WHITHER CARTOGRAPHIC EDUCATION AND TRAINING IN THE UNITED KINGDOM?

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ABSTRACT

Despite what appears to be a healthy situation with regard to map publishing and cartographic employment in the United Kingdom, cartographic education has come under significant threat in recent times with the only two specialist degrees at undergraduate and postgraduate level having been suspended or withdrawn in the last three years. Technical courses have also suffered with poor enrolment or threatened closure. In the broader area of geomatics and mapping sciences several courses have also been under threat of closure.

The paper examines this trend and discusses the various reasons for course closures and suspensions. While there does not appear to be one single cause, the pattern of events is worrying for the future of the industry, especially at a time when more and more maps are being produced by the ever widening range of user disciplines applying GIS methods. There have been calls by some in the GIS industry for improved cartographic training in order to improve GIS output, but this does not appear to be reflected in what is happening higher and further education.

In contrast to more traditional courses in geomatics and cartography, there has been a significant increase in the number of GIS courses and modules in recent years. While this is welcome, many of these courses do not deal with many of the fundamental aspects of mapping, in terms of data capture, processing and presentation, covered by the more specialist courses so even with graduates from these GIS courses there will still be a skills shortage in several areas of the mapping sciences.

How this situation can be addressed and the contribution that can be made by cartographers and cartographic businesses and organisations is considered along with the role of the British Cartographic Society in promoting proper education in cartographic principles.

1. INTRODUCTION

The aim of this review is to summarise the current status and recent history of cartographic education in the United Kingdom. Cartography in the UK is perceived as a narrow profession, albeit applicable to a vast range of users. A result is that employers and employment agencies pigeonhole cartographers as mapmakers working in large government agencies like the Ordnance Survey or a few of the well known atlas publishers. While maps have always been extensively available in the United Kingdom and their value appreciated, it would appear that the profession that creates them is not. Despite this perception, there is an extensive and strong cartographic industry with many small to medium companies, together with a large number of freelance cartographers, producing an ever increasing number of maps.

Education facilities and opportunities reflect this perceived low status of cartography. There are no university Departments of Cartography or cartographic research institutes. Many courses that have a strong cartographic element have either been closed, or have been under threat. Geographic Information Science fairs better with several new courses being established in recent years and on the research side a network of Regional Research Laboratories (RRLs) distributed around the country, typically involving collaboration between local universities with interests in GIS research. Cartographic education also often overlaps with other subjects with the overall area of mapping sciences, and in the UK context many of the more specialist cartographic course components within universities are to be found associated with Geomatics degrees. The other common home for cartographic education, Geography, remains extremely popular in the UK with departments in many universities, often with large numbers of students. Unlike Geography, Geomatics courses generally have struggled to recruit students in recent years. On the other hand, many geography degrees have significantly reduced or removed cartography from the curriculum or replaced it with GIS.

2. HIGHER EDUCATION

Higher Education in the United Kingdom (U.K.) has suffered from significant under funding in recent years. Financial allocations to universities have generally not kept pace with inflation and even where there have been modest increases in allocations to universities themselves, these rarely seem to filter through to departments and, indeed, many departments have seen real cuts in their budgets. Administrative burdens on academic staff have generally increased due the introduction of more stringent quality assurance procedures driven by the funding bodies and the higher education Quality Assurance Agency (some of which are welcome, but others less so).

It has long the case that there are few courses in the U.K. which have a specific or significant focus on Cartography and the last four years has seen this situation deteriorate significantly. One of the very few specialist taught postgraduate courses, the Diploma/MSc in Cartography and Geoinformation Technology at the University of Glasgow, is currently not admitting students, the most recent intake being in 2000. More recently, early in 2002 it was announced that the only undergraduate degree programme in Cartography, the course at Oxford Brookes University, was to close. Together these programmes have dominated the production of academically prepared graduates in cartography since the 1960s and it is likely that any significant cartographic business in the U.K. employs at least one product of these courses. Indeed several cartographic businesses have been created by graduates of these courses, or are very much dominated by them at all levels of the organisation from directors down.

