This report contains feedback from students about a course taught in the School of Informatics during the 2020/21 academic year, in response to the following questions:

- What advice would you give to a student taking this course in future?
- What did you find most valuable about the course?
- What improvements, if any, would you make to the course?
- Please add any other comments you have about workshops, tutorials or labs on this course
- Please add any other comments you have about the presentation of course materials online and their accessibility
- Reflecting on your experience of hybrid teaching and learning on this course, what has worked well for you?
- Is there anything else you'd like to tell us about your experience of hybrid teaching and learning on this course that would help us improve our approach?

Each course organiser receives this report as well as statistics on multiple-choice responses. All these reports, together with student feedback about individual members of teaching staff, are collected and sent to the Director of Learning and Teaching.

Please note that these are personal responses from individual students: some courses only have a few responses and a small sample can be unrepresentative.

Stereotyping and bias, especially unconscious bias, is a serious concern in any survey gathering personal responses. All students received the rubric below before completing the surveys, and you can read a brief introduction to issues of unconscious bias on the university web pages at http://edin.ac/2iypZBv

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### Rubric given to all students taking the end-of-course feedback survey

We value your opinions on the courses you take here at the University, as they allow us to shape future delivery and development. We welcome constructive comments about your courses, whether positive or negative, and ask you to give details about any issues in order to help the course organiser to understand and address them.

We encourage you to be aware of the potential for bias in the completion of these questionnaires, so we have developed resources which may be helpful to you:

- Equality, Diversity and Unconscious Bias (http://edin.ac/2iypZBv)

You also have a responsibility to provide feedback in a manner which does not breach the University’s Dignity and Respect Policy:

- University of Edinburgh Dignity and Respect Policy (http://edin.ac/1Cq0VZy)

The results of the questionnaires will never be analysed in a way that seeks to identify individual students from their responses. However, should you wish to remain anonymous, please do not identify yourself in your answers to the survey questionnaire implicitly or explicitly.
What did you find most valuable about the course?

- As a Computer Science student, it was very interesting to try something very different from all the other courses I have taken throughout my degree. I found the study of genes to be very interesting.
- Being exposed to a completely new subject. Additionally as a computer scientist, it is very interesting seeing how well developed the ecosystem of tools are for bioinformatics. Many of these tools require no CS knowledge but perform highly complex computations and integrations, something which doesn't exist in CS as you are expected to use command line tools and perform a lot of the work yourself.
- From a person with no background in biology this course helped me understand how to bridge the gap between biology and computer science.
- I already had the knowledge of the content of the course (in general) but from an objective vision I think the contents are really useful for the everyday life of a molecular scientist.
- I am a PhD student who will be using a lot of bioinformatics over the next 4 years, this course provided a really good introduction into bioinformatics - the part I found most useful (and have used so far in my PhD) was utilising different databases and downloading data from each database, as well as learning how to perform FASTQC and trimming data files as I had to do use these skills to find and perform FASTQC on old T. brucei data for my PhD. I also particularly enjoyed the introduced to both pairwise alignment and multiple sequence alignment as I will be utilising these skills downstream in my PhD.
- I learned much about how to work as interdisciplinary collaboration and how to analyse biological data.
- I really liked the delivery style - prerecorded videos, live tutorials, a Q&A forum which was frequently monitored and responded to by Course Organizer or tutor. The Python notebooks that were put together mid-course to explain programmatic access were exceptional. The two research based courseworks were great.
- I think the course wan an ideal introduction to the field of bioinformatics. The topics covered in the lectures and the assignments served this purpose very well.
- It was very well organised even though it had to be online. It was very useful to have the tutorials related to the coursework assignments. The weekly quizzes were also helpful.
- It's different tools that provided to do one thing and the tutorials each week that helped understand the material better. Also the discussion forum was very valuable for every student I believe and it is a form to keep things fair.
- Of all my courses this year, Bioinformatics 1 was the one that has best adapted to the online-learning mode. All pre-recorded lectures were really interesting, easy to understand and well organized. All in all, I am very happy with the course.
- Online learning was very well organised with the small tutorial groups.
- The biology intro was good as an informatics student to get up to speed. It was a fun course and the assignments were varied (2 projects, 1 blog post on science issues, and 1 graphical abstract) and more free form than other course. The lecturers were helpful, enthusiastic and good at answering questions.
- The course included a large range of bioinformatics tools.
- The courseworks.
- The tutorials were extremely helpful.
- The whole course is well-organised, And I feel have participated into the class. The discussion board is quite useful for me.
- Very well organised overall, super helpful in discussions, short and straight-to-the-point lectures. Honestly, a pretty great course.
- getting back into writing formally again
- the courseworks. using all the tools taught was very fun and better understanding of the theory learned.
What improvements, if any, would you make to the course?

