CASE STUDY: COLLEGE OF SCIENCE AT UNIVERSITY OF WITWATERSRAND ACCESS COURSE TO THE FACULTY OF SCIENCE

This case study is written from a paper by Marissa Rollnick (Wits University) and Susan Tresman (Open University, UK) entitled ' Widening Participation in Science Education: the Potential for distance learning to deliver programmes of study in foundation level science'. The assessment section is taken from the Biology Course Guide.

PROGRAMME OFFERED

The College of Science (COS) is a virtual college that was established ten years ago in response to the changing demography of students. It was a post apartheid imperative to open the university to those historically excluded and to provide access to able, under prepared students whose schooling would normally have precluded them from studying science at university level. Students spend two years in the COS after which they proceed to the second year of Wits' BSc programme. Over a period of a decade the COS programme has become probably the most successful access programme for science students currently operating in South Africa. In seven years it has produced over 280 BSc graduates who would not otherwise have gained access to a university science faculty.

At present COS provides access only to 200 students each year. It was argued that this number did not fully warrant the huge investment in the programme which relies heavily on a range of teaching and learning strategies that limit the possibility of significantly expanding student intake or catering for different types of students from those currently served by COS.

It became clear that if the COS was to survive and flourish student intake needed to be expanded and alternative teaching and learning methods developed. It was felt that the only way to broaden access to this programme would be to provide the programme in a flexible open learning format. The term 'Open Supported Learning' was chosen rather than "Distance Learning' as those enrolling in the courses would receive more support than they would in traditional distance courses.

The Open Supported Learning Programme (OSLP) has been planned to produce both one and two year stand-alone qualifications by distance learning in science, offering modules in pure science (physics, chemistry, mathematics, biology) and later in earth science. Completion of the two-year programme will still provide access to the BSc programme as in the face- to-face programme.

Learners receive hard copy versions of materials, work through these and hand in assignments. Once a month they attend tutorials on campus and twice a year they attend five day practical and 'hands on' sessions. Each course consists of 2 modules, divided into 16 units. One unit consists about a week's work.

PURPOSE AND TARGET LEARNERS

The College of Science open learning course targets the population between school and university. There are a large number of school leavers with inappropriate school leaving qualifications in the country and this group has thus been identified as a strategic target for development in a recent policy document on the development of Science, Maths and Technology Education in South Africa (Kahn 2000). It also targets adult learners in employment. This programme will serve as a case study for the development of open learning programmes in science in the country. The aim is to make the programme both cheaper and more flexible in terms of the time commitments of students.

The main focus of the programme is:

- The transfer of knowledge and skills in various scientific disciplines to novice learners at post school level.
- The provision of feedback to participating students so that they can assess their acquisition of new skills, knowledge and understanding as they proceed through the course.

A prominent feature of COS courses is that what is learnt stretches far beyond pure content and is as much about what is done with the content as the learning of the concepts themselves. The nine outcomes of the COS course in Table 1 below illustrate this point:

Table 1: Outcomes of the College of Science course

Communication: access required learners to understand the material and effectively communicate their knowledge by written and oral means.
Mathematical Competence: understand how to work with numbers, patterns, mathematical relationships and be able to use appropriate mathematical language to do so.
Problem Solving Skills: apply scientific knowledge and skills to problem solving, in the broadest sense, and in everyday life.
Scientific Method and Experimental Techniques: select and employ appropriate equipment to generate data. Process this data and judge whether the method and results are reasonable and consistent with prior knowledge.
Critical Thinking: ask questions of themselves, each other and facilitator.
Management and Organisation of Information: access, process and use data and information appropriately.
Ethics and Attitudes: Demonstrate an understanding and appreciation of ethical issues in science.
Awareness of Career Opportunities: learners are aware of the broad range of career possibilities available
Content: demonstrate basic conceptual understanding in selected scientific disciplines

The outcomes designed for the COS are informed by the critical cross-field outcomes published by the South African Qualifications Authority (SAQA). All qualifications must address these outcomes, very few of which directly address pure content. The development of the OSLP has been greatly assisted by this requirement as all university qualifications are now expected to be reconfigured to address the SAQA outcomes.

LEARNER SUPPORT

Distance learning can offer flexible and innovative patterns of learning, using a variety of communications and media, but in its most elementary form this type of learning occurs in isolation from tutors or peers. COS sees a two-way communications between tutor(s) and learner as central to the process of learning. In the light of this support is provided to:

- Encourage the learner;
- Correct errors;
- Signal difficulties;
- Inform tutors;
- Allow tutor and learner to explore new directions.

The materials are also designed to be strongly interactive and situated in contexts wherever possible. Contact sessions are used as pivots around which the materials work. Compulsory assignments would be handed in at these sessions and feedback would be provided. Staff to student ration is 1 to 25 and the atmosphere of the small group tutorials is recreated as far as possible during these sessions. In addition each student is assigned to a tutor who offers telephone or face to face support at designated times. Furthermore students at close proximity to each other are grouped to allow for peer interaction.

Within programmes of distance education, it is vitally important to 'connect' students effectively to their University, in order to secure their participation and progression. Some aspects of the process of registration are more difficult owing to the remote methods of study. For these reasons the process of registration and orientation of the students is of paramount importance.