In the Oxford Brookes case the British Cartographic Society mounted a campaign with the university management, arguing for the retention of a programme seen as vital to the continuing success of what must be described as a very healthy industry in the U.K. Unfortunately in a period of increasing under funding of higher education in the U.K., relatively small courses with higher than average requirements for staff and resources are likely to be targeted for cost savings. The overall impact nationally on what is a relatively small sector of industry is not, and probably never will be seen as a valid argument to an institution trying to balance its books.

To take something positive out of the Oxford Brookes cartography programme closure, recently a degree in Geographic Information Systems was introduced to run parallel to the Cartography degree. For the moment this new programme is to continue and it is to be hoped that the long heritage of cartography will remain a significant aspect of that programme, although that is not secure as several key staff will be retiring or taking up offers of redundancy. Also, the postgraduate Diploma in Cartography will continue to be offered, but again the long term future of this must be questionable as specialist cartographic staff depart.

For nearly thirty years the University of Glasgow has offered taught postgraduate courses in cartography and an undergraduate degree with a significant emphasis in cartography, the later being through the degree in Topographic Science which includes balanced coverage of surveying, photogrammetry and cartography along with the mathematics, IT and ancillary subjects necessary for advanced study in the subject. The reduction in funding to universities in the mid 1990s saw a major scheme of early retirement and voluntary redundancy being promoted within the University, with promises of ‘new blood’ appointments being made to replace retiring senior staff. Three of the five academics in the Topographic Science section took advantage of this offer. As it was unlikely that all three would be replaced, serious discussion took place on the relative merits of the undergraduate and postgraduate courses and a decision was taken that the focus of remaining and replacement staff should be on the undergraduate degree and research and that admission to the postgraduate courses should be suspended.

Unfortunately a re-evaluation of the University’s finances led to all ‘new blood’ appointments being withdrawn. So, having approved an updated version of the Topographic Science degree in January 2000, in June of that year the University suspended admission to it from October 2001, it being considered impractical (quite reasonably) to run a degree course with only two specialist academic staff. As this is the only degree of its type in Scotland, and one of only a handful in the U.K. to focus on mapping, a campaign to save the degree was launched which received strong support from the industry in Scotland and the U.K. generally, to the extent the University decided that the teaching of Geomatics should continue. In 2002 a degree in Geographic Information and Mapping Sciences was approved to replace Topographic Science and a new lecturer post advertised to support this. Reflecting the reduction in staffing, the new degree is three quarters Geomatics in the final two years, rather than focusing totally on geomatics like the Topographic Science degree. While the reduction in coverage in some mapping subjects is regrettable (such as the loss of one cartography module), requiring students to study a small amount of either Geography or Earth Science at an advanced level will give them broader perspective and will prove useful in many of the types of employment they tend follow.

Although admission to the postgraduate course is still currently suspended, with recent changes in University policy towards taught postgraduate courses, emphasising their contribution to continuous professional development (CPD), there are hopes within the Department that the course will be resurrected.

It is likely that the course will need to be quite different from the most recent version which relied on quite intensive teaching which was seen to detract from staff research effort. Increased flexibility in funding and staff deployment will help counteract such problems and it is planned to include a significant contribution from those practising in the industry.

The most positive note in higher education is the increased number of Geographic Information Systems or Geographic Information Science courses now available at undergraduate level (see Table 1). There are now probably more degree courses in GIS than there ever have been in the mapping sciences. (Similarly there is now a large number of degrees or combined degrees in Remote Sensing.) Some of these GIS degrees are based in Computing or Information Science departments; some are offered by departments with a long history of Geomatics teaching; some are in Geography departments; and a few are associated with other disciplines, such as planning or land management. Like the more traditional mapping sciences degrees where the balance between surveying, photogrammetry and cartography varied in courses at different institutions, there is a considerable variation in the emphasis of the GIS degrees, some emphasising the information system elements, others more focused on applications in the human or physical environments. Several of these undergraduate GIS degrees are relatively new and it will be interesting to see how they develop in the years to come and if enrolments make them sustainable in the longer term.

