



Making the Most of Practical Work

Practical and fieldwork are important parts of many bioscience courses, giving you the opportunity to put into practice all the theory you've been learning, experience the excitement of science and obtain an insight into what it's like being a researcher. This guide is full of hints and tips from bioscience students on how you can make the most of practical work.

Top tips

- Enjoy practical work – it's a fantastic opportunity to put into practice all the theory you have learned;
- Read the practical or fieldwork schedule before you go...
- ... And research anything you aren't sure about
- Try to link your practical work or fieldwork activities to what you're hearing about and discussing in lectures and tutorials;
- Don't panic – you won't be the only one who doesn't understand what you're doing at the start;
- Make notes about what you did and the results you got...
- ... And keep these notes safe!
- Learn the essential techniques (such as pipetting) and how to do them well;
- Don't be afraid to ask for help, that's what the demonstrators and lecturers are there for;
- Pay attention to and follow any safety instructions;
- Don't rush, you might miss things out...
- ... Likewise don't spend all your time chatting to your lab partner so that you have to cram everything in to the last hour;
- Give yourself plenty of time to write up your lab book or report; and
- Turn up, it sounds obvious but if you don't go, you don't benefit.



Why is practical work important?

Practicals and fieldwork can give you a taste of what it's like to be a scientist and researcher and hands on experience of the theory you've been learning in lectures and through your reading. They give you the opportunity to develop data analysis, communication group work and other skills you won't get from lectures. The practicals at university or college will often be very different from those you experienced at school: they may be longer, open ended (there might not be a "right" answer), involve more complex equipment and require more accurate measuring and recording.

"I quickly learnt that practical work is there to allow you to take what you learnt from a lecture or a book, and apply it. This 'hands-on' approach made quite a daunting subject a lot easier and more fun to learn." Katherine Staines, University of Edinburgh

Practicals and fieldwork can help you to build confidence in your bioscience knowledge and skills and you get the chance to meet people in your degree group and make new friends.

Before the practical

Read your practical schedule. If there are things you don't understand (the theory behind an experiment, what a piece of equipment is or does) ask around, research it, look back through your lecture notes. Think about how the experiments relate more widely to what you are learning about. This gives you time, in the practical, to think about the scientific side of the experiment, not just worry about the next step.

"What would I change if I could? Read the practical procedure before going into the lab. Although we had the practical procedures before going in the lab, at first I didn't read them so I couldn't understand what I was doing" Andria Pelava, University of Leicester

Make sure you understand what you are doing and why you are doing it. If you have to plan any aspect of the practical in advance make sure you have done so. Don't just turn up and expect to be able to breeze through because you've done something similar before.

"Blindly following a set of steps in a protocol means that when things go wrong you're powerless – if you don't know what the components do and why, you won't know what to change." Jelena Aleksic, University of Cambridge.

In the practical

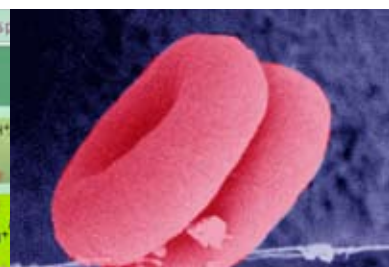
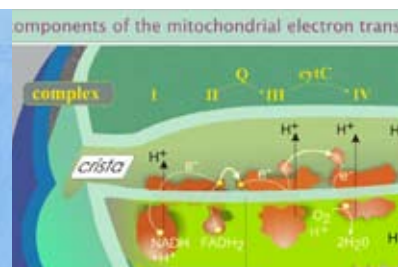
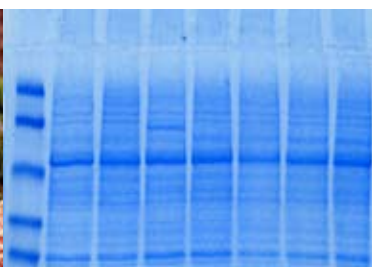
Make use of the demonstrators and teaching staff. Don't be afraid to ask questions, demonstrators are there to offer advice and help but aren't psychic. These could be questions about anything to do with the practical, from how to use a piece of equipment, how to do a calculation, or getting someone to check over your experiment if it's not working as expected. If you were unsure about something in a lecture relating to the practical it may also be an opportunity to talk to teaching staff. Make sure you understand everything before you leave.

