

# GEOMATICS.ORG.UK: A UK RESPONSE TO A GLOBAL AWARENESS PROBLEM

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### ABSTRACT:

Academics and practitioners involved in photogrammetry, remote sensing and spatial information sciences will be aware of a general world-wide shortage of undergraduates embarking on degree programmes in geomatics. Whatever the reasons for this shortage, it is apparent that this is a major issue that needs addressing to safeguard the future of the profession. There is a requirement to educate school leavers such that they are aware of geomatics – know what it is, what it involves and the exciting opportunities a career in the subject offers them. This paper illustrates how the UK is tackling the problem through the geomatics.org.uk project.

Geomatics crosses the disciplines of mathematics, geography, ICT, physics, and many other subjects taught in schools across the UK. Established in 2001, geomatics.org.uk is supported by the UK geomatics sector and aims to raise the discipline's profile in schools by providing useful and timely learning and teaching resources based on contemporary research. Resources available to teachers include lesson plans, instrumentation, software and data that are nominally out of reach of schools due to excessive cost and insufficient training. All resources are aimed at the UK National Curriculum and exam specifications and are provided free to teachers. The management and distribution of resources is operated via a website, whilst a portfolio of nationwide teacher training courses initiates teachers into geomatics theory and practice. The website is not a stand-alone source of information; instead it operates as a portal to the geomatics industry, serving to promote the profession through raising public awareness.

## 1. INTRODUCTION

Academics and practitioners involved in photogrammetry, remote sensing and spatial information sciences will be aware of a general world-wide decline in the number of undergraduates embarking on degree programmes in geomatics. This has been reported in a number of professional geomatics journals and is exemplified by Figure 1. Figure 1 shows the number of student applications to degree programmes in "geomatics" at the University of Newcastle over two decades, 1980/81-2000/01.

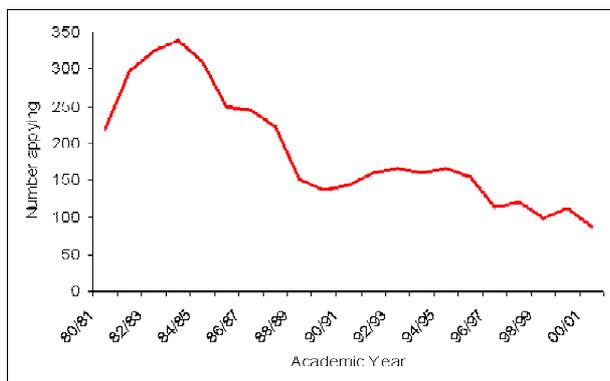


Figure 1. Line graph showing the number of applications for geomatics related degree programmes at the University of Newcastle, 1980/81-2000/01

Examination of Figure 1 reveals a peak in the mid-1980's, when almost 350 applications were received for the university's dozen or so places on the "Surveying Science" programme (a ratio of approximately 30 applicants per place). By the 2000/01 academic year the number of applicants had dropped to around 100 for the two programmes then offered, "Surveying and Mapping Science" and "Geographic Information Science". To exacerbate the problem, the undergraduate quota for these two degree programmes in 2000/01 stood at 35, implying an application to place ratio of approximately 3: 1. Today the number of applications hovers dangerously below the 100 level, with the quota standing at approximately 31. The fact that this figure has not dropped further still may well be related to the fact that significant effort has been made to raise the profile of geomatics in schools and further education colleges across the UK through a project known as geomatics.org.uk.

The National Curriculum for England (DfEE, 2004) together with GCSE, AS and A level examination boards (AQA, 2004; CCEA, 2004; Edexcel, 2004 etc.), place considerable emphasis, throughout a variety of subjects, on aspects of science, engineering and technology that fall under the general remit of geomatics. Examples include age-old geographic principles such as the use of maps, the application of trigonometry in mathematics, propagation of electromagnetic radiation in physics, and the use of databases in ICT. New geomatics technologies, such as remote sensing and geographic information systems (GIS), are also now becoming mainstream in

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specifications, yet in many schools resources for even the aforementioned age-old aspects are still not in place. For the last three years, [geomatics.org.uk](http://geomatics.org.uk) has sought to educate teachers on aspects of modern geomatics that include photogrammetry, remote sensing and spatial information science. Feedback received from the project indicates that teachers have become enthused by geomatics and have started to implement aspects of the discipline in their own teaching. Geography teachers, for example, have seen ways of revolutionising fieldwork and teachers of mathematics, faced with the perennial question, “why are we doing this, miss?” have found an answer other than, “because it’s maths and you need to do it”. The two obstacles in the way of teaching geomatics in schools have been the lack of teacher awareness of the subject (in a survey carried out only 1/3 of geography teachers polled had heard of the term “geomatics”) and the necessary provision of sufficient resources to facilitate successful implementation.