- Coming from an informatics background, I have not felt challenged by this course; I feel as if it is a few simple ideas that are easily memorizable. [That being said, I do quite like the subject matter of this course, and I think the lecturers do a good job of presenting the material - but the entire first half of the course could have been compressed into two weeks in my opinion]

  (the second coursework, which I have only just started, is seeming to be an exception to what I said above, but I'm not far enough along to really comment on it)

- Coursework 2 is much more challenging than coursework 1 so maybe an extra week of tutorials on how to do these tasks could be beneficial.

- I found the coursework to be quite tedious and time consuming with not a great deal of background to make it understandable

- I think that CS and Bio students should be paired and do a group coursework together. I imagine it would be something that is easy for each person but requires them to work together and teach each other to complete. I would've been more than happy to teach a Bio student about the CLI tools or Python, but there wasn't any capacity for me to do this outside of helping people in the tutorials when the tutors had a knowledge gap.

- I think we spent too much time with content about BLAST and the pace for the last part of the course was too quick.

- I would have liked to learn about the main algorithms for multiple sequence alignment in a little more depth.

- I would say that I have personally found time management quite difficult (trying to do a PhD full time, 2 x modules, attending seminars/symposiums/different Precision Medicine events has been very difficult, particularly in November as there seems to be a bottleneck of deadlines for PhD student reports and deadlines for taught modules). Prior to this course I had very little experience programming, and it's something I would like to dedicate more time to learning. I feel like because all the deadlines for both modules and PhD deadlines were placed in the same week/time frame, it has been difficult to spend as much time learning programming as I would like, and because I'm not confident with programming I will end up doing the final coursework assessment the non-coding way, even though I'm aware coding is a much better method (I just don't physically have the time to dedicate to learning coding at the moment). I don't think this is a fault of the course, I think it's more of an issue of the short 10-week teaching blocks, the pressure to put all those assessments in a 10-week time frame, communication between departments about deadlines and the problem of my Precision Medicine program having a requirement of completing 30 credits over the course of the PhD and pushing for these to be completed in the first year - I think it has been a bit too much which is frustrating because I really enjoyed the bioinformatics course and would liked to have had more time to dedicate to the course and to familiarise myself with the concepts.

- Just for the CW2- it was too much based in actually writing code and programming skills while a lot of students did not have such background. There were some tutorials and notebooks provided but it was still too difficult for someone that just learned how to code. Therefore, maybe there could be either a smaller dataset so you can go about it without code or a different set of tasks?

- Quicker feedback

- Seeing as I had no Biology background apart from high school, the Biology Catch-up did help but later on in the course I had no idea what was happening. It's understandable you can't teach us all Biology but a bit more Bio covered in lectures would have been useful, especially in CW1.

- The audio on the videos was a little low on some of them which made them hard to hear. I would drop one or both of the digital artefacts, probably the blog.

- The course was well organized and I don't see anything that needs improvement, I might just say that if tutorials were recorded it would have helped as sometimes we end up missing one or two because of different courses or work commitments

- The course work is very complicated. As someone with no coding background the instructions are clearly written by a bioinformatician, which makes it difficult to understand what exactly is required. Some of the instructions come across as quite vague.

- The lectures in week 9 and 10 are very hard to follow. The subject is unclear, they lack structure, and the wording is overly complicated. Some weeks the videos were uploaded a little late, I would have preferred to be able to watch them on Monday, before the weeks become too busy.

- The necessary workload for the courseworks (here Coursework 1 and 2) should be more or less the same, since they are weighted equally. In the following I explain this in more detail since I think it is more helpful for the lecturers in this way: In Coursework 1 the main work was to get familiar with the BLAST searches, to find literature and to think about how to write down the results. After that one could repeat the procedure 10 times. In Coursework 2, for each part it was necessary to get familiar with the tools (compared to one tool BLAST in CW1 we had here amongst others PubMed, Panther, STRING, plotting with IPython/R/th similar + tools for the extension). Alone for getting familiar with these tools I needed much longer, especially since these tools and the underlying databases are very complex and huge. On top of getting familiar with using these tools, I also needed to find out to interpret the data properly, which was also very time consuming. The goal was to write down a mini-research project. In contrast to CW1, this was again much more complex, since writing an introduction and main part with a good overall structure has to be refined often during the writing process. In the end, I ended up with a result for CW2, which is in my eyes still not finished yet. I know that there are several things which I could have done better, if I had had the time for it. However, the time I spent for Coursework 2 was more than twice as much of the time which I needed for Coursework 1. If you (the lecturers) are planning to do this Coursework again in the next years, it would be probably better to give more time/to modify the weight of this coursework/to split the coursework into several parts/to skip a part of it. Nevertheless, I want to say that the topic itself of the coursework was very interesting, and I learned a lot. I also liked the idea of writing a mini-research article.

