Fellesdelen vår 2014 oppdrag 6: utviklingsarbeid Lex Nederbragt
(på engelsk, slik at jeg etterhvert kan sende det til de andre kurslærere)

Increasing student participation for INF-BIO5120/9120

Goal
Experimenting with different ways to increase student participation in the INF-BIO5120/9120 course, turning students from passively absorbing the material, into actively sharing their experiences.

Introduction
The course "High Throughput Sequencing technologies and bioinformatics analysis" (INF-BIO5120 and INF-BIO9120) is a two-week, 5 study points intense course held every fall. Starting 2014, the course will be a three-week (four days a week) intensive course, earning 10 study points. The goal of the course is to give students enough skills to be able to analyse DNA sequencing data from various sequencing platforms targeted towards a range of applications. The course is heavily hands-on, with a ratio of lectures and practicals around 20 to 80. Students run the practicals on computers (using so-called command-line or web-based tools). 30-40 students are participating (the number of PCs available in the teaching room limits the number of students). I am the coordinator for this course, which is taught with a group of 10 teachers from six different groups.

My own teaching in the course is a two-day module on *de novo* genome assembly, the process where short sequences of DNA are used to reconstruct the underlying much longer genome sequence. This module has the following layout:

- start with a hands-on group exercise (4-5 students per group), not on a computer, but by providing the students pieces of paper with short pieces of regular text, randomly taken from a paragraph of real English, with the assignment to try to reconstruct the paragraph
- one hour lecture to introduce the theory
- first practical with a simple assembly program
- second practical about quality control of the results, including visualization in a so-called genome browser (GUI-based)
- lecture on how to plan a *de novo* genome experiment
- further practicals using different programs and quality control

All material for this module, as it was taught during the fall of 2013, is available online at https://github.com/lexnederbragt/INF-BIO9120_fall2013_de_novo_assembly

Student participation in the current setup of the assembly module
As the course is very hands-on oriented, students need to participate in order to at all be able to finish the course. However, there are several types/levels of participation:

- the part at the very beginning of the module, where students need to solve a 'puzzle' using ordinary text, is a great success: groups are very actively collaborating, discussing strategies, and trying out different approaches, clearly enjoying themselves

- during the rest of the module, students work individually on the material, interacting mostly with the teacher and assistants when they run into problems, but except for a few, not with each other
- in-between, I will discuss the practicals and results in plenum; I then mostly demonstrate the desired results at the front of the class and the students follow along
- lectures are classically one-way oriented, with me talking in front of the class using sets of slides

Increasing student participation

The next edition of the course will become a 10 credit course, instead of the previous 5 credits. As a result, I will most likely be able to add another day of teaching. Feedback from the students indicated that I tried to put too much material in the two days, so I intend to keep the course material unchanged, but slow down the pace. I will use part of the extra time to try several approaches to increase student participation:

1) I will keep the opening exercise, which is highly participatory. I will end this part, though, by asking each group to present their strategy and results to the whole group, perhaps by asking them to make two to three slides.

2) I will ask students to pair up during the practicals. As is common, some students have a naturally faster pace than others. I will try both pairing students of equal pace, or of unequal pace, hoping the faster one can help the slower one. The approaches for pairing could be:

- modeled on 'Pair programming': a "software development technique in which two programmers work together at one workstation. One […] writes code while the other […] reviews each line of code as it is typed in. The two programmers switch roles frequently." (http://en.wikipedia.org/wiki/Pair_programming)
- both students in the pair perform the same task, albeit with slightly different parameters, allowing them to test out different settings, and asking them to examine and discuss the differences between the results. This opens for reflection on the material

3) at the end of the individual practical parts, I will ask some of the students to present their results in front of the class. Technically, it is possible for each student to attach their own PC to the projector, allowing them to prepare some 'live' windows (e.g., of the genome browser) that they can show to the group. I will use a combination of asking for volunteers, and rotating amongst the students so they all get at least one turn.

4) During (the few) lectures I will implement some of the principles of 'peer instruction' (Mazur article discussed at the first meeting). As students are sitting in front of their PC all the time, I will pose questions, have the students discuss in pairs, vote on the answers through an online system, show the tally, have them discuss and vote again.