Background

Over recent years, universities have prioritised the need to enhance the employability of their graduates. Initiatives aimed at achieving this have become embedded within institutions’ learning and teaching strategies and supporting policy documents. While the list of skills that employers desire of their graduate recruits is extensive, many employers highlight the importance of numeracy skills [1,2]. For example, 500 members of the Institute of Directors (IoD) ranked ‘numeracy skills’ as the sixth most important out of a list of twenty-eight employability skills, and 98% of respondents considered them to be ‘very’ or ‘quite’ important [1]. Similarly, following a survey of 233 employers, the Council for Industry and Higher Education (CIHE) reported that ‘numeracy’ was ranked ninth, with 68% of employers considering numeracy to be important [2].

Despite the importance attached to numeracy skills, employers of graduates and non-graduates continue to voice concerns about the poor numeracy skills of their recruits. In a recent Confederation of British Industry (CBI) survey, 39% of employers expressed concerns about employees’ numeracy skills and 23% indicated that they had to invest heavily in remedial training [3]. In addition, 21% of employers believed that numeracy skills are only ‘occasionally’ or ‘never’ demonstrated by graduates [1].

Many employers have lost faith in GCSE Mathematics as a measure of an individual’s mathematical knowledge and skills [4] and are increasingly using a range of numerical reasoning and computation tests to evaluate their applicants’ numeracy skills [5]. Such tests represent a very real challenge for many recent graduates, particularly (although by no means exclusively) those from academic disciplines where there may have been little, if any, explicit opportunity to practise and/or enhance their numeracy skills within the curriculum. Not all subjects can readily accommodate numeracy skills within undergraduate programmes of study, yet all graduates will be expected to demonstrate a minimum level of numerical competency if they are to maximise their graduate employment prospects and succeed in the workplace.

In addition to its importance with regard to graduate employability, numerical competency is vital to the successful completion of many undergraduate degree programmes, e.g. the biological and physical sciences, pharmacy, business studies, nursing, etc. Against this backdrop, university admissions tutors and lecturers across the UK have reported that many of their students are mathematically ill-prepared to meet the demands of their chosen academic discipline [6]. Empirical research in this area supports such a perception. For example, deficits in the numeracy skills of bioscience undergraduates have been well documented [7-9]. Similarly, a decline in
numeracy skills over time has been demonstrated amongst psychology [10], pharmacy [11], and mathematics, physics and engineering undergraduates [12]. This decline in the numerical competency of undergraduates is complex and multidimensional, requiring long-term efforts on the part of a range of stakeholders, including government, funding and curriculum agencies, schools, and teacher training organisations. However, until such time as their efforts yield real and sustained improvements in the numeracy skills of university entrants, all universities can do is implement measures aimed at addressing the problem within their own domain [6].

“Many employers have lost faith in GCSE Mathematics as a measure of an individual’s mathematical knowledge and skills and are increasingly using a range of numerical reasoning and computation tests to evaluate their applicants’ numeracy skills”

This article presents a brief introduction to a three-year project being funded by the Higher Education Academy under its National Teaching Fellowship Scheme 2007 (Project Strand). The ‘Every Student Counts: Promoting Numeracy and Enhancing Employability’ project is being led by the University of Central Lancashire (UCLan), in collaboration with Manchester Metropolitan University (MMU) and Sheffield Hallam University (SHU).

**Aims and objectives of the project**

The primary aims of the project are to identify:

- those generic numeracy skills in which employers expect their graduate recruits to be competent;
- the numerical knowledge and skills, if any, required of undergraduates within a range of academic disciplines, and how development of the former might be better supported within curricula; we are not restricting ourselves to the Science, Technology, Engineering and Mathematics (STEM) disciplines, but are including subjects from the arts, humanities, social sciences, health, and management;
- the intra- and extra-curricular support necessary to enhance undergraduates’ numeracy skills.

**Methodology**

A multi-method approach is being adopted, resulting in the collection and analysis of both quantitative and qualitative data. A variety of online and paper-based surveys is being used to gauge students’, tutors’ and graduate employers’ perspectives on a range of issues related to undergraduates’ numeracy skills. In addition, follow-up student focus group discussions and interviews with individual tutors are being used to gain an in-depth understanding of those issues. We are also identifying best practice in terms of strategies and learning resources aimed at helping undergraduates develop and practise the numeracy skills essential to their future employment prospects, whether or not such skills are linked directly to their academic discipline. While the cross-disciplinary study is being conducted with undergraduates and their tutors at UCLan, an in-depth study of History is being undertaken at national and international levels in collaboration with MMU and SHU, reflecting the interests and expertise of members of the project team.

