
Accounts of the new FDTL 4 Projects

MathCentre of the World

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"Your world has changed. You've left the comforts of home and school and entered the unknown world of university. And the unknowns include a bit more maths than you had expected. Where do you turn?"

This is the experience of so many students at the transition to university. Their courses, in engineering, in the physical sciences and many other disciplines demand an understanding of basic mathematics which they feel they lack. Sometimes they do; sometimes their understanding just needs reinforcement, they need to get another angle on it. Whatever the problem, it's good to have a maths support centre at hand and nearly half UK universities do. For the rest, and for those times when the support centre is not available or the tutor is somewhere else, there will soon be somewhere to turn.

www.mathcentre.ac.uk is in development now. The LTSN Maths, Stats & OR Network, with the Engineering and other Subject Centres who all recognize the importance of meeting this need, are supporting it under the LTSN Development Fund. The idea is the brainchild of Dr Tony Croft of Loughborough University whose work with Professor Duncan Lawson of Coventry on the development of support centres is becoming increasingly well known. Their collaboration with the University of Leeds and the Educational Broadcasting Services Trust extends, under FDTL4 funding, into development of new material to populate the website.

So what will a student find in this new, on-line MathCentre?

Recent research, *Good Practice in the Provision of Mathematics Support Centres*, Lawson, D & Croft, A C (2001), shows that students value, above all, personal contact with a tutor. Not easy to supply on a website. How often have well intentioned educators set up a forum for response to learners' questions and how often have the results ended in disappointment? Lack of funding, lack of time and commitment turn the site into a static bank of FAQs which a user will be unlikely to access again. The MathCentre is realistic about that and it means to be dynamic, open to development in response to its users. From the start it is involving students in the site's design and testing. It will be realistic about what students want and how smartly they need to get it.

There will be free access and clear routing to the brief explanation, the more detailed exploration, and on-line exercises to check understanding of, to start with, 60

essential maths topics. There will be mechanisms, too, for universities to establish or enhance their own, local mathematics support and links to relevant initiatives such as the LTSN MathsTEAM.

The maths tutor will be there. Not a disembodied e-mail correspondent, but a person you will see and get to know on the screen. There will be several tutors, in fact, encouraging, confidence building people, who are to be a key feature of the complementary *MathTutor* DVD-ROM being developed at the same time as the website MathCentre. This will introduce them, they will connect website users to the topics they need and to further study via the DVD-ROM disk.

Contacts:

- [1] MathCentre- contact Dr Tony Croft, a.c.croft@lboro.ac.uk
- [2] FDTL4 project: Mathematics Support at the Transition to University and the DVD-ROM MathTutor - contact Professor Mike Savage, m.d.savage@leeds.ac.uk

HELM: Helping Engineers Learn Mathematics

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Readers of *MSOR Connections* will be familiar with the "mathematics problem", particularly in relation to engineering students for whom mathematics is but a small part of their curriculum. How to deal with variable intake, falling standards and increasing numbers of students is a major issue faced by lecturers - in an environment which for many is becoming more focussed on research rather than innovative teaching. An attempt at addressing this problem was begun at Loughborough in 1996. An all-embracing approach was envisaged in which learning mechanisms were put in place more appropriate to the present-day undergraduate engineering student. This involved writing teaching materials more focussed on students with a lower base of knowledge than hitherto, utilising CAL whenever appropriate, and embracing innovative approaches to assessment. Thus the Open Learning Project (OLP) was borne and significant funding by Loughborough University enabled staff to start to develop the materials required for this new situation. Students responded well to this open learning regime which encouraged us to develop liaisons with other universities and seek external funding to complete the project and fully disseminate the work to other HEIs. The result was HELM - a

£250,000 FDTL4 three-year project undertaken by a consortium of five universities: Loughborough, Hull, Reading, Sunderland and UMIST.

The HELM project began in October 2002. This report details our achievements during the first three months and aims to encourage other HEIs in England and Northern Ireland to get involved. First, however, we highlight our aim and starting point.