"The practical classes are staffed with demonstrators. Their job is to help you understand and learn. Use the opportunity to talk through the material and check your results and answers with them" Kasia Kajala, University of Cambridge

Take notes!

- Keep notes of what you did (for example the steps you undertook and any problems with the method)...
- ...And the results you got (not the results you thought you should get);
- Don't write on a scrap of paper you're going to lose or the on sleeve of your lab coat;
- Use the practical schedule / handout or go and buy yourself a notebook in which you can keep everything together;
- If you don't write it down you'll be amazed how much you forget; and
- On a field trip you might need plastic folders and bags to keep your notes dry!

"If you do not take notes during a practical, trust me, you will regret it when it comes to revising. Write down anything you may need either writing up the experiment or later to remind you what you did" Catherine Jeanes, Royal Veterinary College



Doing the experiments

- Learn to use equipment properly, from accurate measuring to accurate reading of results. This helps to reduce error and minimise mistakes.
- Are you prepared? So, for example, are all your reagents ready? Do you have all the automatic pipettes/ Eppendorfs / petri dishes you are going to need prepared and ready? Do you have all the equipment you will need?
- Don't waste time. If you're waiting for results or there's a long wait to use a piece of equipment start thinking about your write-up, tidy up your workspace, look ahead in the schedule and see if there's anything that could be prepared for a later stage of the practical.
- Be inquisitive, think about the experiment as you're doing it, don't just follow the steps.

"Ask yourself questions as you progress with the work. For example, what do I expect the results to show? Are my results supporting my hypothesis? Are there any outliers, and if so, what factors may have contributed to these?" Ricky Trigg, University of Leicester

Focus

Focus on what you're doing. Practical sessions and fieldwork are less structured than lectures and tutorials, but that doesn't mean they are opportunities to sit and chat. You could lose track of where you're at or forget to add a vital reagent. Concentrate on what you're doing, doubly important when the chemicals you're using can be very dangerous.

If you're working as part of a pair or group don't just sit back and let everyone else do the work. Likewise if one member of your group seems determined to do everything themselves, try to divide up the tasks and activities. The benefit of practicals and fieldwork is that you get hands-on experience of the science, you can't have that as a spectator.

Health and safety

Wear a lab coat and make sure it's fastened. Use gloves and goggles as needed and make sure you wash your hands before leaving the lab. On field trips make sure you're properly dressed – that might mean waterproofs, warm clothing and

boots, or sunscreen and a hat.

Don't mess about, labs can be dangerous places, so no eating, drinking, putting on make-up, chewing your nails etc. Pay attention to any health and safety warnings given at the start of a practical. If you spill or damage something, and aren't sure how to deal with it safely, ask for help.

"Lab work can be very dangerous and if you mess around, not only will you not benefit from the class, but you potentially put yourself and others at risk.... Don't worry if you have an accident, it happens to everyone, just tell one of the demonstrators." James Newton, University of Leicester

At the end of a practical session tidy up after yourself, and on a field course don't leave rubbish scattered over the study site.

