Proposed Guidelines for Laboratory Courses within the British Columbia Transfer System.

for BCCampus Articulation and Transfer of Remote and Web-based Science Lab Curriculum Project

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Overview

As faculty in a number of colleges or universities in the province of British Columbia are working on various aspects of remote access/online/distance science laboratories, the “BCcampus Articulation and Transfer of Remote and Web-based Science Lab Curriculum Project” has been researching and collating the educational experience and outcomes of this pedagogy both in and outside of the province. The results of this research are now available in the online publications “Review of Literature on Remote and Web-based Science Labs” and “Discussion Paper on Remote and Web-based Science Labs”. The field of online science labs is rapidly expanding and since these reports were written (June 2009) there will have been further papers and publications on this subject.

While in the B.C. transfer system some concern has been expressed - mainly with the possibility of a laboratory course being totally simulation without any “hands-on” experience - the feedback obtained so far indicates that the most important issue is ensuring a quality lab learning experience. The Web-based Science Labs currently under development through BCcampus grants are not virtual or totally simulated and so this concern should not hinder transfer or further development of these remote access laboratory courses. The following set of general guidelines could help all institutions in establishing quality labs whether traditional face-to-face, or remote-access, or a blend of the two. These guidelines are preliminary and may need to be adapted to fit different disciplines or different courses within a discipline, but they would provide guidance for colleges and universities in the province who already have or are planning to have some part of their laboratory courses available for students through remote access. Following the guidelines would not be a guarantee of transfer credit as acceptance of any course for transfer would still remain the prerogative of the receiving institution.

(1) http://rwsl.nic.bc.ca/research_papers.html
Guidelines for a quality lab learning experience

These guidelines have been divided into three categories: practical, theoretical and societal. Are these three equal in every lab? Obviously not – nor would we expect them to be. Different disciplines (and different courses within a discipline) may have different priorities and expectations for their laboratory learning objectives. However these three guideline categories include a wide range of goals and science instructors would presumably include many if not all of these in developing their laboratory curriculum. How individual laboratory courses achieve these goals varies from institution to institution and discipline to discipline.

• Practical

This category includes the traditional practical skills, for example performing a titration in chemistry, using a microscope, setting up a circuit, identifying a plant or a mineral on a field trip. Also included here are the newer practical skills now required in a modern scientific laboratory: using computer controlled scientific instruments, accessing scientific data bases, interpreting and analyzing data from instruments, using computer modeling and simulations, etc. More than ever, a science student needs to understand that obtaining and/or using real world data is an important part of laboratory education. The ability to work as part of a team is also a practical skill that can be developed within a laboratory setting.

• Theoretical

Practical skills enhance the theoretical material presented in the classroom and are important to mastery of the material and in the development of scientific reasoning. For these reasons the laboratory part of a science course is not just about learning how to dissect, manipulate glassware, set up electrical circuits, or use microscopes but also requires students to obtain and report on results – the "lab report". A required lab report is a bridge between the theoretical and practical where students often come face-to-face with the complexity and ambiguity of scientific data.

• Societal

While practical skills and theoretical understanding are the more obvious goals of the laboratory course, a number of other goals are also important. Understanding the complex nature of science can be demonstrated in a practical way in the laboratory where results are not always as expected - especially where laboratory exercises are not “cook book”. Cultivating a greater interest in science and in the continued study of science - with innovative techniques and maybe local or regional concerns included in the laboratory curricula - is an important guideline. The ability to work as part of a team is not only a practical skill but also a social skill necessary for all science students and scientists.
Summary

British Columbia has a unique system of course and credit transfer from, to and between colleges and universities. The combination of cooperation at the discipline level and recognition of autonomy of individual colleges and universities is the backbone of the BC Articulation and Transfer system. Transfer is and has always been about course content and not about mode of delivery. Whether courses are offered in once-a-week blocks, in the standard 15 week semester or a 7 week summer school, on a self-paced basis, online or face-to-face has never been a transfer issue. In fact institutions offer a variety of delivery options for the same course and often in the same semester. The information that the course was online or semi-online does not appear on a student transcript. Thus, at present, a student could do the laboratory portion of an already articulated course by an online method or by traditional means.

As remote access/online labs continue to develop in British Columbia (and around the world) it is important to supply all participants in the B.C. transfer process with information about how their colleagues are using these new technologies. If the general guidelines set forth here are followed, there should be an assurance that students are getting the necessary laboratory knowledge and skills irrespective of the mode of delivery. It is important that these guidelines be discussed - and modified as necessary - at the appropriate articulation committee level. The use of new educational technologies (and current examples) should also continue to be part of articulation. Ultimately, as with every other aspect of transfer courses, it is student outcomes that should be monitored to ensure that all B.C. students – including those for whom remote access/online may be the only means of gaining post-secondary education – receive a quality educational experience.