Unit 26: Land Information in Construction

NQF Level 3: BTEC National

Guided learning hours: 60

Unit abstract

Advances in computer technology have introduced the concept of computer-based mapping into everyday life. The ability to analyse spatial data with a graphical output can most beneficial to developers, managers and planners operating within a competitive construction market.

The unit will introduce the learner to the characteristics of spatial data, with comparisons drawn to text based data, using graphical output in the form of maps and plans to demonstrate its advantages. Learners will gain an understanding of the various types of spatial data that are available for use within the construction sector, and will be able to identify when such systems are of benefit and how to put them to effective use.

Typical hardware and software components will be considered and applied to real and simulated projects, using software that can be found in most offices. The concepts of the layering of data, allowing the selection and presentation only of relevant data, will be addressed. The analysis of statistical data, and the use of theme maps based on this, are an integral part of the unit. The learner will be given the opportunity to apply the underpinning knowledge to a variety of tasks, using computer analysis with graphical output.

Learning outcomes

On completion of this unit a learner should:

1 Understand the various types and applications of spatial data

2 Understand the processes involved in interpreting spatial data and images

3 Know the methods of interpreting statistical data for use in map and computer applications

4 Know the essential components that comprise a computer system designed to analyse and display data in various graphical formats

5 Be able to display computer data in a graphical form and use internet-based mapping sites as appropriate.

Unit content

1 **Understand the various types and applications of spatial data**

Introduction to spatial data: raster v vector data; types of map; scales; grids; projections; scanning; digitising; field data collection and input; data formats; data storage; data transfer; transfer format; remote sensing eg satellites, aircraft platforms, sensors, types of imagery, ground checks

Statistical data: sources of statistical data; sources of nationally held spatial data, eg postcodes

2 **Understand the processes involved in interpreting spatial data and images**

Processes: data retrieval; databases; database management systems; map interpretation; interpretation of statistical data; data processing; map generalisation; attribute data; monitoring of data sets; links from digital maps to databases; data editing; graphics systems; image enhancement; polygonisation; analysis of data; automated feature recognition; pattern recognition; layering of data; expert systems

3 **Know the methods of interpreting statistical data for use in map and computer applications**

Methods: *s*ources of statistical data; sources of nationally held spatial data, eg local authorities, central government, census data; thematic maps; socio-economic applications, eg targeting recipients; retail applications, eg locations of retail establishments

Applications: central government; Her Majesty's Land Registry (HMLR); census data; local government, eg planning, housing; Land Management Information Services (LAMIS); utilities, eg gas, electricity, water, telecommunications; property gazetteers; facilities management; planning, eg land use, agriculture, resources, forestry management; forecasting and monitoring changes

4 **Know the essential components that comprise a computer system designed to analyse and display data in various graphical formats**

Components: for, eg hardware, interactive displays, hard copy devices

5 **Be able to display computer data in a graphical form and use internet-based mapping sites as appropriate**

Computer data: *s*tatistical output; products; map production; automated cartography; Ordnance Survey digital maps; data in digital form; use of data to create different outputs; effectiveness of different output types in sites for eg location finding, route planning, land use surveys; internet based mapping websites

Grading grid

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all of the learning outcomes for the unit. The criteria for a pass grade describes the level of achievement required to pass this unit.

Grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 distinguish between the various types of spatial data and identify their source	M1 interpret related sets of data for an area to extract relevant information	
P2 present spatial data in a graphical format	M2 create a variety of outputs from sets of data for an area	D1 critically analyse a variety of outputs from sets of data for an area, and report on the effectiveness of each
P3 identify the key components of a system that can deal with spatial and graphical data P4 describe the applications which benefit from the use of such technology	M3 evaluate the various components of a system that can deal with spatial and graphical data with regard to their effectiveness and ease of use.	D2 specify and justify to a higher authority the purchase of a system that can deal with spatial and graphical data.
P5 retrieve relevant location maps from the internet-based mapping websites.		

Essential guidance for tutors

Delivery

Tutors delivering this unit have opportunities to use a wide range of techniques. Lectures, discussions, seminar presentations, site visits, supervised practicals, research using the internet and/or library resources and the use of personal and/or industrial experience are all suitable. Delivery should stimulate, motivate, educate and enthuse learners.

This unit is intended to give learners practical skills and an understanding of the principles of geographical information systems (GIS). Wherever possible the unit should be delivered with regard to individual programmes so that assignment work involving mainly graphic communication can complement other specialist work.

All the learning outcomes are linked and form a logical, consistent and progressive structure. This starts by looking at the applications of GIS and the data sets required and builds on this through the computer hardware requirements of a system to explore trends in internet mapping.

Teaching and learning strategies designed to support delivery of the learning and outcomes should take an integrated, learner-centred approach. This should involve the learner in collating and interpreting a variety of data sets, carrying out analyses and presenting data accordingly. This data could be extracted from existing databases, from images such as satellite or aerial photographs, or from the internet.

Examples should be used continually to support the delivery process and this should always reflect real life and standard practice. For example, interpretation of relief for road design or location of retail establishments would provide a useful learning exercise.

