TEACHING PHYSICS AT A DISTANCE

–CHALLENGES AND SOLUTIONS–

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Outline

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2 Challenges in distance education

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- Course materials and media
- Experimental provision
- Assessment and examinations

Why Teach Physics At A Distance?

In the UK there is a general desire to make university level education available to all who can benefit from it (widening participation).

There are many citizens who wish to learn about, improve or update their knowledge of university level physics but are unable to attend conventional university. These include:

- Those with full time jobs and the need/desire to meet financial commitments.
- Those with family commitments, such as mothers of young children.
- Members of the armed forces and those working overseas such as British Embassy staff or British Council personnel.
- Students who wish to live at home while studying physics, but lack any nearby university that teaches physics.

Distance education provides a way of meeting the aspirations of these citizens.

The Open University

The OU is Britain's largest university.

It was founded in 1969, to teach at a distance and to operate an open access policy.

It is the 'University of the second-chance.'

There are now 150 000 undergraduates and 45 000 post graduates. Overall it has attracted more than 2 000 000 students.

There are about 5000 'continental' students.

The average student is aged 30, has a family and a full-time job. His/her OU degree will take 6-8 years and will cost about £4000.

Each year about 5000 students embark on science studies at the OU, about 600 take introductory physics, and about 1000 take introductory astronomy.

Major Challenges of Distance Physics Education

Student diversity:

- Prior knowledge and previous attainment.
- Time since last study and study skills.
- Aims and aspirations.

Remoteness from sources of advice and guidance (including other students).

Remoteness from learning resources (lectures, libraries etc.).

Need for experimental work.

Assessment and examination of progress.

Programme Structures

Undergraduate programmes at the OU are MODULAR and are offered at four LEVELS:

Level 1 Foundation modules & short courses

Level 2 Broad survey courses

Level 3 Specialist modules

Level 4 Project based

To deal with diversity students are free to enter at any level.

They can follow a specified programme to obtain an Honours degree in a named subject (e.g. BSc in Physical Science).

Or they can take some other combination of courses to obtain a generic BSc or BA.

In either case, provided they include a sufficient range of physics and maths courses from a specified list, they will be eligible for Graduate Membership of the UK Institute of Physics.

S103 Discovering Science

SXR103 Practising Science

MU120 Open Mathematics

MST121 Using Mathematics

MST207 Mathematical Methods and Modelling

S207 The Physical World

S281 Astronomy and Planetary Science

ST291 Images and Information

SXR207 Physics By Experiment

S357 Space, Time and Cosmology

S381 The Energetic Universe

SD329 Signals and Perceptions

SM355 Quantum Mechanics

SMT356 Electromagnetism

SMXR356 Experiments and Simulations

Student Guidance and Support

13 REGIONAL OFFICES provide local centres for advice and guidance regarding course choice.

Science specialists in those offices (Staff Tutors) are also responsible for recruiting part-time ASSISTANT LECTURERS who provide tutorial support for the students as they study their courses.

The ALs are also responsible for marking the Tutor Marked Assignments (TMAs) that students complete during their study.

Approximately 10% of all UK university staff have worked for the OU as a part-time course tutor (i.e. an AL).

Course Materials and Media

Students must be supplied with course materials. Those materials should employ media that are appropriate to the subject being taught.

An example: S207 The Physical World

This would typically occupy 32 weeks of part - time study at 12 hours per week and would represent about 15% of the work required to obtain a degree.

The course consists of:

8 books (full colour, co-published with IoPP approx 1600 pages in total).
4 supps (glossary, maths handbook, computer book, specimen exam)
8 thirty-minute video programmes
8 hours of tutorials
4 CD-ROMs (inc. Mathematica based *Physica*)
1 CMA
7 TMAs
1 final exam

Experimental Provision

Ensuring an appropriate provision of experimental work is a major challenge in the distance teaching of physics.

In the early days of the OU great use was made of HOME KITS. However, these are expensive to supply and maintain, and it is difficult to provide students with assistance or monitor their progress.

Now, most experimental work is carried out at week-long RESIDENTIAL COURSES held at conventional universities during their summer vacations. (This represents a significant movement of funds from distance education into conventional education.)

Additional exposure to the importance of practical work is provided by:

- Computer simulations
- Video programmes
- Text discussions

Assessment and Examinations

Regular assessments (some based on experimental work) play an important part in ensuring that students remain on schedule, and that they study the course materials with an appropriate level of thoroughness and depth.

CMAs initially played an important part in student assessment, but the construction of high quality multiple choice questions is very difficult and time consuming. CMAs are therefore disfavoured except as instruments for formative assessment where they can be used repeatedly.

TMAs (typically requiring 20 page answers) are now the norm. Students can get up to 50% of their course credit from these.

Exams: conventional three-hour closed book exams provide the other assessment component. These take place in October/November at examination centres in all parts of the UK and in some areas of Europe.