Above all

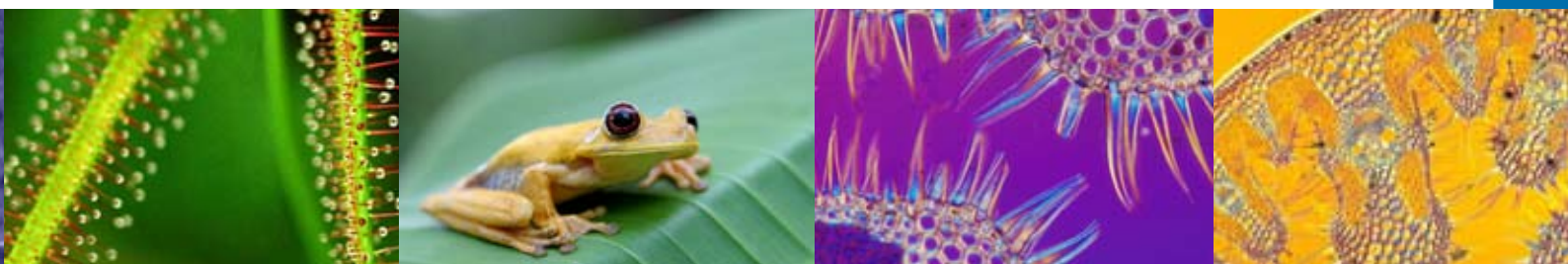
Don't give up. If something doesn't work, try it again if you have time. Go through the procedure and check you have completed every step and check it over with a demonstrator. Science doesn't work perfectly every time and everybody, from the most experienced researcher to the most inexperienced student makes mistakes, and learns from them! If it does go completely and utterly wrong see if you can have a look at your neighbours results, or if there is a demonstration, can you get results from that?

After the practical

After the session you might want to follow-up on some areas or re-read what you researched beforehand. If further recommended reading is provided during practical or field course try to do it as soon as possible afterwards.

"Follow up things in your own time. A three-hour practical class is a short time to teach a subject in. If you are interested use your own time to find out about things from the practical. A bit of initiative will do wonders for your grades and you can pursue the things you enjoy in the class." Rudi Verspoor, University of Edinburgh

Make sure you give yourself enough time to write up your report or complete your lab book. It might take longer than you think



Resources



All the advice and tips in this short guide came from entries to the UK Centre for Bioscience Student Award 2010, which asked students “How would you advise new bioscience students to make the most out of practical work?” The winning, runner-up and shortlisted entries are all available to view and download from our website at www.bioscience.heacademy.ac.uk/funding/essay/award10.aspx

Practical techniques

Virtual Analytical Lab has demonstrations of a number of lab techniques, including using a pipette and making standard curves. <http://hlsweb.dmu.ac.uk/ahs/elearning/RITA/index.html>

Practical Biology has descriptions of standard techniques such as setting up serial dilutions. www.practicalbiology.org

The **Virtual Genetics Education Centre** (VGEC) has tutorials and some practical demonstrations of key techniques. Also lots of background information on genes and disease, ethics and the Human Genome project. www.le.ac.uk/ge/genie/vgrec/index.html

Doing research

Engage aims to support you with the key aspects of planning and carrying out a research project, from literature reviews to step-by-step statistics and scientific writing. www.engageinresearch.ac.uk/

Statistics and data analysis

The **SUMS project** has information on a variety of topics from accuracy and precision to plotting and interpreting graphs and charts. www.step-up-to-science.com/sumsv3/

Statistics Hell, information sheets, podcasts and worked examples on a wide range of statistical tests. Be aware the theme and examples used on the site won't be to everyone's taste... www.statisticshell.com/

Fieldwork

Although aimed at A-level Geography students **Fieldwork Techniques**, from Geography Teaching Today, gives a good summary of many basic fieldwork techniques. www.geographyteachingtoday.org.uk/fieldwork/resource/fieldwork-techniques/

Distant Access to an Ecological Field Experiment gives you an example of how to design a field experiment and what type of data need to be collected. www.bioscience.heacademy.ac.uk/hosted/tiragan/

Presenting your work

Posters: Hints and tips on designing research posters from Newcastle University, <http://orien.ncl.ac.uk/ming/dept/tips/present/posters.htm>, and the University of Leicester, www2.le.ac.uk/offices/ssds/sd/ld/resources/presentation/designing-poster

Giving presentations: Guidance on giving an effective presentation from the University of Leicester, from avoiding death by PowerPoint to effectively answering questions. www2.le.ac.uk/offices/ssds/sd/ld/resources/presentation

Written reports: Writing for science, from the University of Leicester, www2.le.ac.uk/offices/ssds/sd/ld/resources/writing/science, and Writing skills from Skills@Library at the University of Leeds have tips and guidance on writing in general and scientific writing http://skills.library.leeds.ac.uk/topic_writing_skills.php

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All the images used in this guide are available in ImageBank.

