Teaching and assessment of laboratory and field technical skills within the constraints of COVID 19 and social distancing. The effect on accreditation criteria and the guidance to HEIs

RSB Accreditation Committee
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The Royal Society of Biology Accreditation Committee recognise that the ongoing Covid-19 situation and subsequent social distancing measures may impact on the teaching of laboratory skills in Higher Education Centres. The following document entitled "Teaching and assessment of laboratory and field technical skills within the constraints of COVID 19 and social distancing. The effect on accreditation criteria and the guidance to HEIs" has therefore been created to help provide clarity to our accredited institutions on the RSB's view of the importance and practicality of technical skill teaching in the current climate.

Introduction

The Royal Society of Biology includes the acquisition of technical skills in its accreditation criteria, either during levels 4 to 6 (7 to 10 in Scotland) in BSc and Foundation Degrees (FD) or level 7 (11) for MSci or Masters courses (depending on the nature and subject matter of the programme). An important aspect of the RSB's approach, and very relevant to the current position regarding COVID19, is that the criteria do not include a list of specified technical skills in any of the forms of accreditation.

Skills lists for FDs and BSc degrees (Criterion 2i) are determined by the University , often informed by Learned Societies, and reviewed by an Accreditation Assessment Panel. What is more, the list identifies which skills are assessed (usually by observation on a pass/fail basis) in recognition of the practicalities involved, and this sub-section is also determined by the University. The Society does not expect every student to pass every skill; the emphasis is on the student experience (including the students' self-confidence with respect to their skills acquisition) and a general level of practical competence. This includes health and safety.

The Accreditation Committee considers the delivery of practical skills an essential element of a biosciences degrees – employers need graduates with these skills, and the practical learning environment has many educational benefits – while we recognize the difficulties, accredited degrees must continue to deliver on Criterion 2: Demonstration of the acquisition of technical skills

Background: the educational purpose of practical classes
There are several reasons for inclusion of practical classes within degree courses, these are not all concerned with acquisition of particular technical skills. A balance has to be struck between providing enough repetition to generate competence and sufficient variety to provide breadth. The purpose *inter alia* includes:

- Learning by doing, not just listening and watching
- Providing students with an experience of being a practical scientist
- Giving a context to the theoretical understanding of the subject (often stated as "knowledge and understanding" in course descriptions)
- Generation of original data that can be processed and interpreted by the students
- Some experience of experimental design and testing of a hypothesis
- Practical understanding of the requirements of health and safety
- Experience and understanding of team-working, including strengthening cohort identity and forging of friendships
- Enhancement of transferable skills such as time-keeping, self-management and problem solving
- Close collaboration between students and staff (the teaching is more personal)
- An introduction to some of the job opportunities open to graduates (including what a student may wish not to do in the future)
- Competence in technical skills – for many degrees, these are important for the employability of graduates, and the area where employers have most to say.

Field trips
Field courses include everything above but there is, in addition, a strong element of team working. Students are usually working in groups of 4 or more and there is often an approach to the processing of data that involves the whole group (e.g., in the evenings following a day in the field). Residential field courses can strengthen cohort identity and staff/student relationships. The data generated is very amenable to application of statistics because the pooling of results leads to increased sample size.

Post COVID19
While there will be a gradual normalization after the peak of the crisis is past, there is much discussion about the 'new normal', and an assumption that that will involve changes to the way people work. For studio- and laboratory-based subjects in particular, there is a need to reflect on the styles and opportunities for teaching large classes, frequently the current norm for biological sciences degrees. For the next two years at least, the expectation may well be very different for studio- and laboratory-teaching. Notwithstanding this, the criteria, including the development of specific technical skills, are still important for giving our graduates the best possible training for the workplace, in a world where that training may be critical for future success.

The challenge is to meet all of the expectations (and associated learning outcomes) set out above in a situation where teaching in traditional, full, and very busy classes may be severely restricted, if social distancing of some kind becomes the new 'normal'. An additional problem for field courses is transport to and from the site, and the nature of the accommodation and catering facilities.