[Geomatics.org.uk](http://geomatics.org.uk) is supported by the UK geomatics sector and aims to raise the discipline’s profile in schools and further education colleges across the country by providing useful and timely learning and teaching resources based on contemporary research. Resources available to teachers include lesson plans, instrumentation, software and data that are nominally out of reach of schools due to excessive cost and insufficient training. All resources are aimed at the UK National Curriculum and exam specifications and are provided free to teachers. The management and distribution of resources is operated via a website, whilst a portfolio of nationwide teacher training courses initiates teachers into geomatics theory and practice. The website is not a stand-alone source of information; instead it operates as a portal to the geomatics sector, serving to promote the profession through raising public awareness.

The target audience for [geomatics.org.uk](http://geomatics.org.uk) is, albeit indirectly, school pupils studying for GCSE, AS and A levels. The project has up to now focussed on geography, but has overlapped into the related disciplines of mathematics, physics and ICT. Whilst aspects of geomatics are mentioned throughout national specifications for geography, the perception of geomatics (nee surveying) remains vague (Parker and Booth, 1999), with pupils at best believing it to be the use of a clinometer and tape measure, and at worst having no perception of the science whatsoever. Geography, on the other hand, is a subject about which everyone is aware (Lemmens, 2001), is popular within schools, and has massive potential to utilise modern scientific and engineering methodology. By incorporating contemporary geomatics technology into school level geography, it is hoped that pupils will better appreciate the need for scientific enquiry and the power this brings to geographic study. By associating interesting study with geomatics, rather than geography, it is anticipated that there will be an increase in the number of applications for students wishing to study geomatics at university and other levels. The core aim of the [geomatics.org.uk](http://geomatics.org.uk) project is therefore to promote the geomatics profession through raising awareness. Within this broad aim, the objectives are to:

- raise awareness of how geomatics science, engineering and technology can help monitor and manage issues pertaining to the earth;
- raise the profile of mathematics, science, engineering and technology taught in schools and further education colleges across the UK by providing useful and timely geomatics based learning and teaching resources;

- bring aspects of geomatics, already present in the National Curriculum and exam specifications for a wide range of subjects (including mathematics, geography, ICT and physics), into the 21<sup>st</sup> Century by placing modern geomatics technology in the hands of school pupils;
- encourage cross-disciplinary collaboration between teachers of mathematics, geography, ICT and physics through the media of geomatics science, engineering and technology.

This paper reports on the work of [geomatics.org.uk](http://geomatics.org.uk) in anticipation that its success may be of interest in other countries experiencing similar recruitment problems.

## 2. GEOMATICS.ORG.UK: AN OVERVIEW

### 2.1 Internet portal

The project’s name is derived from its hub – a website that acts as a portal to the UK geomatics sector (Figure 2). The website has three overlapping areas: an open access area containing general information about geomatics for students and the public; a member’s area containing ideas and support for teachers applying geomatics in the classroom and, finally, an area for the geomatics community where supporters are kept informed and future plans for the project are revealed. Membership, for both the supporter’s and teacher’s areas is free and is achieved simply by filling in an on-line registration form. There are currently over 600 teachers and 150 supporters registered with the website.

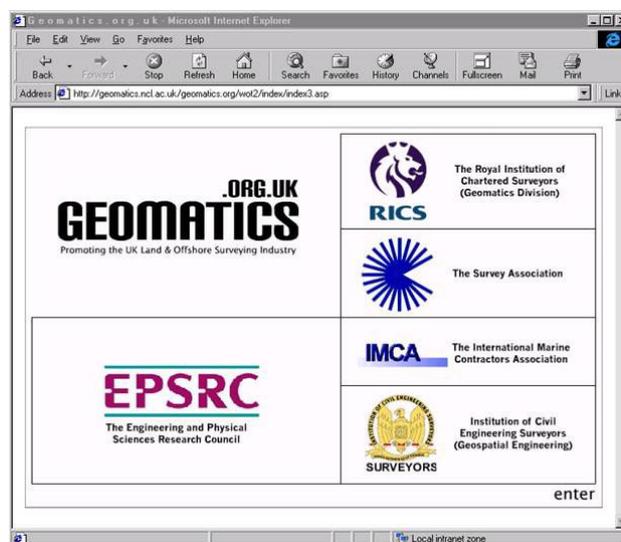


Figure 2. Gateway to [geomatics.org.uk](http://geomatics.org.uk)

