4 ASSESSMENT OF PRACTICAL SKILLS: "I DO AND I LEARN"

'LEARNING BY DOING' IS ONE of the most powerful forms of education, because various senses are involved. There is no doubt that practical classes have a pivotal role in the understanding of basic concepts in Biosciences and in the employability of students. However, despite the importance of practical classes, one common intended learning outcome, i.e. the acquisition of practical skills, is very often not adequately assessed. The emphasis of the assessment is often placed on the practical write-up and pays only little attention to the manual competency of the student.

We investigated how practical classes can be designed such that manual competency of Bioscience students and an assessment of practical skills are achieved. To this end we designed and integrated practical classes in two core first year undergraduate Bioscience modules ('A' and 'B') at the University of Kent. Table 1 shows a 'skills matrix (subject specific and practical skills) for the modules.

Students' manual competency was monitored throughout the two modules and formally assessed at the end of each.

Student numbers were approximately ninety for both modules. To give every student the opportunity to obtain the required practical skills, students worked individually, being supervised at all times by trained postgraduate demonstrators (student:demonstrator ratio of 10:1) and a member of staff. Students received extensive theoretical background knowledge in lectures and workshops prior to the practical classes and also got a brief introduction to the specific laboratory tasks in 'pre-lab' sessions. We observed a rather widespread range of skills, e.g. some students were very able to achieve accurate data while others clearly struggled. After students had carried out a specific task, they were asked to produce a short write-up to summarize their results. This write-up, together with a 'comprehension sheet', which linked theory with practice, served as an 'aide memoir'. It was checked and corrected by the demonstrators, but not assessed.

Table 1 Skills matrix for the two first year bioscience modules

Module	Equipment	Techniques	Learning outcomes
A	Pipettes pH meter Spectrophotometer	Accuracy Preparing solutions Dilutions Titration Standard curves Spectroscopy	Use scientific equipment and perform routine laboratory tasks Prepare solutions and measure concentrations accurately Analyse and present data
B	Pipettes Spectrophotometer Chart recorders	Enzyme assays	As above Perform enzymatic assays and determine enzyme parameters

To ensure that students had obtained the intended practical skills, an assessed practical was timetabled and students were informed in advance about the nature of the assessment. In a workshop prior to the assessment a manual for the assessed practical was handed out and potential problems and methodical errors, as well as health and safety aspects were discussed with the students.

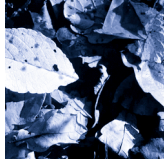
In the assessed practical, students repeated one of the previous experiments with subsequent marking of their results. For example, students had to produce a standard curve and determine the concentration of a given protein solution. The marking was mainly based on accuracy, but other factors, e.g. safety, following good laboratory practice, etc. were taken into account. Students who were outside a set error margin and therefore failed the assessment were asked to repeat it. In this case, students were shown again how to use the equipment and potential methodical errors were discussed.

To evaluate the success of this scheme, students were asked about the usefulness of the practical classes and assessments through questionnaires. In general, students commented positively on the organisation of the practical classes and their embedding into the lectures. Students thought that the aims were very well achieved and felt more comfortable with the techniques and the equipment. Students found that "the practicals were structured and set up very well". The accuracy of practical work in later modules improved markedly; however, no quantitative data are yet available.

CONCLUSIONS

From our analysis of the evaluation forms and informal discussion with students we concluded that the project was successful in that it enabled us to assess objectively the manual skills of students. However, we noticed some points that need to be taken into account when this form of assessment is used:

* *Suitability of the practical class* — assessed practical classes are a powerful tool in the assessment of



manual competence, however, not all practical classes are equally suitable for this approach. The learning outcomes of the chosen practical classes, being of a numerical nature were comparatively easy to assess. However, a practical class where the main learning outcome of which is the cloning of a gene or the identification of a microbiological specimen cannot be easily assessed in the same way. Careful design of the practical classes and their assessment according to the learning outcomes is therefore important.

* *Link between practical classes and theory* — lectures/workshops and practical classes must be closely interlinked. A careful curriculum design and detailed plan of work is very important.

* *Differential learning* — we observed a widespread range of manual competency. It is therefore important to address this issue and to provide support for weaker students. This can be done by closer supervision of those students or by giving extra help in the use of equipment.

The practicals discussed in this report are available from the Practical Compendium on the LTSN Bioscience website (*http://bio.ltsn.ac.uk/compendium/*).

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'DIS-TRIBUTE'

A PROJECT TO IMPROVE PROVISION FOR DISABLED STUDENTS IN LAND-BASED EDUCATION

THIS HEFCE-FUNDED project is being undertaken by Writtle College in Essex. The overall aim of the project is to enhance the accessibility of land-based curricula by identifying, and, where possible removing, barriers to participation.

In addition to common accessibility issues, land-based curricula raise other hurdles associated with outdoor practicals and work with animals, and machinery. Conversely, they offer opportunities, such as simulated and real work experience, specialist learning resources, and experience of provision for those with learning difficulties and special educational needs.

The main project outcome is to provide a set of discipline-specific learning and teaching practitioner guides to be used as a resource by staff to address disability issues in vocational curricula in both FE and HE. Academic staff, educational developers and disability specialists will be involved in the production of the guides and the aim is to use existing networks such as the Land Based Colleges Consortium and LTSN Bioscience to aid the dissemination of material. Additionally a range of assistive technologies will be evaluated for land-based curricula using advice from disability specialists and practitioners across the sector.

PROJECT OBJECTIVES

* raising the awareness of issues relating to students with disabilities, ensuring compliance with QAA Codes of Practice, SENDA 2001 and other relevant legislation;

* developing greater sensitivity to disability issues amongst staff and students, engendering confidence in relating to and supporting individuals with a range of disabilities;

* developing a comprehensive set of institutional level policies relating to students with disabilities which are co-ordinated with institutional strategies for widening participation, learning and teaching and Equal Opportunities, and which are particularly appropriate to land-based education;

* outlining and delivering (at Writtle) a programme of staff development designed to embed the policies across the whole institution;

* exploring, developing and sharing best practice of particular relevance to institutions offering FE and HE programmes in the land-based sector.

In relation to the latter objective one of the project members is currently trying to make contact with disability representatives in land based colleges or universities with land based departments. The aim is to establish a baseline in terms of the number of land based students with disabilities and the nature of these disabilities. If you can provide such information for your institution then the project team would like to hear from you (please contact Jonathon Price at *jbpl@writtle.ac.uk*). The project is still in its first phase with a finish date of September 2005.

RELATED WEBSITES

The UK Centre for Legal Education which provides a useful overview of the SENDA Act (2001) *http://www.ukcle.ac.uk/directions/issue4/senda.html*

The JISC TechDis group who focus on technologies to improve provision for disabled staff and students in HE *http://www.techdis.ac.uk/*

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