**Some preliminary results**

Here we describe some preliminary results from our online surveys for graduate employers, UCLan students and UCLan tutors. The employer survey was launched in March 2008 and will remain open until the end of March 2009. The student and tutor surveys were launched in October 2008 and will remain open throughout 2009. All three surveys were piloted and revised before being made available in their final format.

**Employers’ perspectives**

Preliminary results indicate that 51% of respondents (N = 164 to date) use either commercially available (64%) (e.g. Saville & Holdsworth Ltd [SHL]) or bespoke (36%) numeracy tests in their graduate recruitment procedures. Seventy-one percent of this group indicated that it is essential for applicants to ‘pass’ the numeracy test in order to progress to the next stage in the selection process, although what actually constitutes a ‘pass’ varies across employment sectors and depends upon the position and graduate scheme to which the individual has applied, e.g. 40% for mainstream and 75% for fast-track, but usually using different tests. Although some employment sectors (e.g. banking, accountancy and financial services) appear more reliant upon numeracy tests than others (e.g. law firms, human resources and telecommunications companies), such tests appear to be used primarily in recruitment to the types of posts that often match graduates’ career aspirations, e.g. professional, managerial, and technical occupations. When asked if respondents had any comments regarding the numeracy skills of graduate applicants for vacancies in their company or organisation, a range of views was expressed, of which the following are examples:

- Many graduates are rejected without interview because of poor maths skills. (Bank or financial institution or services)
- We do find that even though our tests are pre-GCSE standard, around half of candidates fail. (Bank or financial institution or services)
- Stronger on the use of software than the underlying principles. (National government)
• High level of numeracy evident. (Oil company)

• Not all understand scientific notation. Not all understand how to convert between units of measurement. (Consulting firm)

• We ask all of our interviewees a numerical problem solving test. Our graduate interviewees did not perform as strongly as other candidates in this section. They mainly struggled with basic numerical calculations (e.g. percentages, proportions) when without a calculator. (Fast-moving consumer goods company)

UCLan students’ perspectives

Ninety-four percent of undergraduate respondents (N = 264 to date) recognised that numeracy skills are important in everyday life and 84% felt they would need to be numerically competent if they were to gain future employment. However, 54% indicated that, prior to completing our survey they were unaware that graduate employers are increasingly using numeracy tests as part of their recruitment procedures, and even though 78% were unfamiliar with the sorts of numeracy tests employers use, 53% were ‘very’ or ‘moderately’ confident that they could pass such tests. Nevertheless, students’ comments highlight some of the issues that have to be addressed when supporting them in the development of their numeracy skills, for example:

• I feel competent at maths although my dyslexia means I often read numbers backwards. (Nursing; female; 23-30)

• I think my problem lies with the fact that it’s been a long time since I did maths at school, so my confidence is low on the subject. (Biomedical/biological sciences; female; 23-30)

• Maths gives me panic attacks and makes my brain freeze. (Art and design; female; 30-39)

UCLan tutors’ perspectives

At the time of writing (November 2008), only 33 tutors had responded to our online survey, although it is anticipated that this sample size will increase significantly over the coming months. Despite the small sample size, some early comparisons may be made with the undergraduates’ responses and perspectives.

Tutors’ views on the importance of numeracy skills were similar to those of the students; only 6% of tutors felt that numeracy skills were not particularly important in everyday life and only 15% disagreed that students would need to be numerically competent in order to achieve graduate employment. All felt that numeracy skills would be important to students in their future employment. However, 46% indicated that, prior to completing our survey they were unaware that graduate employers are increasingly using numeracy tests as part of their recruitment procedures. Given that 79% of tutors were unfamiliar with the sorts of numeracy tests employers use, it is perhaps not surprising that only 12% of respondents were ‘very’ or ‘moderately’ confident that their students could pass such tests, with 42% ‘not at all confident’; 18% selected ‘don’t know’.

Many tutors perceived that the main barriers to adopting a more proactive approach towards supporting the development of students’ numeracy skills within their programmes of study were (i) fear of loss of subject time to accommodate numeracy skills (52%), (ii) lack of staff trained specifically to support numeracy/mathematics (39%), with 24% and 52% of respondents not feeling confident to teach basic mathematical concepts and statistics respectively, and (iii) staff expectations that students embarking upon the programme already possessed the necessary numeracy skills (39%).

