

Post-Studentship Report for The Biochemical Society

Over the summer, between my second and third year of studying for an undergraduate degree in Biology, I was given the opportunity to complete a programming studentship with the Biochemical Society. Through the studentship, I was able to complete two programming courses and attend a webinar focused on career development.

The studentship developed many of my subject-specific skills including expanding my knowledge of R to biochemical contexts such as enzyme kinetics that I had not encountered before. I also learnt to create new figures such as volcano plots that I was previously not familiar with (Figure 1). The R for Biochemist 101 course has greatly expanded my coding ability in R. Additionally I learnt how to code in Python for the first time and by the end of the course I was confidently able to explore metagenomics data in Python, a language that I had not used before. Furthermore, I became proficient in using loops in my code and using Jupyter notebooks.

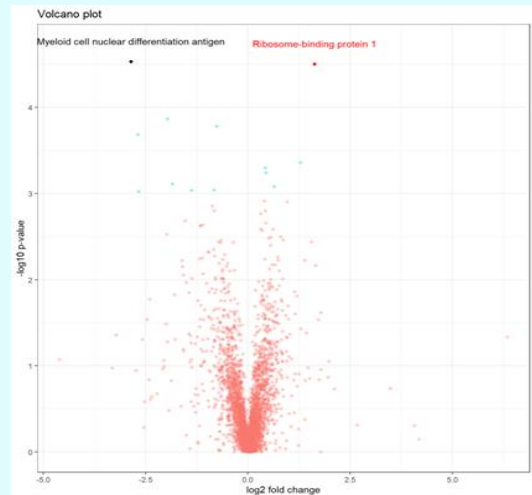


Figure 1. Volcano Plot produced as part of the R for Biochemist 101 course.

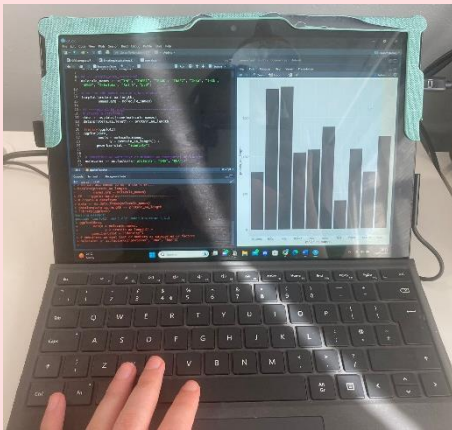


Figure 2. Coding for the studentship.

I was introduced to transferable skills in the career webinar and was able to develop mine using the skills audit suggested. My problem-solving skills were greatly improved by solving errors in my code and adjusting to coding in a new language. Additionally, my time management skills were improved to ensure I completed the studentship on time. Finally, my attention to detail was improved as I had to ensure the details of my code were correct for it to run smoothly. I feel I am a more adaptable learner, and this has helped me to feel less intimidated to try new programming languages (Figure 2).

This studentship has made me more self-motivated to learn and explore programming, bioinformatics, and data analysis independently. I feel more confident in my choice to continue studying the analysis of biological data by learning more applications of bioinformatics. The studentship has given me an informative experience and knowledge that I will be able to use as I apply to study for a Masters degree related to bioinformatics and hopefully one day work in bioinformatics and data analysis.

Thank you to the Biochemical Society for the opportunity of the studentship,
Abigail Wilson.

