Demonstrating (Supporting Laboratory, Practical and Field Work)

What is Demonstrating?

Demonstrating is a common term used to describe the role played by PGRs and Researchers in practical and laboratory classes and sometimes also in fieldwork sessions. Demonstrating implies showing somebody how to do something – and in essence this is the case for laboratory demonstrators. They work, proactively and interactively with learners helping them gain practical skills and deeper understanding of their subject.

Demonstrators are facilitators of learning in a practical environment and work to support the course leader in achieving the aims of the class. The role may also involve assessment. Demonstrators are likely to be providing formative assessment, in other words, giving feedback to learners on their skills and practices. This is a really important role – students learn huge amounts from the feedback that they receive and it helps them to develop skills that they can use in the next practical class. In a practical class most of formative feedback will likely be instantaneous and given verbally. Some demonstrators will be asked to summatively grade laboratory write-ups and practical reports too.

Demonstrators also frequently work alongside technicians and allied staff – who are involved in setting up equipment and experimental material in preparation for the class. So, setting up and clearing up the class, may also be part of the role.

Why have Practical, Laboratory and Fieldwork Classes?

The practical module you support at Cardiff will have a set of Aims and Learning Outcomes. However, typically these aims are to connect the theory (gained in lectures) to practice and application. Seeing something with your own eyes, getting ‘hands-on’ experience and ‘learning by doing’ can powerfully reinforce our understanding.

In addition, Laboratory and Fieldwork can help students to:

- Improve their understanding of the methods of scientific enquiry through experimentation, problem solving and analysis;
- Develop generic transferable skills such as observation, recording, manual dexterity, logical reasoning, collaboration, note taking, initiative, written and oral presentation;
- Develop specialised technical skills and familiarity with technical equipment;
- Help increase interaction between students and encourage discussion;

- Increase contact and communication between students and teachers;
- Inspire interest and motivate learning.

Pause for thought

Take a minute to note down the key learning goals of the practical classes you will be supporting. You might want to think about both the specific knowledge that you wish to help the students to gain and also the particular practical and general skills that you wish to help them master.

Theory – Experiential Learning (Learning by Doing)

One learning theory that underpins many of our approaches to practical and experimental classes is that of 'Experiential Learning'. Learning by and through hands on experience is central to the way many such classes are designed and conducted.

David Kolb published his seminal work "Experiential Learning: Experience As The Source of Learning and Development' in 1984; it provides a set of fundamental concepts on which much current practice is based.

Kolb's Learning Cycle

Kolb's learning theory sets out a four-stage learning cycle. The cycle captures the process by which 'immediate or concrete experiences' provide a basis for 'observations and reflections'. These 'observations and reflections' are assimilated and distilled into 'abstract concepts' producing new implications for action that are then 'actively tested' to feed forward into shaping and understanding new experiences, i.e. a cycle of experiencing, reflecting, thinking, and acting.

Kolb's model therefore has four phases

Concrete Experience
Reflective Observation
Abstract Conceptualization
Active Experimentation

What this model communicates is that learning doesn't simply arise from having certain experiences but from what the learner 'does' with those experiences. This implies a very important role for the demonstrator: to help students learn from their experiences in the

laboratory by prompting them to untangle, decode, classify and organise their experiences and observations. Through these processes the demonstrator enables the students to find connection with the theory that they are learning in lectures and their previous knowledge and understanding.

Preparing to be a Demonstrator

A Personal Preparation Checklist
Questions to Ask The Course Convenor // Course Documents:
• Why are the students doing this laboratory class? • What are the key outcomes that are expected? • Are there any particular concerns – common mistakes and pitfalls? • What came before the class, what comes after it and what does it link to in the course? • How will the students be assessed – and am I involved in that? • Are there any particular Health and Safety issues to be aware of? • Do I have any role in helping to set up for the class – e.g. support technicians? • Are there any accommodations that need to be made for any students who have a disability? If so, what is my particular role? • Should I attend the accompanying Lecture(s)? • How do I get paid and when?
Things to Do:
• Read all course documentation. • Read all laboratory or practical briefing sheets given to the students. • Review any Lecture notes – remind myself of the underlying theory etc. • Review the health and safety regulations and familiarise myself with H&S procedures and protocols. • Check the requirements for using protective clothing and equipment. • (If possible) Speak to somebody who demonstrated in the class last year – find out what were the main problems that the students had then.
Skills to Develop:

- Can I carry out the skills that the students will be asked to develop?
- Can I (safely) use any equipment or instruments that the students will be using?
- Can I carry out the procedures and protocols that the students will be asked to do?
- Can I teach others how to use the equipment safely?
- Can I show the students how to perform the procedures they need well?
- Can I ask the students some useful questions to test their understanding?
- Can I link the underpinning theory with the practical?
- Can I do all the calculations and plot the graphs etc. that the students will be required to do?