In the case of the first cohort of Supported Open Learning students a number of processes have been introduced to integrate students. These include:

- Personal interaction with programme staff during the registration event.
- Induction events, on registration day which afforded new students an opportunity to work through examples of the teaching materials, meet and discuss teaching with COS staff, interact with each other via a number of 'ice breaking' activities. Students learnt about time management, the tutorial and laboratory work, the study programme and something about each other – their previous experience and hopes for the course and personal study targets.

COURSE DESIGN PROCESS

Written texts need to present key information and be of a high didactic standard. The organisation of the subject matter should be coherently structured and take into account learners' previous knowledge. Incorporated into the text should be self-assessment questions and answers to facilitate a type of immediate feedback. In this respect distance learning materials can be effective, if not more effective, as any other science course and may represent greater value for money than full time equivalent courses.

In COS there was a strong ownership of the existing face to face programme and a desire to replicate its excellence in the OSLP. The development of staff as writers of distance materials took place side by side with the development of the materials through the editing process.

In 1999 the university's strategic development fund provided a small grant and work began on the development of the format and outcomes for the OSLP. Since these were closely modelled on the existing face to face programme, the outcomes produced closely matched the philosophy and aims of the existing course and compelled those involved to extract the essence of what they were trying to do in the programme. The result was a set of outcomes that guided the development of the new materials. Some development of units was begun at the end of 1999 and these were referred to the South African Institute for Distance Education (SAIDE) for review. An ideal would have been to allow SAIDE to review all units but not enough funding was available for this. Thus the generic feedback provided by SAIDE was used as a guideline by internal editors and critical readers.

During 2000 most of the first year material was developed for piloting in 2001. The majority of writers were either face to face tutors on sabbatical, or writing while teaching either full time or on a reduced teaching load. So, development of materials has taken place primarily through staff goodwill and their strong feeling of ownership of the courses. In most cases they have resisted the buying in of external writers, whom they feel are not sufficiently familiar with the culture of their courses.

At the end of 2000 the first staff were recruited – half-time co-ordinators for each subject area and a half time manager and administrator.

ASSESSMENT

Assessment strategies for the various courses vary but basically the final mark is the record of marks accumulated during the module. These marks are from activities such as assignments, practical activities and tests and from exams. Below is an example of how marks for Biological Science are calculated.

Table 1: Mark weightings for various course components

Module	Proportion of class mark to exams		
	Class mark	Exam mark	Total
Module 1 (Feb – June)	40 % (160 marks)	60 % (240 marks)	100 % (400 marks)
Module 2 (July – Nov)	40 % (160 marks)	60 % (240 marks)	100 % (400 marks)

Class Mark

The class mark consists of different assessment activities that take place as students work through each module. It provides a record of progress and also enables the tutor to provide valuable feedback to the student on how he/she is doing. Table 2 below shows the proportions that the different activities contribute to the final mark of each Module

Table 2: Breakdown of class mark component of the course

Module	Class mark activity		
	Assignments	Practical activities and test	Total
Module 1 (Feb – June)	50% (80 marks)	50% (80 marks)	100% (160 marks)
Module 2 (July – Nov)	50% (80 marks)	50% (80 marks)	100% (160 marks)

Assignments contribute 20% (80 out of 400 marks) and the practical activities and test contribute 20% (80 out of 400 marks) to the class mark for each module.

Assignments

For each module students have to complete and submit four assignments. Assignment 1 contributes fewer marks to the class mark than assignment 4. This is because it usually takes time to get used to an open supported learning way of studying so the marks that a student gets for the later assignments are likely to be a more accurate reflection of his/her ability. Table 3 below shows mark allocations for assignments.

Table 3

Assignment	Module 1 (Feb – June)	
	Actual mark for assignment	Contribution to class mark
Assignment 1	20 marks	10 marks
Assignment 2	40 marks	20 marks
Assignment 3	50 marks	25 marks
Assignment 4	50 marks	25 marks
Total		80 marks

The actual mark for each assignment refers to the actual mark that will be written on the students assignment. The contribution to the class mark refers to the number of marks that each assignment will contribute to the class mark. Contribution to the class mark is the actual mark divided by 2.

Examinations

Each of the two Biological Sciences modules is examined separately. For each module there are two exams – a practical exam written in the laboratory and a theory exam written in an exam venue. Each exam is two and half hours long and covers the content and sills learned during the module. The table below explains exam papers and mark contribution.

Table 4: Exam papers and exam mark contribution

Module 1 (June examinations)		**Module 2 (November examinations)**	
Paper 1 Theory paper (3 hrs) Biodiversity 1 & 2 120 marks	Paper 2 Practical paper (3 hrs) Biodiversity 1 & 2 120 marks	Paper 3 Theory paper (3 hrs) Biodiversity 3 Cell biology Introduction to Genetics 120 marks	Paper 4 Practical paper (3 hrs) Biodiversity 3 Cell biology Introduction to Genetics 120 marks
Exam Total for Module 1: 240 marks		Exam Total for Module 2: 240 marks	

A student needs to score a minimum of 50% in order to pass each module and a sub-minimum of 40% has been set for the exams for each module. This means that unless a student scores an average of 40% or more for the exams for each module he/she will not pass that module, even if the class mark is a pass. This rule has been put in place to set a standard for each module to ensure that students who pass the module have acquired a certain level of skills competence and an adequate understanding of the course content.