Biochemical Society Summer Studentship Report

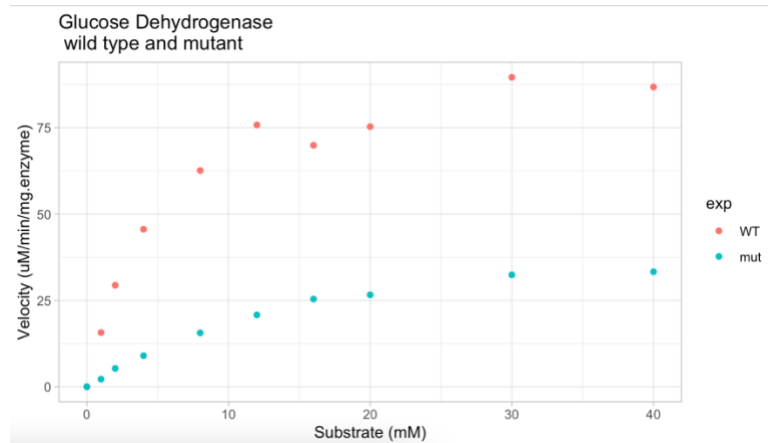
Sameekshya Kar

September 2023

The Programming Skills Studentship has been a transformative journey for me, enhancing both my subject-specific knowledge in Python and R and fostering the development of essential transferable skills. These courses significantly expanded my programming capabilities. I started with basic ideas of Python learnt in my university but have since gained a solid understanding of Python and R, allowing me to manipulate and analyse data effectively. I can now write code to automate tasks, visualize data, and perform statistical analyses, all of which are essential skills for a researcher in the field of biology. The use of packages like ggplot2 allowed me to learn about the use of packages and visualize data in a much better way. Through the coursework and practical exercises, I have learned how to work with biological datasets. I can now clean and preprocess data, perform statistical tests, and draw meaningful conclusions from my analyses. These skills are invaluable for research in biology, and they have greatly improved my ability to contribute meaningfully to scientific projects. The programming courses challenged me to think critically and solve complex problems while being resilient. I have developed the ability to break down complex tasks into smaller, manageable steps and devise efficient solutions. This problem-solving mindset is not only beneficial for programming but also for addressing research questions and scientific challenges. Some of the transferable skills I could gain in the course of the studentship are time management, being consistent, resilience, communication, problem-solving, and self-confidence. This program gave me the flexibility to learn and develop new skills in my own time and at my own pace. Managing multiple courses and internships while balancing other commitments has honed my time management skills. I have become more efficient at prioritizing tasks, meeting deadlines, and maintaining a healthy work-life balance. These skills are crucial for success in academia and beyond. The studentship included interactions with course moderators and fellow participants. Engaging in discussions, seeking help when needed, and explaining concepts to peers improved my communication skills. Clear communication is essential in both research and professional settings, and I am now more confident in my ability to convey ideas effectively. The skills I have acquired had a profound impact on my personal development and future career plans. I now feel confident in my ability to work with data, code proficiently in Python and R, and tackle complex scientific problems. My enhanced programming and data analysis skills have opened doors to more advanced research opportunities in biology. I can contribute more meaningfully to research projects and explore new areas of study. The transferable skills I have developed, will serve me well in my future research career. The studentship has been instrumental in shaping my career progression and future plans. It helped me expand networking with peers and experts in the field. It has been a pivotal experience in my academic journey. I am immensely grateful for the opportunity to expand my programming skills, develop transferable skills, and gain confidence in my abilities. This studentship has not only enriched my knowledge but also set me on a path towards a rewarding and fulfilling career in biology.

Programming skills summer vacation studentship report

Firstly, I believe that this scheme has been crucial in improving my data handling and analysis skills. I have developed proficiency in two coding languages, R and python, and have learnt how to effectively



work with and visualise biochemical data. The courses have taught me how to manipulate complex data in order to extract necessary information and I look forward to applying this knowledge to other personal and academic projects, such as my 3rd year research project.

Example of a graph I created during R for Biochemists 101 where I learnt to analyze data from an enzymology experiment.

Having to complete the courses in my own time meant I had to develop a schedule to keep on track. This not only allowed me to improve my time-management but also made me feel more motivated. As I enter my final year of university, I feel I will be better at allocating my time to different projects, thus improving my efficiency. As my degree focuses on neuroscience, initially I was apprehensive about working with biochemical data. This scheme has ensured that I can adapt my knowledge and continue to apply it effectively even if the subject matter is not my area of expertise. This is a skill that will be of value in my future education and any workplace scenario, making me a more productive researcher. By developing these skills, I also recognise that I am more able to conduct self-directed learning. I also found the transferable skills webinar to be of good value in teaching me the importance of such abilities. Having honed a diverse set of skills, I feel more confident as I begin my final year lab project, where I am expected to apply similar computational skills (as those taught in this programme) to neuroscience research. For example, my project involves the application of Bonsai (a visual programming language), so my enhanced programming skills will be of great assistance as I may better handle the large datasets.

In the future I endeavour to pursue a career in bioscience research, and I have learnt the value that programming skills adds to a researcher's capability. Given that I have improved my data visualisation, I feel I will be better at presenting and communicating my findings as well as better understanding published data and figures. These skills will be of great value as I pursue academic research, attend journal clubs, and present my own research. Additionally, as a result of the studentship, I believe I am better equipped to undertake a master's and potentially, a PhD level research project.

With my increased programming proficiency, along with my much-improved data-handling skills, I now believe I am well-equipped as a candidate to pursue a career in research. This scheme has provided me with many resources that have contributed to my learning, to which I am very grateful. Overall, this studentship has been an incredible opportunity to develop technical skills, to learn from academics, and to provide me with skills needed to make a strong contribution to bioscience research.

Thank you very much to all involved in planning and delivering the programming skills studentship!