Starting the Class

Many practical classes begin with an introductory briefing – a short presentation in which the forthcoming tasks and experiments are outlined and any important points are highlighted. It is more common that the lecturer in charge of the class will provide this input – however, if you are asked to do this, here are some pointers that might be helpful.

1. Introductory Briefing – A suggested outline

- The aims of the session and how these relate to the rest of the course and lecture material.
- Clarity on what is expected of the students - details of any assessments – the format of written work and hand-in dates.
- An explanation of concepts and theories that are fundamental to understanding and successfully completing the practical – links to the lecture (if appropriate).
- A session time-line – showing what the students need to be doing when. Highlighting any important milestones in the protocols etc.
- A demonstration of how the equipment works.
- Health and safety issues that need to be noted.
- Any practical details such as the clean-up procedures and how to dispose of any harmful chemicals, biological materials and sharps.

It is a good idea to give the students a chance to ask any questions before sending them off to start the practical – however, many will be eager to get started so keeping your briefing as brief as you can is always a good idea!

Health and Safety

a. In the Laboratory - There are a number of legal requirements that must be adhered to before carrying out work in a laboratory. *(The Management of Health and Safety at Work Regulations 1999 (updated 2002)).* One of these is the need to carry out risk assessments on the chemical and biological agents that are to be used in the class. The academic responsible for the class will have undertaken this assessment, however, you may be required to think about minimising exposure of yourself and colleagues to these chemical and biological agents. This may involve making sure that you and the students are wearing the necessary protective clothing, e.g. safety spectacles, lab coats, latex gloves etc. Demonstrators also ensure that nobody is eating, drinking or chewing gum in the class. It could involve using fume-hoods and appropriate sterile technique. After the class, demonstrators should also check that sharps, broken glass and biological waste are disposed of properly.

Important health and safety issues in the field and in the laboratory will be covered with you in your School and if you are working with any potentially hazardous substances you will be will briefed on the correct handling and accident procedures. However, before you begin demonstrating it is a very good idea to check that you know:

- Who are the trained First Aiders in your School?
- Where is the First Aid kit in the laboratory?
- Where are the Fire extinguishers and Fire buckets (and can you use them?)
- Where are the evacuation points and collections points for the class?
- How are incidents or accidents recorded?

b. In the Field – Fieldwork takes place in a wide variety of disciplines and may include a Geography trip to a glaciated valley, a Biology field visit to a marshland or a History visit to an Art Gallery or Museum. Field courses may take one day or last for weeks, and they may be in the UK or overseas. The level of risk clearly varies hugely and the need to have conducted and produced a well-written risk assessment before the trip is very clear. However, this is the responsibility of the academic in charge of the field trip and the Head of School. As a demonstrator you need to be aware of the risk assessment and to have considered your role in implementing any health and safety precautions and responses.

Taking students out into the great outdoors presents a number of possible risks from the terrain, the weather and the wildlife. Being well prepared is the key to a safe and successful trip.

Some pointers:

Having sun protection (lotion, hats, water) with you.
Having insect repellent.
Checking the weather forecast.
Having charged mobile phones.
Being aware of local conditions, e.g. tide-times, flooding risks, falling rocks etc.
Having a First Aid Kit.

Although the students are adults and are expected to take personal responsibility for their own actions and wellbeing, we do have a duty of care when taking them into the field to reduce risks to an acceptable level. Therefore common sense guidelines, such as the below, should be adhered to:

- Follow the instructions of the guide, owner and/or party leader;
- Keep together in a group;
- Do not wander off individually or in little groups;
- Inform the group leader if any problems or difficulties occur
- Be aware of moving vehicles and equipment.

