



Mind the skills gap: Information-handling training for researchers (July 2008)

Website and literature search

A literature search was initially conducted using the following keywords: 'research training', 'researcher training', information methodology, postgraduate training, postdoctoral training. These searches yielded very few relevant results, which are shown in the Appendix below. To supplement these searches the keywords were expanded to include 'information literacy' which provided further relevant hits – results again shown in the Appendix. The databases used for searches included academic research databases, such as is used in ISI Web of Knowledge, as well as the popular Google Scholar and Google searches.

The searches provided few results focused solely on postgraduate and postdoctoral training, with much of the research covering the broader area of student training, often focused on undergraduate training when referring to university-based education. There are a few examples of groups conducting investigations into issues such as information literacy in higher education. The most prominent of these include: SCONUL's work on information skills in higher education and information literacy and academic libraries; Manchester Metropolitan University's Joint Information Systems Committee project that includes a focus on the information skills set of staff in higher education. Again the focus in such projects on postgraduate and postdoctoral training is limited.

Appendix: literature review and website search

The focus of this literature review was the broad area of information skills within Universities. An initial search was undertaken using the search terms 'postgraduate training' or 'post-doctoral training' or 'researcher training' and 'information skills'. This literature was then mined for further information on training in thirteen areas identified during the empirical element of this research project. These areas are as follows:

1. Using subject-based portals or gateways
2. Using appropriate search engines
3. Obtaining research papers and data
4. Finding research material in the Library
5. Evaluating research information
6. Bibliographical citation
7. Citing websites
8. How researchers can manage information generated through their research
9. How researchers can retain and preserve information generated through their research
10. Using electronic repositories
11. Open access to research reports
12. Licensing and copyright issues
13. Developments in metadata

The literature identified using this search strategy revealed a number of interesting characteristics. The first was preponderance towards work in the medical field and the second was the placing of issues raised within the 13 sub-areas as information technology training rather than information skills training.

Much of the literature located is related to the broad area of medical (and related) studies. This is exemplified in the following table (Table 1), where in a broad literature search in ISI Web of Knowledge (search terms used: "postgraduate training") approximately 82% of the research papers were related to medical and health sciences.

Subject Area	Record Count	% of 2201 articles located
Medicine, General & Internal	540	24.53%
Health Care Sciences & Services	276	12.54%
Education, scientific disciplines	271	12.31%
Surgery	207	9.40%
Psychiatry	109	4.95%
Education & Educational Research	100	4.54%
Dentistry, Oral Surgery & Medicine	90	4.09%
Public, Environmental & Occupational Health	87	3.95%
Pediatrics	69	3.13%
Pharmacology & Pharmacy	69	3.13%
Clinical Neurology	56	2.54%
Emergency Medicine	56	2.54%
Obstetrics & Gynecology	42	1.91%
Anesthesiology	40	1.82%
Pathology	37	1.68%
Total of 15 top subject areas	2049	93.09%
Subject areas below reaching below 1.5% each	152	6.81%

Table 1: ISI Web of Knowledge search results – search terms “postgraduate training”

In literature searches where more search terms were used in order to narrow and refine the results (e.g. “research training AND information tools”, “doctoral training AND information skills”, “postdoctoral training AND information skills”), the literature located was very limited and the dominance of the health and medical-related studies was greater. A number of searches performed in several online resources and the results turned up are shown in Table 2.

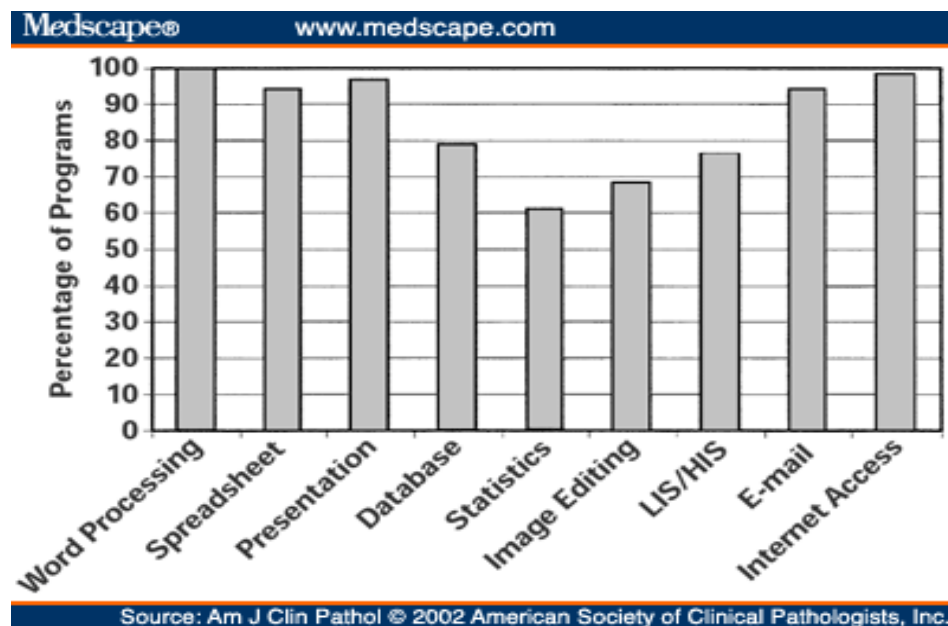
	“research training” AND information skills	doctoral training AND information skills	search engines AND research training	“information literacy” AND “postgraduate training”
Web of Science	12 hits	9 hits	44 hits	1 hit
Google Scholar	174 hits	15 hits	271 hits	34 hits
ABI Global	0 hits	0 hits	1 hit	0 hits
Library, Information Science & Technology Abstracts (LISTA)	0 hits	0 hits	3 hits	0 hits