- With the final coursework, I sometimes felt like I am just following a cooking recipe, just doing step by step what the assignment was saying. Because of that, I had some struggles actually interpreting the results - I didn't perfectly understand the meaning of every step I made, I only knew HOW to do it. Maybe it would be great if the course could also go a bit more into detail on what exactly you can
use the different tools for.

Additionally, I felt like the final section regarding next-gen sequencing all happened a bit too quick. The last two lectures were the ones that I probably learnt the least from because there was a lot more information and it was much more condensed than in the previous lectures.

- though the schedule is a bit tight for me coz there are lots deadlines.
2. Bioinformatics 1 -

What advice would you give to a student taking this course in future?

- Be active in the tutorials.
- Do the weekly reading before watching the lectures. It might seem daunting at first, but it is very well paced - at least from the perspective of coming from Computer Science and being inexperienced in Biology.
- I didn't have a background in biology at all and I didn't need it to enjoy the course and get a lot out of it. You can engage surprisingly quickly on the bioinformatics without having to get overwhelmed by the biology (and the latin names!). Watch the biology primer videos - they're great. The Pesvner book is an amazing piece of life's work. Every page I open in that book reveals something fascinating but it's an expensive book and you don't necessarily need it for the course - the course materials are excellent actually.
- I think the first thing and the most important is to arrange well about their time. A good time management helps a lot.
- It is a very informative course, I have definitely learnt a lot but some of the coursework pieces took a lot of time.
- It's a very well-organized and interesting course regardless of your background, grading was imo very fair, and it is very achievable to get a good grade with not too much effort.
- Read the material of each week before hand and if you have a question do use the discussion board. It will help somebody else too and the stuff members reply very quickly and are very helpful.
- The tutorials are really helpful, you should definitely try to attend them every week.
- To proactively learn the biological concepts covered in more depth than the minimum required. I think this makes the course more enjoyable because it makes more clear the motivation behind the techniques covered in it.
- To programming students - learn basic biological concepts before the course starts as you'll understand the context of why these methods are done much more clearly.
- To biologists - learn some basic programming before the course starts so it doesn't seem as daunting.
- Try and start out with some practice with python.
- Very interesting and challenging, requires study on multidisciplinary subjects.
- You don't need a strong background in either informatics or biology - you could come from a completely unrelated background and still be able to grasp the ideas of the course and do well. (And this course is quite enjoyable, so if you do have an interest in this field then I would absolutely suggest taking it)
- do the quiz. they aren't that hard, and helps you stay on track of the weekly lectures.
3. Bioinformatics 1 -

Please add any other comments you have about workshops, tutorials or labs on this course

- A lot of the tutorial time was spend on setting up the environment and getting started. It would be nice if there was two parts to the tutorials and it was expected that you do the first part at home. This was kinda implemented by asking people to install and open the software, but I think there should've been a few more steps just so that we could hit the ground running in the tutorial.

- I enjoyed the format of the tutorials. I think it encouraged participation of the students and practical learning of the topics covered in the lecture.

- I learnt the most from the tutorials. All of the tutors were extremely helpful, encouraged discussion and helped fix problems.

- I think the most difficulty is that lots people haven't successful downloaded their tool in advance which need to waste some time of the workshop to deal with these things.

- I think the tutorials have worked really well, and releasing the material ahead of tutorials is good as it gives people a chance to work through the content before each tutorial - would it be possible for the answers to each of the problems in the tutorial to be posted after the course has finished for those who want to go back through the course in more detail and practice programming/ going through the content?

- I went to a few tutorials and it tends to depend on the tutor but I had a generally good experience. We sometimes had to prepare and other times went through stuff in the tutorial, and it always helped me a bit with understanding. They are way too long, though, probably because of the hybrid experience.

- The platform for the remote learning worked very well and the tutors knew how to use it well.

- The tutorials were really good. Interactive and informative.

- The tutors were phenomenal and without a doubt some of the best tutors I have ever had. My tutors deserve a lot of praise for their work, their approach to teaching was really great and it was a pleasure to have tutorials with them.

- The tutors were really nice and always did their best to help you with your problems or questions.

- These were very helpful but it depended on the tutors.

- they were good
4. Bioinformatics 1

4.) Please add any other comments you have about the presentation of course materials online and their accessibility.