If you would like further information on Health and Safety – The Open University Learning Space Unit *Health and safety in the laboratory and field* provides an excellent overview at http://openlearn.open.ac.uk/mod/oucontent/view.php?id=398652

The Key Skills to Develop as a Demonstrator

There are several teaching skills that are highlighted in the role of the demonstrator; here we provide guidance on the following:

1. Being Pro-active
2. Supporting the students and time-management
3. Approaching people
4. Listening
5. Questioning
    a. Question Categories,
    b. Question Frameworks,
    c. How to ask Questions
    d. How to give comfortable thinking time
    e. Answering a Student's Question
6. Giving Feedback

1. Being Pro-active

One of the key things that academic staff want from their demonstrators is that they be pro-active in their approach to students. A big part of the job is to mix with the students and to actively assist them in getting the most from the practical. So don't sit at the back of the laboratory chatting with a pal, or marking work or reading a research paper…head out there and mingle! Also, remember the shy or anxious student who doesn't call you over for help may be the one who needs your assistance the most.

However, the students also have a responsibility here too. They must be prepared to engage with their demonstrators, to take notice of the advice offered and to follow any instructions given. If a student is rude or abusive to a demonstrator, the demonstrator should immediately speak to the lecturer in charge. Such behaviour is very rare and completely unacceptable and students should be held to account. However, it is fair to ask why such behaviour arose and to address the causes as well as the resulting bad behaviour. Respect begets respect and to build a mutually positive and professional teaching relationship is the clear goal.

Having said to "be pro-active" and to seek to initiate conversations with the students, there is also clearly a time to leave them to think and work things out for themselves. You can interfere too much and distract them from their work – the trick is getting this balance right. Try and keep an eye on their body language and to ascertain if they know what they are going to do next.

2. Supporting all the students and managing your time in the class

Time-management is a key skill that the students are developing during practical classes. Juggling the different jobs that need to be done and multi-tasking. The same is very true of the demonstrator. It is very easy to get bogged down with a particular problem (e.g. a piece of equipment not working or an individual student who is experiencing difficulty) and lose track of time. A practical concern for a demonstrator is to ensure that they have spoken to every student they are responsible for supporting, in every class. Some students are clearly going to need more help and guidance than others but make sure that you don't ignore the quiet students who are just getting on with it – they too will appreciate and benefit from your input and encouragement.

Keeping the focus and the goals of the class firmly in mind is important – you can write down the learning outcomes on your folder or in your notes, to help you keep on track. Try to avoid getting too sidetracked on peripheral topics or giving long personal anecdotes about your own experiences and research interests.

3. Approaching people

Probably the single most difficult thing to do as a demonstrator is to go over and talk to a student who is not asking for your help and may well be trying to keep their head down and avoid your eye contact. Remember some students find it difficult to admit that

they are struggling or they have made a mistake – and they may be the students who most need your help.

It is also likely that many of you will be demonstrating to students who are not much younger than you, indeed you may be asked to demonstrate to learners who are mature students, older than you, from different walks of life, or even more experienced than you. Demonstrators need to feel confident in their own abilities and feel that they do have something to offer to their learners.

A Tip – When approaching students – ask an open question that the students have to answer with a full sentence (rather than a 'yes' or 'no' response). A question such as – "What stage are you up to in the protocol now?" or "What kind of readings are you getting for the first sample?" are easier to then follow up with a second question or response and so instigate a conversation. Don't approach with the question, "Is everything OK here?" as it is so easy for the students to say "yes thanks" – and you are then struggling for what to say next!

4. Listening

Listening is probably the most under-valued teaching skill and yet the most damaging or limiting if absent in a demonstrator. There are many different ways that we listen to our students.

Sometimes we 'Skim' listen just to get the gist of what somebody is saying whilst at other times we are listening out for key words or phrases. At times we are very focussed and critical in our listening, seeking to pick up on some of the things we hear in order to probe further or challenge. This focused approach can also be used to show empathy and connection, i.e. if we mirror the language used and respond with similar words in our replies. When we listen empathetically we are seeking to go beyond simply hearing the words that are being said but to seek an understanding of the emotion behind the words and find out how somebody is thinking and feeling. This requires close observation of body language and the emotional signals that are been given out, to fully 'listen'.

The approach we adopt as listeners tends to depend of what we are focused on or orientated towards at the time – and this varies from one teaching context to another. Barker and Watson proposed four styles of listening

People-orientated
Content-orientated
Action-orientated
Time-orientated.

The terms are fairly self-explanatory, with those who are people-orientated having concern for the students and their feelings. They will use emotion and empathy in listening. A Content-orientated listener is more interested in what is said rather than who says it or how they say it. They will focus on facts and logic and the soundness of the argument. Action-orientated listeners have their mind firmly fixed on the conclusions that can be drawn and what needs to be done in response to what they are hearing. Appreciating clear, concise, uncluttered explanations that are firmly grounded in reality. Finally, the Time-orientated listener have allocated so much time to the job of listening. They will seek short precise answers and constrain speakers if necessary to their timetable.