Some of the tutors’ views are reflected in this sample of comments:

• Students choose our degree because they think it will be more practical and not focus on the theoretical; that leads to problems when we introduce mathematical problem solving concepts (Business and management)

• I have a maths degree! The University needs to tackle this problem - it is not just students who struggle (Health studies)

• Because teaching time is limited, and because staff time is very pressurised, I don’t feel that we have enough time to really explain the background to statistics (i.e. how everything is derived) in a way that students find meaningful. They get the theory in their lectures, but I don’t think they find it easy to tie that in with the practical elements (e.g. use of SPSS), and by the time they’re getting to grips with the practical stuff, the theory is just a distant memory. So I don’t think we’re joining up that circle. Additionally, I think there is a lot of concern, in a female-dominated subject area, about numeracy skills. Quite a few students clearly struggle with basic arithmetic, but more just seem quite put off by numerate subjects in general, presumably because of negative experiences about it in the past, or social conditioning (girls aren’t good at maths). So it would be nice to tackle that somehow. (Psychology)

Numeracy skills competency: employers’, students’ and tutors’ perceptions

In our survey for graduate employers we presented a list of generic numeracy skills and asked employers to indicate those in which they would expect their graduate recruits to be competent. We presented students and tutors with a similar list and asked students to self-evaluate their level of competence in each, and tutors to indicate to what extent they considered their students competent (on a 5-point Likert scale, ranging from ‘don’t know’ to ‘highly competent’). Preliminary results to date are summarised in Figure 1. Employers’ requirements for numerical competence and students’ perceptions of their levels of competence follow a similar trend and appear correlated ($r = 0.76, p < 0.01$), although students may well have over-estimated their competence with regard to some of
the topics listed. The only numeracy skills for which the percentages of responding employers and students fell below 50% were: ‘representative sampling’, ‘using database software’, and ‘using statistical software’; surprisingly, many employers (52%) did not appear to require their graduate recruits to ‘understand the language of maths’ (Figure 1). However, the most striking observation is the discrepancy between the students’ and tutors’ perceptions of student competence; for all fourteen items listed, the percentage of tutors believing their students to be ‘moderately’ or ‘highly competent’ fell below 40%. Although the sample of tutors was small, the disciplines represented included Accounting, Biosciences, Business and Management, Chemistry, Economics, Engineering, Health Studies, Nursing, and Psychology – all of which require significant, although varying levels and types of numerical competency. This will require some further exploration in the student focus group discussions and interviews with tutors.

Conclusions

Preliminary results of this project suggest that graduate employers, undergraduates and their tutors (from a diversity of academic disciplines) recognise the importance of numeracy skills to employability. Competency in a range of numeracy skills is important to students in obtaining employment linked to their graduate aspirations, particularly within certain employment sectors. Despite this, the majority of undergraduates and tutors are neither aware of the ways in which numeracy skills can impact on graduates’ future employment prospects, nor are they familiar with the types of numeracy tests individuals encounter as part of graduate recruitment procedures. While preliminary data do not suggest any particular concerns regarding students’ self-evaluation of their competence in the range of numeracy skills considered important by graduate employers, the picture may well change for certain groups of undergraduates when the data is further analysed, for example by subject discipline, pre-university mathematics qualification, age and gender; it is also probable that many students over-estimated their competence with regard to some of the topics listed. The low confidence in students’ numerical skills expressed by tutors will require further exploration.

Greater awareness of the use of numeracy tests in graduate recruitment and access to the types of tests used by employers would benefit undergraduates, since greater familiarity and practice could help improve students’ test performance. However, enhancing students’ employability in the longer term would require the promotion of undergraduates’ numerical competence by offering them sufficient opportunities and support to practise and further develop the numeracy skills required in the workplace – through curricula and/or centrally provided resources or facilities.

We are only 15 months into this three-year project and, therefore, data collection and analysis are on-going. Our surveys are extensive, and therefore, we have been able to provide only a flavour of the ‘Every Student Counts’ project in this brief article. For example, our student and tutor surveys cover issues as wide ranging as students’ and tutors’ views on how students may be best supported in developing their numeracy skills; conceptions of mathematics and attitudes towards numeracy skills; students’ maths anxiety and their learning approaches. For up-to-date information on the progress of the project, including further details of the History strand, visit the project website at: www.uclan.ac.uk/information/services/ldu/research/every_student_counts.php
References