### 2.2 Teaching resources

#### 2.2.1 Schemes of work and ideas for lesson plans

The project has developed learning and teaching resources, based on contemporary aspects of geomatics, for GCSE, AS and A level specifications and the National Curriculum. The schemes of work have been developed in close collaboration with an educational advisor from the University of Newcastle and with teachers from various institutions across the country. Developing materials in this manner has ensured that the resources created were useful and timely to teachers. The website also contains ideas and examples for many school subjects

and age groups and the list of resources is constantly expanding. All resources are free, with teachers only having to register with the website to access them (Section 2.1).

### 2.2.2 Case studies

One high profile (BBC News, 2001; The Guardian, 2001) area of geographic investigation identified by teachers at the start of the project as desperately in need of better learning and teaching resources was the study of coastal zones. This subject is one of the major areas of physical geography taught and examined in schools across the UK. Prompted by a request to develop a coastal erosion practical session for A level students, the initial aim of [geomatics.org.uk](http://www.geomatics.org.uk) was to develop learning and teaching materials based on the use of geomatics to determine rates of coastal erosion. The materials were originally aimed at students studying GCSE, AS and A level geography, however, the resources also proved useful for students at the earlier stages of the National Curriculum. Further, with the National Curriculum placing increasing emphasis on cross-disciplinary teaching, the resources developed crossed over into the subjects of mathematics, physics and ICT.



Figure 3. Kodak DCS660 aerial image of Filey Brigg

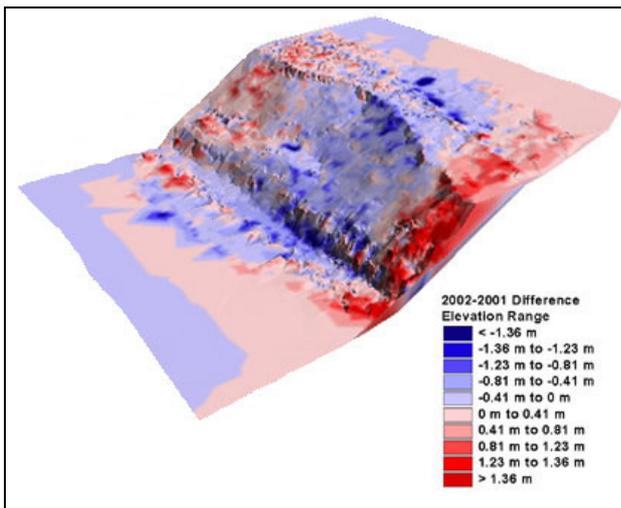


Figure 4. Photogrammetrically derived coastal erosion data

The original case study drew heavily on data and results from “Synergy of GPS, digital photogrammetry and InSAR for coastal zone monitoring”, an Engineering and Physical Sciences Research Council (EPSRC) funded project (grant number GR/N23721/01) that investigated the ways in which inte-

grated geomatics technology could help tackle the management of coastal erosion (Buckley et al., 2002; 2004). Resources provided in the case study comprised data collected for the research project (Figures 3 and 4). Further case studies have since been added to the site.

### 2.2.3 Equipment packs

One of the principle objectives of the project was to place precision instrumentation, out of reach of most school budgets, into the hands of school pupils. Equipment is available as class sets consisting of different combinations of geomatics instrumentation, data, software and schemes of work to enable teachers to implement practical geomatics field and laboratory work in their teaching programmes. Teachers are able to register to borrow equipment via the aforementioned website. At the time of registering, teachers specify when, and for how long they require individual items of equipment.



Figure 5. Maths on the beach! Geography and mathematics come together in a coastal erosion survey



Figure 6. A handheld GPS receiver used in a coastal survey

The schemes of work described in Section 2.2.1 and case studies in Section 2.2.2 also encourage the use of the equipment so that geomatics fieldwork may be carried out in addition to the basic lessons, e.g. for coastal erosion studies (Figures 5 and 6), pupils can make their own observations. River sectioning and GIS development (Figures 7 and 8) are further areas of geographic inquiry that have made use of the equipment available.