Pause for thought –

It is likely that you will need to employ all these listening styles in your interactions with your students but which will you personally find the easiest and the most difficult to carry out well?

We don't always get it right – which of these 'irritating listening habits' suggested by Barker and Watson (2000), do you see in yourself?

- Interrupting the student.
- Not looking at the student.
- Rushing the student and making them feel that they're wasting your time.
- Showing interest in something other than the conversation.
- Getting ahead of the student and finishing their thoughts and sentences.
- Not responding to the student's requests.
- Saying, "Yes, but . . .," as if you have made up your mind.
- Topping the student's story with "That reminds me. . ." or "That's nothing, let me tell you about. . ."
- Forgetting what was talked about previously.
- Asking too many questions about details and missing the point

5. Questioning

Being able to ask useful questions is a key demonstrating skill. The use of questioning is an important way in which tutors can facilitate learning and check understanding.

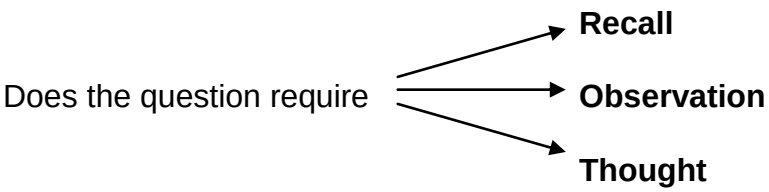
a. Question Categories

There are several ways that questions can be organised and categorised. A common way of categorising questions is to decide if they are **Open** or **Closed**.

With Open questions being divergent in nature and encouraging a range of responses (e.g. “Why” and “How’ explanatory questions are often open). Closed questions are convergent and usually have one right answer and frequently relate to the knowledge of specific facts (e.g. “When did you add the solvent?”, “Is this Anaphase?”)

Note - For a demonstrator - open questions are very good ways of beginning conversations and a closed question is a good way of concluding the exchange.

A second categorisation is focused on the resulting action of the questioned student –



For **Recall** questions, the student either knows it or they don’t, being able to answer simply relies on them remembering something.

For **Observation** questions, the student needs to see something or go look for something. These questions are often asked to encourage the student to go back and re-examine their findings.

For **Thought** questions, the student needs to be able to work something out, to think through the steps of the problem, to apply their knowledge, to analyse their assumptions, to evaluate their approach.

Note – For the demonstrator – it is important to remember that ‘Thought’ questions require more time for the student to prepare an answer. You shouldn’t ask this kind of question and expect an answer to come straight back to you – it is likely just to be a guess if this happens (See d. below)

b. Question Frameworks

One very useful idea in the art of asking questions is the question scaffold or ladder. The idea is that you plan to ask a set of linked questions that have been planned to build in complexity or to help the student progress through a process or scheme. Staging questions in this way can help the learner to build their own mental models or understanding by finding connections, linkages and similarities with other things they already know about.

We are aiming to ask questions logically and sequentially – to move the student along a pathway of increasing clarification or understanding.

A → B → C → D

Another questioning approach that is commonly used in many forms of small group teaching and problem classes is that of Socratic questioning, which aims to draw out answers from students.

Starting with basic **clarification questions** –

e.g. What exactly does this mean?
Where does this come from?
What do we already know about this?
Can you give me an example?

Moving on to more **probing questions** -

e.g. What else could explain these results?
How did you choose that method?
Can you explain more about why/how ... ?
How would you justify that conclusion?
What would happen if we changed this variable ... ?

Following up with a set of rationale / **reason challenging questions**

e.g. Why do you think this is happening?
How can you prove this?
Convince me ... ?
What do you think causes it ... ?
Does your reasoning hold if we change x?
How might it be refuted?
What evidence is there to support what you are saying?
Do your findings support the hypothesis?

Next comes the ‘so what’ questions, the **implication and consequence questions**

e.g. What would happen next?
How could this be used to do X ... ?
What are the implications of this... ?
How does this fit with the theory?

Why is this finding so important?
What does this mean for our hypothesis?