Table 1. Undergraduate programmes in Cartography, Geographic Information Science, Mapping and related topics (excluding specialist programmes engineering, land, or hydrographic surveying and remote sensing).

University	**Course title**	**Major subject**	**Combined subject**
Aston University	Geographical Information Systems		x
Bath Spa University College	Remote Sensing and Geographical Information Systems	x	x
University College London	Geomatic Engineering	x	
University of East London	Geographical Information Sciences	x	
" "	Surveying Sciences	x	
University of Hertfordshire	Geographical Info Sciences	x	
University of Glamorgan	Computing Geospatial Information Systems	x	x
University of Glasgow	Topographic Science *	x	x
" "	Geographic Information and Mapping Sciences	x	
University of Greenwich	Geographical Information Systems		x
Kingston University	Geographical Information Systems	x	x
Manchester Metropolitan University	Geographical Information Science	x	
University of Newcastle Upon Tyne	Geographic Information Science	x	x
" "	Surveying and Mapping Science	x	x
Oxford Brookes University	Cartography *	x	x
" "	Geographic Information Systems		x
University of Portsmouth	Geographical Information Science	x	
University of Wales Swansea	Topographic Science (Geoinformatics)		x

* course being withdrawn

Based on UCCAS programme listing November 2002 with modifications

At the Masters level the portfolio of GIS courses now appears to be fairly stable, with courses available at universities spread across the country. The most significant recent development is the programme offered by City University (London) who have assembled one of the strongest academic teams in GIS in the United Kingdom. Their new course is available full time, part time or by distance learning and will no doubt have an impact on existing postgraduate courses.

In addition to degrees or major sub-programmes in GIS, many degree programmes in other subjects include compulsory or optional modules in GIS. Generally there has been a trend in recent years within geography programmes to replace modules in 'cartography' or 'surveying and mapping' with GIS modules. This is not surprising as a basic grounding in GIS is a reasonable expectation for any modern geography graduate, but there is some concern that the basic principles of mapping, such as co-ordinate systems, map projections and map design have been lost in this move to emphasise alternative skills.

3. FURTHER EDUCATION

If the situation for specialist cartography and mapping courses at university level is worrying in many respects, it is even more so for technical training in cartography at colleges.

Many colleges across the country are registered to offer Ordinary and Higher National Certificates and Diplomas in cartographically related subjects, but anecdotal evidence suggests that most of these courses have not run in recent years, or have had very modest enrolments, putting their continuation in question as colleges also face severe financial restrictions.

Attempts to develop National Vocational Qualifications (NVQs) in surveying and cartography in the 1990s appear to have had little success. In theory, these qualifications are based primarily on assessment of competence in the workplace rather than formal taught courses, although often there will be a need for candidates to attend some training courses to gain basic knowledge of the discipline and fill gaps in what has been learned in the workplace. The major problems here are probably the great variation of emphasis in cartographic employment and the large number of relatively small employers scattered around the country making it difficult to build critical mass.

Government policy since the e-revolution now focuses on business sector identification with a view to the development of training and lifelong skill promotion. These ideas are often developed through commercial providers rather than the existing educational establishment which is left to struggle with significant underfunding and staffing pressures. Approaches have been made to UK education and training organisations which today have to "take full account of the responsibilities of the devolved administrations in Northern Ireland, Scotland and Wales." (SSDA, 2001). Inevitably, such organisations, under government rethinking, then change their name and/or remit which does not help continuity of effort.

The current approach to training, personal and business development is to empower sectors of industry to develop their own Sector Skills Councils under the auspices of the Sector Skills Development Agency (SSDA). "Trailblazers" in this context are listed in Table 2.