Trisha Narayanan

Biochemical Society Summer Studentship Report

Jinbao Fan

September 2022

One of the skills that I have developed throughout the scheme is the ability to be more aware of the different syntax and structures between different programming languages. As I'm from a theoretical chemistry background, Python was the first programming language I learnt and I have no skills in R at all at the beginning of this scheme. After learning about R, I am now more confident in using Python because I now can better appreciate its syntax. Another important skill I learnt is time management. Since no one plan my day on a calendar during the scheme, I have to learn to make my own daily, weekly, and monthly schedules. I learnt how to break things down into small pieces and achieve them one by one by staying organised. To my surprise, tasks are much easier to deal with in this way, and I finished almost all the tasks I assigned myself to do over the summer. After this scheme, I am more comfortable with managing my own time. Perhaps the most important skill I developed is being persistent. At the beginning of learning R, I felt really uncomfortable as it was so different from Python. However, I did not give up, and I eventually got much better at R. I now understand that learning new languages is meant to be uncomfortable at first and it takes time to master it.

In terms of my personal development, the skills I learnt from this scheme could be very helpful in my third and final year study. Since I now can manage my time more efficiently, I could get things done faster during the term time and spend the rest of them learning more about other programming languages and physics. In the learning process, it is inevitable to get frustrated and I feel like I am more comfortable dealing with it than before. I think it would help a lot in managing my stress level. Python and R are so widely used, so it would be very beneficial to gain some understanding of these languages. In the final year project, it is very likely I will have to do some data analysis tasks and the knowledge I gained here can be very beneficial in terms of presenting complex data.

Since my dream is to become a computational chemist in the future, all the skills I learnt during this scheme is incredibly useful. Getting a deeper understanding in different languages is a skill that is crucial in this field, and I now understand how to learning more languages. I think after this experience of learning a second language, learning a third or even fourth language would be much easier.

Online Summer Vacation Studentship Report

By Seán Sexton

Skills (technical and transferable)

Doing this studentship has given me the confidence to study through a self-machine approach. The exercises provided in these courses allowed me to learn about programming through trial and error with the help of videos and tips given by the moderators/tutors.

Through completing the exercises in both the 'R for Biochemists 101' and 'Practical Python for Beginners', I have gained more knowledge in statistical analysis. I didn't know how to relate some of those concepts to the biochemical field in computer programming until I completed this studentship. Gaining exposure to actual metagenomics data and handling it in Python and R showed me how the concepts I have learned in my course like metabolism can be analysed in a computer programme.

As well as this course, I was also doing research placement in Queen's University, Belfast. Thus, it was important to be able to balance my time both in Queen's and also following this programme. I learned how to manage my time by using Google calendar to schedule my lessons/seminars with this programme and also complete my time in the lab in Queen's. I also feel that I am more in control of my stress by planning in this way.

The links between these skills and how they relate to personal development + career progression

This studentship has opened my eyes to the opportunities a biochemist can have apart from the scientific field.

The seminars provided me a wealth of knowledge into varied career paths and also how to use the skills I had acquired throughout my life into job applications. It was interesting to hear Dr. Hayley Moulding talk about different career paths that some of her friends had taken. Seeing other people following non-linear career paths has been reassuring for me as someone who had no idea on what to do after university at the time.

Additionally, it was interesting to hear Dr. Donald Reid discuss the importance of knowledge of computer programmes in the field of work. Having knowledge in programming shows a willingness to learn new skills and ability to analyse high-throughput data.

Conclusion

After completing this studentship, I feel that I have a clearer picture of what I want to do. I enjoyed doing this internship and seeing biochemical data in fields such as in enzyme kinetics being applied in computational programmes. Therefore, I believe I would enjoy a career in biochemical research would be suitable for me. I am considering applying for a master's programme, after completing my undergraduate degree, in Biochemistry, either in the UK or elsewhere, so I can gain more knowledge in the field.

Summer Vacation Studentships 2022 report

My career progression involves continuing on in academia (possibly doing a PhD programme) and my overall career goal is to work within the pharmaceutical industry (for a pharmaceutical company). This scheme has given me the opportunity to develop essential skills needed for these career goals, which have been explained below.

I have been able to develop technical skills such as data handling, attention to detail, and computing/IT skills (obtaining good foundations in both of the programming languages used for R and Python). I had to pay particular attention when putting code into R or Python, since it was easy to make a mistake which would then lead to an output error. This allowed me to develop my 'attention to detail' skills, which are important and needed when looking at results from scientific experiments/carrying out research. Throughout this scheme, I learnt how to handle data in R and Python (developing my data handling skills); being able to do this is needed for a career in scientific research, where large amounts of data are handled and analysed using different types of software. My computing/IT skills were also developed which will greatly benefit me in a career within scientific research, where computing is a necessity.