Figure 7. River survey conducted using an engineering level

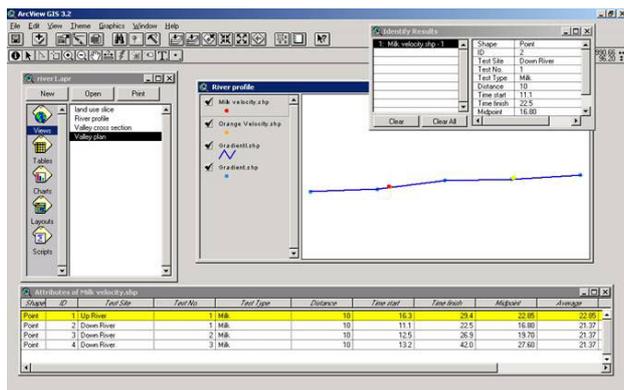


Figure 8. Resulting GIS from a river survey

### 2.2.4 Training courses

Whilst equipment has been chosen on the basis of robustness and ease of use, in many cases teachers require training in the use of the equipment if they are to get the best results out of fieldwork (and not embarrass themselves in front of the school pupils!). In order to solve this problem, geomatics.org.uk has run IN Service Training (INSET) courses for teachers across the country. In excess of 250 teachers have been trained to use the equipment. For school pupils, an annual summer school is attended by approximately 30 school pupils. Other extra-curricular school activities run by geomatics.org.uk include Saturday morning sessions for “Gifted and Talented” pupils.

## 2.3 Promotional activities

### 2.3.1 School, colleges and the general public

In order to promote the campaign to school teachers and pupils, articles have been published in journals and websites such as Science Next Wave (Mills and Waddicor, 2003) and Ordnance Survey Mapping News (Mills et al., 2002; Waddicor et al., 2003), see Figure 9. Press releases have attracted the at-

tention of the local press, e.g. The Dorset Echo and The Journal (Spencer, 2003), and other media such as the National Grid for Learning (NGfL, 2002), EPSRC NOISE! (Noise, 2003) and EPSRC Newline (Norton, 2002).

24 Students from Cranleigh High School, Marnley, report 'great quality' obtained as a result of their first job in setting up the equipment.

www.ordnancesurvey.co.uk/education

How you can invigorate your teaching with free equipment from geomatics.org.uk

This project is supported by the Engineering and Physical Sciences Research Council (EPSRC) and the geomatics industry and is dedicated to helping teachers integrate geomatics into their teaching. The main way in which we are doing this is by the loan of geomatics equipment to schools – all free of charge of course! The project has been running for over six months now and we've already earned out many successful loans to schools all over the country.

A basic kit includes one surveyor's level and tripod, levelling staff and a hand-held Global Positioning System (GPS) receiver. The level is mainly used for measuring changes in height but can also be used to measure horizontal angles and distance. The GPS receivers give National Grid coordinates and also display detailed mapping of the local area. They can be used for all manner of exercises where you need to know geographical coordinates, be it orienteering or mapping the distribution of bus stops!

How do I use the equipment?

Most teachers have been enthusiastic about borrowing the equipment however one comment was somewhat glib: 'That's all very well, but what do I actually do with the equipment?' The answer to that hopefully lies on the web site and in this article. The web site has a number of pages to support the use of this equipment and help teachers get the most from it. It also has examples of what other schools have done in the past to inspire you!

Free equipment?

In the last issue of Mapping News we introduced you to geomatics – the science and technology of collecting, manipulating and displaying spatial data about the Earth – and how it could be used to monitor Britain's fragile coastline. We also revealed details of a project to promote geomatics in schools, fronted by the web site.

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Mapping News Issue 23 Winter 2002

Figure 9. Ordnance Survey have provided article space in their school newsletter, Mapping News

In addition to articles in journals, geomatics.org.uk has made numerous visits into schools across the UK, and actively promoted the discipline at educational exhibitions and teacher's conferences throughout the country. During the summer of 2002 this included a four week UK Roadshow for the BBC's Tomorrow's World programme (Figure 10).



