Mature Students in HE; Academic Maths Support

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At SHU there was a demand from staff and students alike to provide some form of support for students who seemed to be struggling in mathematics. SHU's academic maths support facility, Maths Help, was set up in response to this demand. This seems to be a need which is common to many institutions and this need is frequently met by the setting up of some form of support. (Beveridge and Bhanot (1994:13) report that 76% of FHE institutions have some form of maths support.) Maths Help offers a daily open access drop-in session and specially tailored short courses. It serves education students at the Mathematics Education Centre and students who are maths specialists and who are studying other serviced subjects at City Centre sites.

An analysis of who uses Maths Help has revealed that the need for support in mathematics is widespread and not, as might be assumed, only for those with weak or non-traditional maths backgrounds. Students with a range of previous qualifications, on a range of courses with a range of attainment and performance levels come with a range of problems.

Methodology

The initial purpose of our study was to evaluate the effectiveness of the Maths Help system with a view to improving the level and nature of the support offered. We are involved in an ongoing project to review who comes forward for help, why they come, why others don't come, what is causing students' difficulty and to investigate whether Maths Help is supporting those needing support, if it is actually helping students and if it is the most appropriate form of support.

In this research we have focussed our investigations on the students themselves through direct observation, questionnaires and in-depth interviews. We have also undertaken an analysis of Maths Help users and an analysis of assessment performance.

Theoretical Context

We have chosen to set our work in the context of general research

findings on teaching and learning within HE rather than the more specific research on maths learning most of which has been conducted at school level. A predominant concern of research has been to investigate students' experiences of studying and learning in HE with a view to improving that experience. Marton and Saljo (1984:36-55) focussed attention on deep and surface approaches to learning. These concepts are now established within the research literature and embedded in many of the subsequent curriculum developments. (Gibbs 1992:24-161)

More recent work has focussed on a variety of factors which encourage deep or surface learning. A number of studies have investigated the relationship between students' approaches to learning and the contexts in which they are working. Biggs (1989:17) reports that

> Teaching that gave evidence of deep learning contained in sharp form one or more of the following:
> - an appropriate motivational context
> - a high degree of learner activity
> - interaction with others, both peers and teachers
> - a well-structured knowledge base

The student complements these four elements with her/his intrinsic motivation. We are particularly interested in the motivational factors and the acquisition of a well structured knowledge base.

There is an assumption in the literature that deep approaches to learning are always "best". At first we questioned this; for many of the students we help, maths is not the main focus of their study; there is increased availability of IT maths tools which, for example, enable students to solve equations without "understanding". However, preliminary findings suggest that students are keen to understand their maths and that a lack of deep understanding of some "basic" concepts is creating problems for a significant number of students. Staff want their students to have "lasting learning" and "transferable learning". Gibbs (1992:4) examines the notion that a full understanding is not always required and that an ability to memorise without understanding is sometimes enough. He reports that

> Studies have shown that a surface approach does tend to produce marginally higher scores on tests of factual recall immediately after studying. However this small advantage is quickly lost. A surface approach leads to rapid forgetting and as little as a week later students who have taken a deep approach will score far higher than those who have taken a surface approach, even on tests of factual recall.

Maths Help in this Theoretical Context

We have considered our initial quantitative findings (who comes to Maths Help, what they ask for help with etc) within this theoretical context.

By providing the drop-in facility we are sending out signals to students. For some this reinforces the validity of their anxiety and can create an expectation of a "quick fix". For others this provides a non-embarrassing , non-threatening initial opportunity to ask for help.

Does the drop in facility encourage surface approaches to learning? If it does, do we need to be worried? Or, is it important that students have at least the opportunity to admit their difficulties in the belief that this is the first step towards being able to do something about them?

Do we provide the four key elements described earlier in a drop-in situation? Our conjecture is that this is very difficult to do. Is the students' motivation intrinsic? Our evidence suggests that the students' need for Maths Help is assessment driven, that is, their motivation is extrinsic.

Can the specially tailored short courses do better? We can create an environment that encourages learner activity and interaction, we can work towards a well structured knowledge base. Much depends on the students' motivation. The majority of students who request short courses and who come to short courses are mature students. The provision of short courses can provide an opportunity for mature students to bring their wealth of experience to the learning situation; the issue for us then is about **reconstruction** of their knowledge base - not "topping-up" or "filling the gaps".

Our data suggests that significantly large numbers of students, including those with formal mathematics qualifications, feel that they do not have a well structured knowledge base in mathematics. Some students without this nevertheless appear to have a deep approach to learning, often culled from other life or work experience. Others clearly have neither a well-structured knowledge base nor a deep approach to learning. The following excerpts from in-depth semi-structured interviews with two students illustrate this:

Student A says

I got 90% in my algebra assignment.
I don't understand algebra.
You can learn by simply accepting but it does not allow you to put it into other contexts.

At work someone would come to you with a problem. What you saw on the surface wasn't the real problem. You had to look deeper.

Student B says

I only got 20% in the algebra assignment.
I can do basic algebra.
I'm that frightened and I know I can't do it.
I understand the help I've been given but I still don't know how to start.
I don't know what you're supposed to do.
I liked it on my HND course. A topic was introduced, questions were set, there were lots of assignments. I need deadlines. Basic explanations.
I failed the maths on my HND course.

Our interpretation is that Student A appears to be "alright", this student can take a deep approach and more importantly perhaps can identify problems and take action. For A, Maths Help's role is that of facilitating the reconstruction of the student's knowledge base.

Student B, however, insists that a surface approach is right albeit acknowledging that it has not worked. B may be able to do basic algebra but does not have a well structured knowledge base. B does not have the connections and the ability to relate new work to old which would enable a starting point for solving problems to be found.

How can Maths Help help student B? Student B does not have a well structured knowledge base and is not taking a deep approach. Our conjecture is that it is easier to help a student to reconstruct their knowledge base if the student is able to take a deep approach. Can we instruct students in the use of deep approaches? Ramsden, Beswick and Bowden's (1987:168-176) research shows that attempts to do this have resulted in an effect opposite to that desired.

The theoretical context of deep and surface approaches to learning whilst providing a helpful framework for the categorisation of students does not help us to formulate appropriate support strategies for some students. The students we see have already learned, or rather failed to learn, algebra. Students with deep-rooted difficulties think they have learned algebra; this is one of the major problems. How can we help students restructure their knowledge in such a way that they can use it? We need to investigate the meaning of algebra to individuals and so it may be more helpful to interpret our findings in the context of hermeneutics.

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