Table 2: Search terms and results from Web of Science, Google Scholar, ABI Global and

Information skills training has been identified as significant at an individual and organisational level. Fox (1996) found that IT competency is highly considered as essential or important for the future of individuals in their profession. Kinn (1996) indicated that a number of institutions have made the decision to supply training in information management and information technology to their postgraduate (and/or research) students as well as to professionals who have already a degree.

However, McKendrick (1993) points out that the current postgraduate experience is far removed from what the institutions and the Research Councils have sought to offer and often the current system of information support in most of the UK universities fails many postgraduates and more established researchers (Gomersall 2007). This is explained by Stirling et al. (2000), for instance, who in their attempt to address several aspects of training and research revealed that the availability of information technology support was lower than their perceived importance; this could potentially highlight a lack of training in some aspects of research methodology. In addition, Murphy et al. (2004) mention that several pre-qualification courses made some provision for teaching IT skills but still informatics was not yet integrated into the curriculum of that profession (health) and so necessary IT skills are not attained. Through their fieldwork, Murphy et al. (2004) found out that the established view was that, if student lack IT skills, it is their responsibility to address that, which explains why students do not receive enough IT training or feel that insufficient training is provided.

GoldberKahn (1997) based on the results of his research suggests that although informatics training is considered important by most training programs, the inadequacy of resources (this is supported also by Kinn (1996)) and the lack of formal and structured programs may limit training. These have resulted in students not having received sufficient training (Murphy et al. 2004), students' skills being inadequate (Tsai and Tsai, 2003), or even students having received no formal information technology training at all (Clamp et al. 2007). Indicative IT-related areas that training is probably required were identified by Henricks and Healy (2002). These are illustrated in the following diagram.



However, a big part of the studies' participants felt that such training should be routine at both undergraduate and postgraduate level (Clamp et al. 2007). Drawing on that, several researchers (e.g. Burke et al. 1993, Feneley 1999, Stirling 2000, Clamp et al. 2007, etc.) agree that there is a need for training in research methodology through a more formal way in order to provide a basic standard of

information technology competency, and for further consideration to be given by those responsible for postgraduate education, training and research to establish how this might be achieved (Feneley 1999). This agreement between researchers has been developed based on a previous body of literature which recognises and emphasises the importance of computerized information management (e.g. Becich 1994, Buffone, 1993, etc.) and its role to the successful practice of the relevant professions (Henricks and Healy 2002). In order to provide some further support, Murphy et al. (2004) recommend certain steps to be taken to ensure that such training is embedded in the students' programmes. Their recommendations include providing funding for information management education, training and initiatives, supporting educational research (e.g. innovative ways to assess information competency), and working towards "*a national Informatics curriculum with measurable learning outcomes which makes it clear what knowledge and skills are required at different stages of career progression*".

Yet, the number and the importance of the issues raised should not be considered of lesser weight.

The main issues raised within this body of literature can be categorised in three areas: different research practices of research students, research student training and recommendation for its improvement, and addressing (or not) the time lag between the time that research is conducted and the time that its results are accessed by other researchers. These areas could potentially be further broken down; however this procedure is not followed here because there is often overlap of the issues raised in the research located.

1) Different practices among research students, and different practices of a student across time, and different practices depending on the role of the individual in their institution:

- Due to the absence of formal information technology training, it has been found out that research students follow different working practices when carrying out their work (Chu and Law, 2006).
- It is suggested that research students use different sources in different stages of their research. There are primary two reasons for that: a) students lack the ability to search for information they need and/or lack knowledge of relevant sources – but while they are advancing from one stage to another in their subject knowledge expertise, they are also developing their information search expertise, and b) a change in learning needs – from general (e.g. books) to specific (e.g. research articles), from specific (e.g. research articles) to the most current (e.g. conference papers) (Chu and Law, 2006).
- Online resources such as the Web of Knowledge (provided by ISI) have seen a relatively consistent rise in their usage. However, the usage of these systems is not always at the same level across different faculties and usage is concentrated mainly in subject areas related to science (Urquhart et al., 2005, Pinfield, 1998). Possible explanation for this is the perceived importance of journal literature in different subject areas, varying levels of IT literacy and availability, different information seeking behaviours and the levels of information skills training (Pinfield 1998). Based on this research, other researchers (e.g. Buschman and Warner, 2005, Bawden, 2001) described and investigated the concepts of "information literacy" and "digital literacy" and their role in how students are utilizing the Web, something that requires newer forms of literacy – for instance, library, media and computer literacy.
- The use of electronic resources depends also on the post that the individual holds within his/her institutions. In particular, according to Pinfield (1998), academic staff tend to use electronic resources mainly for research (and not for teaching), and postgraduate students tend to use the system more than undergraduate students. The high usage of such resources amongst staff and postgraduate students indicates they are used mainly to facilitate research. It can also be inferred that these groups are the receivers of any existing information skills training or that they are required to a higher degree than undergraduate students to carry out independent research, which usually involves literature searches.