I have also been able to develop transferable skills such as adaptability, organisation, problem-solving, resilience, and confidence. All of these skills are extremely important for a career within academia or within the pharmaceutical industry. During this scheme I had to organise and adapt my time, so that I could get all of the modules completed on time. These skills will be needed for my career progression, where I will need to organise my time efficiently to complete certain tasks/projects. I also had to stay resilient to complete tasks that I had found more difficult compared to others; this skill would be needed in a scientific research career, where problems would be faced and so resilience would be needed to keep on progressing. I further developed my problem-solving skills throughout this scheme, which are also important for a career in academia or in the pharmaceutical industry, where many obstacles would need to be overcome by finding appropriate solutions. Finally, for my personal development, I was able to gain more confidence in computing.

Post-Studentship Report

When I applied for the Biochemical Society's computer-based summer studentship, I was looking for a project that would give me the flexibility to learn and develop new skills in my own time and at my own pace.

Programming skills are of utmost important these days, as research and technical advancement go together like never before. To keep up with progress it is important to not only acquire programming skills but also keep developing, polishing, and leveraging those skills over the course of one's career. To do that I felt I needed a foundation, some basic knowledge to start with, which would act as a springboard for further skill development.

The skills I wanted to develop were not purely technical; indeed, most situations require a combination of skills which one needs to draw on to deliver. I felt that if I could expand my technical skill set, I would hopefully also feel more confident in my future learning, which in turn would convince me to keep trying and further expand my skills. Programming has always been something I steered clear of as I felt I lacked the natural talent for it. Doing the summer project was a leap of faith for me, something I did as much for my future career development as something to put on my CV as it was for my own personal development.

The studentship courses have taught me that I no longer need to fear programming and say, 'it's not for me'. Instead, it has inspired me with a can-do attitude. The most challenging part of the course for me was R Studio. I struggled more with the syntax and found it less intuitive than that of Python. As I went through it though, the syntax 'design' became more and more clear to me. I have long had a love of languages and language learning, and these programming sessions have taught me that programming languages are just that – languages which can be learned and, in my case, hopefully one day mastered.

The moderators have provided clear and easily decipherable explanations for how the programming language works. The module documents were easy to follow and replicate, and I know I can always return to them when – not if – I need a refresher in the future. In this final year at university, I am undertaking a research project which will require some degree of data analysis, and it is my intention to challenge myself by not only performing the data analysis using software I feel fully comfortable with, but also trying them out in R Studio and Python.

Post-Studentship Report

Following graduation, my career goal is to apply for a PhD and enter a research position combining computational biology with fieldwork to study infectious diseases. The technical skills, workload management and problem-solving skills developed during this studentship, as detailed below, will not only be invaluable for completing my Honour's and Master's projects, but will really help me to write applications for, and to work in PhD and research roles in this field.

In terms of technical skills, this course was my first introduction to Python, and reinforced and expanded upon my knowledge of R from university. Learning both languages together allowed me to explore similarities and differences, and to see some common coding principles. This experience has made me much more confident coding in both languages, and in being able to learn other languages if required, such as Perl or Linux, all of which is highly useful during a PhD and research. Additionally, the course taught me a new aspect of R: the use of ggplot2. This not only improved my data visualisation skills, useful for presentations, posters and publications throughout my future studies and research, but also made me more comfortable using more complex packages. This will be especially useful in research, where more complex R packages are often used, such as DESeq2 in transcriptomics.

The most important transferable skill I developed was workload and time management, as I was completing this studentship alongside another studentship in structural bioinformatics, which required me to plan and balance both workloads. This practice in planning was really useful, and has improved my ability to manage the future workloads involved in my Honour's and Master's projects, as well as my personal work-life balance. Additionally, undertaking the two studentships together helped me develop adaptability, through constantly switching between different coding languages and methods, very useful for a research career switching between computational and field skills.

When encountering errors in my code, I was able to develop more transferable skills: resilience and problem solving when trying to solve them myself, and when this was not possible, I gained practice in concise written communication when asking the demonstrators. This experience in knowing how to approach solving errors, and how to ask for help, really helped me prepare for my future studies and career, which will all involve coding. Additionally, it boosted my confidence for creative thinking in how to solve problems in unfamiliar settings i.e. a new coding language.

To conclude, I am very grateful to have been awarded a place on this enjoyable studentship scheme, as it helped me develop skills invaluable to my future studies and career progression into research.