Finally, the 'big picture', **metacognitive questions**

e.g. What was the point of asking that question?
What have you learnt from doing this?
Why do you think I asked you that?
What should I have asked?
What does this mean?

c. How to ask Questions

The way that questions are asked can be quite threatening (if you think about it you can probably remember how some teachers have used questions to 'punish students' in the past, e.g. asking a difficult question to the student who was chatting in class). However when demonstrators are asking questions in the practical they are doing so to facilitate and encourage their students to learn. It can therefore be helpful to try and conscientiously ask questions in an 'encouraging' way. This might mean using a calm, quieter voice tone, it might mean sitting down next to the student rather than towering over them, it could mean thinking about and seeking to soften your body language – all so that your students are less intimidated by you – especially if you are asking tough, challenging questions!

Paraphrasing and re-stating questions can also be a useful strategy if a student is hesitating or struggling to answer.

d. How to give 'comfortable thinking time' for students to answer questions

If the question we are asking is simply answered by remembering a given fact or making a straightforward observation it is likely that the student will not need any 'think time' but will be able to answer straight away. But for the majority of questions that we ask in class, the student will need to think about it, they may need to work something out or analyse their findings – all of which takes time. Providing students with this space to think is an integral part of questioning. One useful tactic is to highlight the question first – "so in a minute I am going to be asking you …" or better still – ask the question and leave them to think about it, whilst you go and help some other students, returning 5-10 minutes later to re-ask the question.

e. How to answer a student's Questions

Whilst it may be completely appropriate and helpful to directly answer a question from a student you must take care to ensure that you don't end up doing all the thinking for the student. So one approach might be to re-direct the question back to the student or to

other students in the group. Prompt them to think about it in a slightly different way or highlight a starting point for them to begin working it out for themselves.

> "You might respond to the student's question by directing her (or his) attention to a particular aspect of the issue she has raised, or drawing her attention to some previously learned course material that is relevant to answering the question or by going beyond what the student has said in some way. The intent of probing questions is to draw the student's attention to things that may be only implied in her answer, and so help her answer her own question"
>
> William E. Cashin, Kansas State University (1995)

Don't make the student feel bad or silly for asking a question. Whilst 'there is no such thing as a bad question' might not be 100% true, we should generally avoid doing anything which would embarrass the student because they might be hesitant to ask for help on the following occasion.

Note – If you do not know the answer to a student's question – admit it and go and find out from a colleague or the course convenor. Never waffle and pretend, you will get found out and this will undermine your credibility far more that not knowing something.

6. Giving Feedback

There are two kinds of feedback that you may be asked to provide for your students.

1. **Verbal, face to face feedback in the practical**

2. **Written, feedback comments on submitted written work after the class.**

   Guidance on writing feedback is available in the Assessment and Feedback section of this module. There are also some further tips in the 'Supporting Problem Classes' section.

However, regardless of the context all good feedback shares the following features… It is:

- Specific – to the student and to the task.

- Timely – given whilst the student is still able to relate the feedback comments to their actions and thoughts when producing the work or undertaking the task.

- Constructive – in that it guides the student's future actions.

- Balanced – both reinforcing, positive comments and critical improving comments.

- Encouraging – to build the student's confidence and self-belief.

In addition, feedback that engages the learner and is delivered in such a way as to invite a two-way dialogue is considered to be particularly impactful and beneficial.

Pause for thought –

Think about the teaching environment and setting that you will be asked to give feedback in and consider how you could practically 'invite' this feedback conversation with your students.

1. Verbal, face to face feedback in the practical

What difficulties can you envisage giving face to face feedback to your students?

How might you limit these difficulties or avoid them all together?

Tips on giving face-to-face feedback

- Verbal feedback can convey more information than written feedback because you can use your tone of voice, facial expression and body language to convey your meaning. However, you have to ensure your communication is honest and your voice and body language are in harmony.

- You should encourage your students to note down important things that you are saying so they don't forget (and you can see that they have understood you). Remember, it is very hard to listen intently to the advice being given to you in the laboratory or practical situation. Lots of things are going on around you, it might be quite noisy and you may be feeling a bit anxious or uncertain.

- Students reactions to verbal feedback, do vary depending on their personality, mood etc. They may only hear the positives in what you have said and completely disregard the criticisms. They may react very defensively and seek to justify their errors rather than taking on board the advice. Rather than debate a point, give the student a little time and space and then go back to check they really did hear you.