2) Shortcomings of existing research student training, and suggestions that could possibly address these shortcomings and improve the training of students.

- According to Qari (1999), the rapid emergence of online library services and online information sources (including online public access catalogues – OPACs, full-text databases, online document delivery and access to the Internet and the World Wide Web) has raised a number of training issues and concerns while the library's role has been considerably affected. The shifting of the technology has created the need for effective development of training initiatives, based on a good strategy that would provide the necessary skills and experiences. As a result, the aim of the training ought to be to teach how to select the proper database, choose the appropriate index and pick up relevant key words for searching. Prior to that though, librarians must be provided with the necessary confidence and competence to use IT in their jobs, which implies training for them as well. Issues about effective training of campus-wide or geographically-dispersed users as well as self-training are also mentioned in Qari's (1999) study. In order to address them, he recommends video-based programmes and online tutorials so as to allow users to choose by which method they would like to learn in the information technology environment.
- While many students are unfamiliar with existing sources and their availability, a growing understanding of them can contribute to the development of their information search expertise. This has a direct impact on the training students receive as the training should provide students with an overview of the role of different source types in the various stages of a research project (Chu and Law, 2006).
- In support of Pinfield's (1998) work, more recently Urquhart et al. (2005) maintained that there is a growing use of electronic resources, but practice varies both between institutions and between disciplines. However, they found that the main categories of electronic resources used by students are search engines and organisational web sites and not more specialised and/or academic resources as Chu and Law (2006) suggest. This caused particular concerns to the tutors interviewed by Urquhart et al. (2005) study as they questioned the student's ability to evaluate and use the information that they find. Drawing on this, they recommend the use of virtual training suites to improve students' information skills and the adoption of different roles by librarians to promote and evaluate the use of such tools. They also make reference to the existence of various models of e-learning support, but they fail to identify which models and skill-sets are most cost-effective for particular situations.
- According to Korsah (1996), information technology training ought to include, apart from researchers, library and information science personnel. At postgraduate level, he argues that factors such as programmes and courses offered, duration, general admission requirements, facilities and resources available as well as mode of instruction and assessment are important in the development and enhancement of the library profession. However, because his study was based on Ghana's experience, his research has been further cited only in studies were related to that country's context and so conclusive arguments should not be maintained.
- Barry (1997) acknowledges that the electronic library and the internet intensify the need for information skills in academic research and distinguishes the skills required by postgraduate students in three categories: judgement; knowledge and operation of resources; linguistic/logical skills. Researchers' training, he maintains, should address all of them possibly through a different model of library skills training that needs to be adopted, supervisors themselves undergoing training and support, and national and local institutions formulating their training policy.
- According to Vibert et al. (2007), the ability of researchers to access efficient and exhaustive online library resources is important as the better their ability is the quicker those resources become their preferred way of getting work-related information. This reiterates the fact that

formal training on those specialized online information resources should be introduced in graduate courses as lack of training appears to be the main reason for the difficulties encountered by researchers. However, Vibert et al. (2007) argue that lectures and dedicated hours of practice may not be the indicated way to train researchers. In contrast, they suggest that by introducing easily accessible, online tutorials that can adapt themselves to the needs of individual users may be a more appropriate way for IT training.

3) Time gap between conduct of research, publishing of results and retrieval of those results by other researchers.

- Cognetti et al. (1995) explored the level of knowledge and diffusion of four informative tools among specialised users. Part of their research came up with similar findings to the ones mentioned previously – researchers were not always aware of the information sources they could use in order to locate relevant information. As a result, most of the participants were in favour of inserting courses on the use of information tools into the University curriculum and of training in the use of the tools. More important though is the finding that there is a significant time gap (estimated at 6 years) between the availability on-line of these tools and the information of its existence by the users. This time gap does not seem to be as long after 13 years from this study, yet neither Cognetti's et al. (1995) nor have other more recent studies attempted to address this issue.
- This time gap can be partially attributed to data withholding among researchers, which has been remarked by researchers such as Vogeli et al. (2006). In relation to information practices among researchers, Vogeli et al. (2006) argue that data withholding can become a significant hurdle to information sharing between students as it can result in delayed research, inefficient training, and a culture of withholding among future life scientists. Taylor (2007) recognises the importance of information sharing and the hurdles set by the academic competition and commodity-driven corporate forces on the scientific endeavour. He then calls for the definition of "*strong, clear requirements that researchers have reasonable universal access to data, materials, rights and results, and that... innovations are widely available on just terms for the public benefit*". Yet, he does not have a clear view of how information sharing can be encouraged in practical terms.

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