HELM Project Aim

The overall aim of HELM is to enhance the mathematical education of engineering undergraduates by the provision of flexible teaching and learning materials. These may be integrated into existing engineering programmes by selection of individual stand-alone units, or by adopting the whole scheme. This aim will be achieved by the following:

- Identification of successful aspects of Loughborough's existing OLP materials and enhancements needed
- Identification of other materials already available at other HEIs in the consortium to add to the resources
- Development of additional new materials to complete the scheme
- Implementation of HELM website <http://helm.lboro.ac.uk>
- Testing and evaluation of all materials and revision
- Recruiting institutions to trial the materials
- Running workshops and contributing to conferences
- Dissemination of the final product (assisted by LTSNs)
- Development of a network of consultants to assist wider implementation
- Evaluation of all processes

HELM Learning Resources

There are three basic strands to the HELM learning regime:

Printed Materials: High quality printed workbooks already exist which cover much of the basic mathematics required by undergraduate engineering students. These workbooks were written specifically with the typical engineering student in mind and over-rigorous mathematics is avoided. The material is attractively presented with numerous diagrams, worked examples and guided exercises. At Loughborough this material is freely available to students and enables them to better structure their learning and, to a certain extent, learn at their own pace. This material liberates staff to change the nature of lectures: from rushed exercises in note

taking to a better and more relaxed exposition of the subject material.

These workbooks are being significantly enhanced by the addition of a large number of engineering related examples and case studies (work led by the University of Hull).

Additional workbooks are being written to complete the scheme: Numerical Methods (University of Reading), Statistics (University of Sunderland) and advanced Engineering Mathematics topics (Loughborough University and UMIST).

CAL Segments: Many of the workbooks will have web-delivered CAL segments including audio, animation and self-assessment aspects. Those already developed have been found to be especially useful for supporting students of moderate mathematical ability, and for enhancing lectures.

Assessment Regime: Students following the HELM regime are tested, typically five times each semester, with web-delivered assessments. Students are encouraged to engage in learning by allowing them to access trial tests over and over again (with feedback) before taking a one-attempt summative test. The OLP experience has shown that students are very appreciative of this composite formative and summative assessment regime and, almost without exception, participate fully. This regime strongly motivates students to keep up with their studies and thereby improve achievement and progression.

Achievements So Far (Jan 2003)

Since the award of the FDTL grant much has been achieved with 14 academics contributing directly to the project. Milestones are:

- Project Administrator appointed (November 2002)
- Educational technologist appointed (December 2002)
- Contracts, detailing work to be carried out by consortium members, drawn up and signed (November 2002)
- Potential trialling partner universities identified (Aston, City, Northumbria, Southampton, UWIC and others)
- Website built (<http://helm.lboro.ac.uk>) (January 2003)
- Draft workbooks on Statistics, Numerical Methods, Functions of a Complex Variable, Multiple Integration and Mathematical Modelling developed (December 2002)
- First workshop held for consortium members and initial trialling partners (December 2002).

- First Steering Group meeting held, with very positive outcome (December 2002)
- Network of interested parties formed (20 staff at 11 HEIs, as at January 2003)
- Paper submitted to IMA Mathematical Education of Engineers 2003 Conference and accepted (January 2003)
- Information poster and brochure prepared (December 2002)

The immediate future tasks:

- Integration of engineering examples into most workbooks
- Testing new materials
- Extending publicity
- Recruiting further trialling partners for 2003-4

Getting Involved with HELM

If you are interested in sampling the HELM materials then visit the HELM website (<http://helm.lboro.ac.uk>).

We would welcome expressions of interest for trialling the materials in 2003/2004. There is a wide range to choose from. Members of the team can visit institutions to discuss the HELM project and trialling procedures or, if preferred, interested parties can visit HELM at Loughborough.

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STARS: Creation of Statistical Resources from Real Datasets

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When and Who?

This 3-year project started in October 2002, and the team consists of the Project Director Colin James (De Montfort University), Penny Bidgood (Kingston University), Neville Hunt (Coventry University), Brad Payne (The Nottingham Trent University) and Vanessa Simonite (Oxford Brookes University).

Overview

The goals, which have been set in response to feedback from our community [1] and others, are to:

- make available real datasets, from accessible databases, in a form suitable for a learning and

teaching resource in HE across a range of disciplines;

- construct learning materials to accompany these datasets;
- develop such materials so they can be used with various statistical packages for a range of student abilities, backgrounds and needs.

The materials will be accessible electronically for use by both staff and students. All materials will reflect real, in-context, scenarios so they will address a number of issues, including:

- professional development for lecturers;
- student motivation and retention.

The intended outcomes/outputs include the following, which are listed in no particular order of importance.

- an increased awareness of the value of statistics;
- a catalogue of real datasets suitable for use across a range of subjects, categorised by discipline;
- information about the accessibility of appropriate databases;
- a series of workshop activities;
- written articles and published papers;
- discipline-specific and level-specific worksheets (making use of Excel, Minitab, SAS, S-Plus and SPSS) which can be modified by staff for local use;
- individualised datasets, assignments and suggested "solutions", in an attempt to address the problem of copying/plagiarism. Our intention is that access to these will be restricted.