Figure 10. geomatics.org.uk has attended exhibitions and teacher's conferences across the UK

The Tomorrow's World Roadshow reached a combined public audience of over 140 000 people in Birmingham, Cardiff, London and Glasgow. Other exhibitions have included the 2002-2004 Geographical Association Conferences, the 2001 BA Festival of Science and the 2004 Mathematical Association Conference.

### 2.3.2 Geomatics sector

The project would not have been possible without the generous support of the UK geomatics sector. Over 40 organisations from industry and academia have pulled together to support and promote the profession. To encourage support, articles have been published (e.g. Waddicor and Mills, 2002) and presentations have been made (e.g. to the RICS, Annual Meeting's of Teachers of Surveying, Hydrographic Society in Scotland, EPSRC, Comité de Liaison des Géomètres Européens). The project was also exhibited at World of Geomatics in 2002, 2003 and 2004. This high level of promotion has resulted in over 150 geomatics professionals becoming members of the supporter's website; the acquisition of over £34 000 of funding from the geomatics sector over the duration of the project; unquantifiable "in-kind" contributions, including the donation of professional geomatics equipment from Leica Geosystems, and free advertising and article space in school newsletters from Ordnance Survey.

## 3. TEACHER AND PUPIL FEEDBACK

### 3.1 Statistical feedback

Feedback on the project has been received through a questionnaire, sent to all teachers who have borrowed equipment. This has helped shape the project and aided decisions on where funds were best spent. Example response rates to questions included:

100% would borrow equipment from [geomatics.org.uk](http://geomatics.org.uk) again and would recommend an equipment loan to a colleague.

91% felt the equipment borrowed had enhanced their field work.

84% thought it was "less important" that all courier costs were covered by [geomatics.org.uk](http://geomatics.org.uk).

71% thought it was "important" that more equipment should be purchased in order to increase availability.

### 3.2 Teacher feedback

As well as statistical feedback, the questionnaire includes space for comments from the teachers. Responses have included:

"The students benefited greatly from this experience."

"(We had) the best day's fieldwork of the course. The students thoroughly enjoyed it, produced some good results and learnt a lot."

"Thought this whole project was inspiring and service superb!"

"Many thanks for arranging the loan - our students have benefited greatly from this opportunity."

Teachers are also questioned following attendance at an INSET event, with numerous comments received, including:

"A very enjoyable day with never a dull moment!"

"Excellent hands-on training, very well organised. What a remarkably valuable service."

"Really useful and very enjoyable, head and shoulders above similar courses."

"It's been fantastic! I am completely sold on the whole project."

### 3.3 School pupil feedback

Finally, school pupils' comments on attending the "Mapping the World" Summer School have included:

"Geomatics is a combination of all my favourite subjects!"

"Very informative, practical topics are helpful and the people are friendly"

"Informative and enjoyable - the way we were treated was exceptional!"

"Everybody has been really friendly and we have had an excellent time. Hope to see you on the course in the future."

## 4. CONCLUDING REMARKS

### 4.1 Summary

This paper has summarised the activity of an ongoing UK project to raise the profile of geomatics. The project's overarching aim is to provide all the information people need to learn about geomatics and to promote the profession through raising awareness. A key element of the site is the provision of extensive teaching resources and equipment to help bring geomatics into the classroom. It is anticipated that through raising awareness of geomatics amongst teachers of geography, mathematics, physics and ICT, more school pupils will become aware of geomatics and apply to study degree programmes at UK universities.

### 4.2 Future prospects

The future of the [geomatics.org.uk](http://geomatics.org.uk) project is secured until June 2006 following an award from the 2004 EPSRC Promoting Public Awareness (PPA) scheme (see Mills et al., 2004). The funding commenced in June 2004 and provides two years of funds for a Junior Research Associate to run the project from its base in Newcastle. Further funds and equipment have been made available by collaborators on the new project. The new phase of the project will focus on teachers and pupils of mathematics, in addition to continuing the promotion of geomatics within geography.

### 4.3 Supporting the campaign

If you would like to support the [geomatics.org.uk](http://geomatics.org.uk) project, in any way, please contact any of the authors of this paper. If you are experiencing recruitment problems in your own country why not point people in the direction of [geomatics.org.uk](http://geomatics.org.uk), or better still, setup a mirror site! Further details and up-to-date news on this continuing project can be found in the member's area of [www.geomatics.org.uk](http://www.geomatics.org.uk). Register, it's free after all!

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