Many of the above aims could be achieved (or substantially achieved) by theoretical or virtual methods and simulations:

- Some learning by doing (a simulation is better than just listening)
- Giving a context to the theoretical understanding of the subject
- Some experience of experimental design and testing of a hypothesis
- Some experience of team-working, including strengthening cohort identity and forging of friendships
- Enhancement of transferable skills such as time-keeping, self-management and problem solving
- Close collaboration between students and staff
- An introduction to some of the job opportunities open to graduates

The following list represents the main challenges:

1. Providing students with an experience of being a practical scientist

   Generation of original data that can be processed and interpreted by the students can be done using simplified approaches, or using provided data for meta-analysis. Much more difficult to meet fully by other than our traditional means is the requirement for competence in technical skills, especially where these technical skills have a direct bearing on the subject taught, especially perhaps in the molecular sciences.

2. Practical understanding of the requirements of health and safety

   As above, this may have to be taught a different way. Some subjects have a far greater reliance on this than others, (e.g., safe handling of microorganisms cannot be fully simulated). It may require small group teaching.

3. An introduction to some of the job opportunities open to graduates (including what a student may wish not to do in the future).

   This will be more difficult to achieve. Students who in the past have found that they do not desire a laboratory-based job after graduation may have too little experience to come to a judgement. This all depends on the longevity of social distancing (e.g. if one or more academic years are affected). If only 2020/21 is affected this will not be a significant problem.

4. Competence in technical skills

   One approach is to identify a core list of skills and teach and assess these as an activity independent of a hypothesis-driven practical class. The time any individual student spends in the lab is likely to be significantly reduced, but the laboratory usage time overall could be the same. There may be an increased use of objective structured clinical examinations (OSCEs). The challenge of very specific technical teaching is to ensure students see the learning in context, and not just as an independent activity.

   A more resource-intensive solution is that classes are significantly reduced in size and/or the laboratory is open for much longer hours and at weekends.
   Another approach may be to build on the Health and Safety training already in use, and increase the Personal Protective Equipment (PPE) list that students need to use. Currently, we

would assume that students being taught in laboratories wear disposable gloves and eye-protection, as well as laboratory coats.

Additional advice might be:

a. To require the use of Howie-style lab coats, which students may not take out of the laboratory, and which are laundered by the University
b. To require the use of cloth face masks – most of the benefit of face masks is in preventing spread from an infected individual.
c. Review eye-protection – in particular, the use of wraparound safety glasses/goggles for all activities, not just chemistry
d. Consider using thermal cameras at the entrance to the labs and having rules that say 'if you have a temperature, you can't come in'. While not a panacea, as it won't identify asymptomatic individuals, it will act as a reminder of the new situation.
e. Take particular care of clinically-vulnerable students: consider, with them, how they can continue their studies in a more shielded environment.

Whichever approach, or combination of approaches, chosen, one outcome is likely to be a close and in-depth review, with implications for the future, of the precise aims and learning outcomes associated with each session. In short, what does the class achieve, is there a different way of doing it, is it needed at all?

The Accreditation Criteria
The Accreditation Criteria themselves will not change; however, further guidance may be developed

Headline guidance to HEIs

Immediate issues, academic year 2019/20
It is considered that most of the technical skills associated with the year will have been met by March 2020.

We accept there will be difficulty in securing work placements starting in 2020. Foundation Degrees are still expected to meet the work-placement criteria but this need not be in a laboratory or field station setting, and for the period of social distancing could be met by the HEI or a realistic simulation.

BSc sandwich placements do not affect Accreditation; they are not included in the criteria.

Period of Practice placements for MSci and BSc sandwich programmes with Advanced Accreditation are still expected to meet the criteria but a placement in a laboratory or field station is not required.

Issues affecting student intake academic year 2020/21
It is accepted that HEIs may need to make considerable adjustments particularly in relation to the acquisition of technical skill. The Society considers that criterion 2 can be met over the course of a programme not just one academic year. See additional notes with the new Accreditation Handbook.

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Long term

It is anticipated that the pandemic will have some long-term consequences for teaching, learning and assessment in higher education. Not all of these will be negative, there will, for example, be some significant developments and increased familiarity with innovative learning technologies, and the RSB will look favourably on the use of suitable solutions to simulate laboratory and other experiences.

The Society will be reviewing its criteria and guidance notes annually in light of any ongoing situation.