It is recognised that, for many staff, the most important outputs for day-to-day aspects of the job will no doubt be those in the last two bullet points. These expand the concepts discussed in [2]. The worksheets are intended to support, but not be a substitute for, lecture materials.

Can this Project help with Widening Participation and Retention Issues?

To some extent widening participation and retention go hand in hand so we expect that easily-accessible, always-available, relevant resources, which address concepts in a non-technical way and in a variety of needs-related formats, will help students with a range of characteristics.

Students wishing to succeed will, most of the time, want to meet material which relates to them and their discipline - anything else is likely to switch them off. Consequently we need to produce materials which help to motivate students, but there is rarely sufficient time to create in-context examples for every module on which we teach. The project aims to address this

dilemma by giving the project team the opportunity to create in-context resources which you wish you had time to produce yourselves, and to make them widely available.

In-context Data Sources - where are they?

The main challenge is to refer to real scenarios - there are many datasets on the web, for instance, maybe with meaningful variable names but with little or no accompanying description of the context in which the data was obtained.

We are sure many of you have come across and used datasets coupled with scenarios, and the hope is that you will wish to share your knowledge with us and the teaching community.

Which disciplines should benefit first? - it's up to you

The initial focus will be on the production of worksheets for three (service course) disciplines. We would like you to tell us which you regard as the most important - so far the only area that we are committed to is Health Sciences and Practice.

Where will the resources we produce be found?

We are in the process of developing the web site <http://stars.ac.uk> where we shall demonstrate our progress by providing an increasing number of resources and requesting feedback. Please visit this site in the near future, whether or not you have already done so.

How can we help each other?

As well as suggesting data sources and disciplines we hope you will help to ensure that we produce what you want. To that end we are asking for volunteers to pilot and/or evaluate the materials so we can improve them.

What happens next?

Please email Colin, with an appropriate response, at cj@dmu.ac.uk (subject: FDTL) if you answer **YES** to any of the following questions.

- Do I know where to find datasets **with** scenarios?
- Could I and my students benefit from these resources and, if so, which three disciplines (in rank order) are top of my list?
- Can I offer existing materials which I would like the team to develop further?
- Would I like to be associated with this project in the capacity of a pilot/evaluator?

Please mention this project to staff in other departments if you think they would benefit from these resources - if they wish to contribute as well then so much the **better for all of us**.

References

- [1] Davies, N. (2001). Feedback from the Stats/OR Community. *MSOR Connections* 1.1 (Feb), 3-4.
- [2] Davies, N. & Payne, B. (2001). Web-created Real Data Worksheets. *MSOR Connections* 1.4 (Nov), 15-17.

PPLATO: Promoting Physics Learning And Teaching Opportunities

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PPLATO is a Consortium project led by the University of Reading with Brunel University, Open University, University of Newcastle upon Tyne, University of Plymouth and University of Salford. It addresses two key issues facing the physics HE community - teaching mathematics to physics undergraduates and widening participation in undergraduate physics. PPLATO will survey and evaluate current practice in these areas, developing and disseminating an extensive range of new resources and good practice, building on previous successful developments and experiences. These will be free or at nominal cost to the sector. Project outcomes are expected to be: improved student competence in mathematics and physics and wider participation and improved retention in undergraduate physics.

New resources will include flexible materials for teaching, diagnostics, assessment and tutorial support, with effective strategies for their use. A generic Foundation Year programme for entry into physics and engineering degree courses will be developed and made available to the sector electronically. A key feature of the conduct of the project will be the close liaison with the sector throughout, establishing what is currently being done and seeking a consensus approach to the problems and a sharing of resources. Implementation sites for developmental use of the emerging PPLATO resources will be sought so that evaluation, reflection and response will characterise the project. Institutions wishing to take part in this undertaking and to have access to the developing resources should contact the Project Director, Mike Tinker (m.h.tinker@reading.ac.uk). There will be a small amount of funding to cover the costs of this work.

A first stage of PPLATO is to survey physics departments in the UK to investigate current practice and solutions to the problems of teaching mathematics to physics undergraduates and widening participation in undergraduate physics. We are asking each department to respond electronically to a questionnaire sent via e-mail. All replies will be treated in the strictest confidence and an anonymous synthesis of views will appear later.