Table 2. Trailblazer Sector Skill Councils.

Sector Skill Council	Industry sector
Skillset	Audio visual industries
Lantra	Environmental and land based industries
Cogent	Oil and gas extraction, chemicals manufacturing and petroleum industries
Skillfast	Clothing, footwear and textiles industries
Skillsmart	Retail industry

One problem exists for cartography in this sector context, namely, where does such a cross-discipline business reside? Clearly there is a case for the mapping and geoinformation businesses to come together to generate an identifiable sector (or sub sector), but there is some doubt whether the geographic information and mapping industry is large enough and well enough co-ordinated to achieve this. This situation reinforces the unfortunate loss of organisations such as the Survey and Mapping Alliance – a loose association of geographic information and mapping related societies.. It may also be noted that despite the vast amount of investment in this kind of scheme, the education and training aspects are often contracted to commercial training companies outside the established education sector.

4. THE MAPPING PROFESSION AND EDUCATION

In the United Kingdom neither cartography nor GIScience have a specific professional body accrediting courses or assuring standards. The Geomatics faculty (formerly Land and Hydrographic Surveying division) of the Royal Institution of Chartered Surveyors (RICS) has done much to open the previous content restrictions of the courses they approve and now several GIScience courses, particularly at postgraduate level, have been validated, joining a range of the surveying and mapping undergraduate degrees that have traditionally had their stamp of approval. The Association for Geographic Information, the body that represents the GIS industry, has done much in recent years to promote the continual professional development of its members and does make annual student awards, but there little evidence of promotion or co-ordination of formal education in the field. The British Cartographic Society is a Learned Society and as such has neither the charter nor the resources to accredit courses.

Given the relatively small sector of U.K. industry involved in Geographic Information and mapping, there is a need for a co-ordinated approach to promoting both education and careers in the variety of cognate disciplines scattered across a relatively small number of universities and colleges. An RICS funded initiative to promote Geomatics education is to be

applauded. It has achieved this largely through the creation of a web site (www.geomatics.org.uk) and stands at science and technology exhibitions, but cartography and GIScience are under represented in this initiative. The lack of a co-ordinating body since the demise some years ago of the Surveying and Mapping Alliance must in part be to blame for this.

Obviously universities have a vested interest in promoting their own courses and individual societies are concerned with their own specialist area, be it cartography, hydrography or remote sensing, but the difficulties faced by several specialist courses in the geographic information and mapping sciences does highlight the need for some co-ordinated action to be taken if the industry is to have a continuing supply of well qualified graduates.

The authors have been aware of an increasing number of comments made by senior figures at GIS events in the last few years about the number of poorly designed maps being produced by users of GIS and that there is a need to include more cartographic design instruction within GIS courses and training. Cartographers have long complained about the poor quality of the output from GIS, which generally today is not due to limitation of the GIS itself, but to lack of understanding of cartographic principles by their users. It is difficult, however, to see how this can easily be resolved because many of those currently teaching or offering training in GIS have no background in cartographic design and most organisations using GIS are unlikely to explicitly hire a cartographic designer to oversee the output from their GIS. Oxford Brookes University and one or two commercial training organisations have run short courses on cartographic design for GIS, but clearly these are not having a significant impact.

Unfortunately judging from the apparent random decisions on cartographic courses throughout the range of education and training from post 16 to university level, the changes occur in a fashion which appears as local individual decision making on unrelated grounds i.e. belying any perception of a rational underlying policy. The British Cartographic Society (BCS) is currently seeking to reassess the profession; education and training, employment requirements and skills.

The BCS Education Committee as an initial project is carrying out a survey with mapping related businesses to gather details of opinions and needs in training, personal development and business growth. In addition, the British Cartographic Society Registered Course/ Event scheme was launched this year to promote cartography and the Society. While this does not involve validation of the course, it is seen as a cost effective method of increasing awareness of both the courses and the existence of a specialised organisation for cartography. It offers the use of the Society logo and a designated page on the website to providers and organisers of mapping related courses or events hopefully emphasising the wide extent and contribution of mapping.

