the whole master "STAR DRAWING".

Focused in the right and interesting parts, pedagogic in all levels and gave room to reflect, understand and LEARN "SMILEY DRAWING".

Our comments:

The main themes of the general comments for the whole course are:

Pros:

+The students seem to like the course, several students say it's the best course on the master's program.

Cons:

-The views of the bioinformatics part vary substantially from loving it to thinking it was too intense.

-Many students would like to see more time for the bioinformatics topics, or less topics.

-Background knowledge varies a lot, especially for the bioinformatics part and this can cause substantial stress if not handled correctly, as exemplified in one student comment above.

3. Reflections on the course execution and results and 4. Suggestions of changes for upcoming course offerings

Please see reflections related to the different questions in the course evaluation above, and our related actions in the summary below.

Final comments and conclusions, and further plans

We are of course very happy that many students express strongly that they like the course. However, we aim to be better and there are several things that can be actively addressed in coming course rounds. As discussed below, and in the different separate questions above, we propose several improvements for the next course offering.

Specifically in the bioinformatics part

-We will trim some content to allow for deeper understanding of key concepts and less stress for students, given their varying backgrounds in bioinformatics.



-We will also look into adding an extra lab on the basics of R. This is to allow students without previous knowledge of R or programming in general to have more time to get acquainted to the language and to catch up. We will also explore the possibility of applying flipped classroom learning to the concepts of R and single cell bioinformatics, allowing the students to watch tutorials before class.

-Removing any type of negative stress is fundamental for learning and as stated above we will revise the lab part to allow for extra time for the basics.

-We will also coordinate with previous courses to make the students' bioinformatics learning as streamlined as possible throughout their master's.

Specifically for the main lectures and project part

-We will try to rework the project work part a bit to allow students to influence the content of their project work. We will also investigate if the project work can be even more efficient from a learning perspective by trying out other modes of teacher-student and student-student interaction, ie through a jig-saw type seminar.

Generally for the course

-We will continue to work especially hard on the inclusiveness and openness experience of the students in the course. This is key to having a positive learning experience.

-The varying background knowledge of the students, primarily in bioinformatics, needs to be handled to create a positive learning experience. As stated earlier the students have very varying background knowledge in bioinformatics, and since it is our utmost goal to be inclusive and create an optimal platform for learning in the course, we will try our best to identify individuals that want more assistance.