- The biggest advantage of face-to-face feedback is that it is usually interactive. You can see the effects your words are having and add further explanation if you

feel it is helpful. You can also open the way for dialogue and encourage them to ask you further questions. You can ask a student to 're-explain' a point back to you and so check their understanding.

- Do remember to speak quietly and privately with the student - some students will be self-conscious and embarrassed to have their feedback overheard by their peers.

- Give timely feedback. It can be very frustrating if you simply want to check that you are working along the right lines but you cannot get the attention of the demonstrator. However, it can also be distracting if a teacher is trying to give you feedback before you are ready for it and whilst you are still thinking it through. Simply asking, 'Are you ready to talk this through yet?' might help to get this timing right.

- Observe the students as you give the feedback - monitor the students' facial expressions and body language and if they seem to be over-sensitive to a critical comment try to soften your approach.

- If the student is being graded on particular actions and skills in the laboratory – ensure that your feedback is in line with the marking criteria and the standards set for the class.

2. Written, feedback comments on submitted written work after the class.

It is likely that submitted written work will be marked using a standard marking sheet and a set of descriptive criteria that spell out the different levels of student achievement. If this is the case, chances are your feedback will also be structured and limited by the design of the marking sheet too. Remember to always try and write something in each feedback 'box' provided and craft a few sentences of comment in any 'Further comments' sections. Students appreciate this and can feel very short changed and dissatisfied with one word or very brief feedback – e.g. "Good try".

Guidance on writing feedback is available in the Assessment and Feedback section of this module. There are also some further tips in the 'Supporting Problem Classes' section.

Reflecting on your Demonstrating Practice

If you are to improve your demonstrating you will need to think about and review your performance after the laboratory or practical. Write a list of the things that you think went well in addition to those that didn't go so well. Then think about ways you feel you could improve – not only correcting any mistakes or addressing your weaker areas of demonstrating but also thinking about how you might transfer some of your strengths

too.

If you can get feedback from others this will give you even more information to reflect upon.

1. Why not ask the **students**? This is particularly helpful if you are working with the same group of students for a number of weeks and can follow up on their comments.

> Just take a moment to think about what you could actually ask the students to get useful feedback from them?
>
> e.g. You could ask them..
>
> "Please write down three things that you have learnt today"
>
> "Can you tell me one thing you have found helpful and then give me one suggestion for improvement in my demonstrating – I really want to get better at this"
>
> "With your lab. partner can you think of one question that you would like to ask me before we pack up"

2. If you can - compare notes with your **fellow demonstrators** to see if there are tips you can give each other or things that you have noted as common student concerns.

3. Very helpfully - get feedback from the **academic who has been responsible** for the practical. It is likely that s/he will have a quick chat with you after the class and you can use this opportunity to ask for their advice on any tricky things that have cropped up during the class and to ask them how you performed.

Reflecting on the Practical - When demonstrating you have a unique perspective on how the class is going. In supporting the students you will be very aware of the things that they have struggled with, the misunderstanding they have had and how the timings of the class have worked in practice.

You could reflect on a number of different aspects in the class –

- **Student Learning** – do you feel the students learnt what was intended in the practical, both the knowledge and the skills?

- **Practicalities of running the class** – did the practical arrangement work

according to plan, were there any unexpected outcomes or happenings (good or bad), can you see any better ways of doing things?

- **Your role in the class** – were you able to support the students effectively, were there any surprising incidents or questions that you felt challenged by, any successes that you can unpick and learn from?

Providing feedback to the course leader, including suggested improvements, is always helpful and if you can give this feedback constructively and positively you can help to improve the class for future students.

Developing a good relationship with the academic staff you demonstrate for, who may not be your research supervisor, can be very beneficial - they could provide a reference for you in the future and be able to comment on your teaching and demonstrating abilities.

Further reading suggestions

Allison, I. (1995). Demonstrating. in F. Forster, D. Hounsell & S.Thompson (Eds). "Tutoring and demonstrating: a handbook". Universities' and Colleges Staff Development Agency.

Barker, L.L. and Watson, K. (2000) "Listen up", St Martin's Press.

Kolb, D. (1984) Experiential Learning : Experience As The Source of Learning an d Development. Prentice Hall

The Graduate Student as Teacher. Chapter 8 of "Postgraduate Study in the Biological Sciences: A Researcher's Companion", Published Portland Press, London 1993.

Ward, A., Baume, D., & Baume, C. (1997). "Assisting with Laboratory Work and Field Trips". Learning to Teach Series. Oxford Centre for Staff and Learning Development.