- Accessibility is good - smaller bite-size videos work much more effectively than a single hour-long lecture (from my undergrad) and are much easier to follow!
- Having the lectures split into 15-20 minute chunks made it more manageable.
- I really enjoyed that the lectures were shorter and self contained. I would've appreciated having number of pages besides each reading, as I didn't attempt to do some of the readings as a chapter sounded like a lot.
- I really liked the way the lectures were split into reading parts and video parts, it helped me gain a much better overview.
- Online materials were good, sometimes posted late which made getting to grips with them before thursday tutorial difficult considering we have other classes to do.
- Perfect, can't think of any glaring problems
- The audio on the videos was a little low on some of them which made them hard to hear.
- The smaller 10-15 minute lecture videos made it much easier to watch and hold your attention.
- Using recordings to teach how to use the relevant tools were very useful. If it was taught in labs/tutorials, things can be forgotten easily if not recorded to revisit the teachings.
- materials are all useful
Reflecting on your experience of hybrid teaching and learning on this course, what has worked well for you?

- Flexibility of doing lectures when it suits me
- Having prerecorded lectures and flexible registration for tutorials was valuable for me. This flexibility was especially helpful because I moved to Edinburgh almost in the middle of the semester.
- Having the lectures recorded was the most useful thing for me, I hope that even without online teaching future students will have the same material.
- I like having prerecorded lectures, I can do them at my own pace and at a time that suits me. Having the tutorials in person at the end of the week then gave me the opportunity to ask any questions I had. I really liked the way this course was run.
- I only experienced online learning due to the ongoing situation, but overall it worked very well.
- I would have had to travel from glasgow to attend this class so in that respect it had worked very well for me
- If every course was organized as well as Bioinformatics 1, I would barely mind the online learning at all.
- I especially liked:
  - The pre-recorded lectures
  - Zoom tutorials
  - The weekly quiz
- It was okay.
- Perfectly, I really appreciated the straightforward short lectures and weekly quizzes
- The learn page for this course was very well organised and it was easy to find everything.
- The smaller 10-15 minute lecture videos made it much easier to keep your attention.
  - Weekly quizzes motivated you to keep up to date with the course and ensured you had understood the week's work.
  - The course organisers were very active on the discussion forms, so you could always turn there whenever you were stuck.
- The tutorials have worked very well for me. Especially, I liked the following things:
  - in the beginning of the tutorial the lecturer said a few words to the students (answering some questions, introducing the tutorial). In this way, the course felt much more personal, since I could see the lecturer "live"
  - I also liked that the tutorial groups were small (7-10 students) and that many students had the camera on. In this way, the course felt more personal, too.
- There was no hybrid teaching for this course - it was all online. It worked well. The staff had clearly trained on the platform and knew what they were doing. It was seamless and excellent (the best of all my classes actually).
- Work load was perfect and I didn't have problems with media hopper or Zoom
- discussion board is well used in this course!
- no hybrid, was all online
7.2) Is there anything else you’d like to tell us about your experience of hybrid teaching and learning on this course that would help us improve our approach?

- I know that this was difficult because this was the first time doing it, but consistent upload times. One week the lecture content was late and I didn’t have time to complete it before the tutorial due to other commitments.

- I think this course was an exemplar of how to do online teaching with good group interaction for the tutorials and very responsive staff on the discussion forum. Well done!

- I would’ve appreciated like 1.5X the amount of lecture content, some weeks only had 1 hour of content. Also it would’ve been nice to have more lectures showing the way to get the same information with the web UI and the code — basically more ‘live’ practical code examples in the lectures.

- Keep doing what you’re doing, just figure out how to make the tutorials a bit shorter without sacrificing too much.

- no hybrid, was all online
12. Thank you -

Thank you very much for taking the time to complete this questionnaire. Your response and comments will be fully considered.

Please provide any additional comments you may have about the course, the teaching on the course or the resources that support it in the box below.

- I genuinely enjoyed this course, thank you all for making and teaching it!
- I love this course, interesting
- Really good course! Thanks to the organisers for keeping us up to date with any changes!
- Thank you for organising a fantastic course - I was really impressed with how organised everything has been (especially with all the teaching moving online due to covid-19) - this has been the most well-organised course I have done personally (at both Edinburgh and York) and am really impressed with the standard of teaching across the board given the circumstances. Thank you to the course organisers and thank you to all the volunteers too!
- Thank you! I hope you take my idea of group courseworks into consideration as this worked really well in my other courses like Human Computer Interaction
- The course staff including the TA's were really great. This was a superb class and I really enjoyed it. The support was outstanding. Well done guys - as I said above it was the best experience I've had during this Covid challenged year.
- There was one tutor which was so good. She was very enthusiastic and had a good system of making sure that everyone was following.