There seems to be a resurgence in appreciation and value of mapping and its associated skills. However, presumably due to a lack of such skills or awareness of cartographic methods, less specialist users often reinvent methods when a skilled cartographer could have advised on the application. The widening availability of mapping software, including plug in software such as Avenza MaPublisher which links directly between GIS and design programmes, reinforces the need for cartographic based skills while access to geographic information demands further knowledge of data handling and visualisation.

Renewed liaison between cartography and other mapping related disciplines is now essential. Alongside, the promotion of the potential and capabilities of the geoinformation scientist or geomatician may be linked to rationalisation of training and education which satisfies the requirements of industry at all levels.

5. OTHER EDUCATIONAL ISSUES

Mapping, or at least map use, has always figured prominently in schools in the United Kingdom. Basic concepts are introduced relatively early in primary schools and generally there is some element of mapping in the curriculum up to the age of fourteen. There has been some introduction of GIS in secondary schools, but anecdotal evidence suggests this is rather patchy, depending largely on an interested teacher taking the initiative to learn about GIS and introduce it in their teaching. Publicly funded schools have an advantage in this respect because under the Service Level Agreement between the Ordnance Survey and the local councils, Ordnance Survey digital datasets are available to these schools at no cost. This does of course require some co-operation between the council department holding the data and the individual school, but such issues should be surmountable.

The Ordnance Survey continues to devote significant effort to promoting mapping in schools. In addition to producing special map extracts for teaching and examinations and publishing Mapping News which is sent to the head of Geography in every school twice a year, they have run several workshops for teachers on the use of maps and map data within the curriculum. A major initiative in 2002 was the supply of a free map of their local area to every eleven year old (provided the school registered).

These were standard published editions of the current 1:25 000 or 1:50 000 map, not a cheaply produced substitute. The take-up of this offer was significant and one hopes this, or a similar initiative, can be repeated on a regular basis.

6. CONCLUSION

The last four years has been a difficult period for cartographic education in the United Kingdom, with admissions suspended to of one of the leading postgraduate courses and the decision to close the only dedicated undergraduate course. In contrast to this, there has been a significant expansion of courses in Geographic Information Systems or Science.

Despite the outlook for specialist courses in cartography being rather bleak, there is at least satisfaction in the high standard of cartographic attainment of students in recent years as evidenced by the standard of entries and ward winners in the annual British Cartographic Society student awards sponsored by Readers' Digest and National Geographic Society. It is also important to recognise that several other courses with a significant cartographic content, such as those at University of Newcastle, University of Portsmouth and University of Wales at Swansea continue to produce graduates suitable for employment in the cartographic industry, although few departments seem to have been left untouched by some form of reorganisation in recent years.

7. REFERENCES

[1] SDA (2001), Skills for Business - Influence, DfES, Nottingham

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Biography

Since graduating with a BSc in Topographic Science from Glasgow University in the late 1970s, David Forest has researched and taught cartography and other aspect of mapping in universities in Canada, England and Scotland. He has a MA in Geography (Cartography) from Queen's University at Kingston, Canada and a PhD from the University of Glasgow, Scotland. His PhD topic was on the development of expert systems for small scale map design.

He is current Senior Lecturer in Geomatics in the Department of Geography and Geomatics at the University of Glasgow, where he has been since 1991. He is a Fellow of the British Cartographic Society. He was BCS President from 2000 to 2002 and continues to serve on BCS Council as Immediate Past President.

David's primary research area is the application of expert systems in cartography, particularly related to helping non cartographers achieve satisfactory map output from GIS. Other research interests include topographic map design, cartographic education and theoretical issues in cartography. As part of the Geomatics group at Glasgow University he is involved in research on participatory GIS for areas of community land tenure and in supporting various applied projects requiring cartographic and GIS input.