Wherever possible, links should be forged with relevant employers, and in particular learners is employer. This will provide an opportunity for learners to relate to familiar areas and to use it to supply suitable data and inform their study of the selection and design of the most suitable interpretation and presentation techniques.

Group activities are permissible, but tutors will need to ensure that individual learners are provided with equal experiential and assessment opportunities.

Health, safety and welfare issues are paramount and should be strictly reinforced through close supervision of all workshops and activity areas, and risk assessments must be undertaken prior to practical activities. Centres are advised to read the *Delivery approach* section on page 24, and *Annexe G: Provision and Use of Work Equipment Regulations 1998 (PUWER)*.

Assessment

Evidence for this unit may be gathered from a variety of sources, including well-planned investigative assignments, case studies or reports of practical assignments.

There are many suitable forms of assessment that could be employed, and tutors are encouraged to consider and adopt these where appropriate. Some examples of

possible assessment approaches are suggested below. However, these are not intended to be prescriptive or restrictive, and are provided as an illustration of the alternative forms of assessment evidence that would be acceptable. General guidance on the design of suitable assignments is available on page 19 of this specification.

Some criteria can be assessed directly by the tutor during practical activities. If this approach is used suitable evidence would be observation records or witness statements. Guidance on the use of these is provided on the Edexcel website.

The structure of the unit suggests that the grading criteria may be fully addressed by using four assignments.

The first of these would cover P1 and M1, the second would cover P2, M2, and D1, the third would cover P3, P4, M3 and D2, and the fourth would cover P5.

To achieve a pass grade learners must meet the five pass criteria listed in the grading grid.

For P1, learners must distinguish between the various types of spatial data and identify their source. This would require the interpretation of various data sets for a specified area. Data could include satellite images, aerial photographs and maps and statistical data extracted from a census or UDPs.

For P2, learners must present spatial data in a graphical format. The various methods of output and presentation should be addressed.

For P3, learners must identify the key components of a system that can deal with spatial and graphical data. This must include the hardware and software components required for a GIS.

For P4, learners must describe the applications which benefit from the use of GIS technology, including the various applications where such systems would be used.

For P5, learners must retrieve relevant location maps from the internet-based mapping websites. Learners must retrieve relevant location maps and/or direction finders. This would be more appropriate carried out as a class exercise, with learners working together to find the relevant information. The contributions of individual learners would need to be monitored and authenticated.

To achieve a merit grade learners must meet all of the pass grade criteria **and** the three merit grade criteria.

For M1, learners must interpret related sets of data for an area to extract relevant information. This could be through an extension of P1.

For M2, learners must create a variety of outputs from sets of data for an area. This could be extended from P2 by creation of a variety of outputs for the same data.

For M3, learners must evaluate the various components of a system that can deal with spatial and graphical data with regard to their effectiveness and ease of use in a range of situations.

To achieve a distinction grade learners must meet all of the pass and merit grade criteria **and** the two distinction grade criteria.

For D1, learners must critically analyse a variety of outputs from sets of data for an area, and report on the effectiveness of each. This could be achieved through an extension of M2 to include an evaluation of the different techniques used and their advantages and disadvantages.

For D2, learners must specify and justify to a higher authority the purchase of a system that can deal with spatial and graphical data. Learners should describe their findings and make recommendations in the form of a report to a higher authority, indicating relevance to their company and/or work situation.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

The learning outcomes in this unit are closely linked with, for example, *Unit 10: Surveying in Construction and Civil Engineering* and *Unit 23: Spatial Data Techniques in Construction and Civil Engineering,* together with similar units at Higher National and degree level.

This unit may have links to the Edexcel Level 3 Technical and Professional NVQs for Construction and the Built Environment. Updated information on this, and a summary mapping of the unit to the CIC Occupational Standards, is available from Edexcel. See *Annexe D: National Occupational Standards/mapping with NVQs*.

The unit provides opportunities to gain Level 3 in key skills in communication and information and communication technology. Opportunities for satisfying requirements for Wider Curriculum Mapping are summarised in *Annexe F: Wider curriculum mapping*.

Essential resources

The resources are explicit in the content. No centre should attempt to deliver this unit without access to a range of modern computer-based mapping packages and equipment.

Indicative reading for learners

Textbooks

Brewer C A — *Designing Better Maps: A Guide for GIS Users* (ESRI Press, 2005) ISBN 1589480899

Heywood I et al — *An Introduction to Geographical Information Systems 2nd Edition* (Prentice-Hall, 2002) ISBN 0130611980

Hohl P — *GIS Data Conversion: Strategies, Techniques and Management* (Delmar, 1997) ISBN 1566901758

Mather P M, Brandt T — *Classification Methods for Remote Sensed Data* (Taylor & Francis Ltd, 2001) ISBN 0415259096

Websites

www.esri.com	Esri (Arc-info)
http://maps.google.co.uk	Google Maps
www.multimap.co.uk	Multimap
www.ordnancesurvey.org.uk	Ordnance Survey
www.streetfinder.co.uk	Streetfinder

Key skills

Achievement of key skills is not a requirement of this qualification but it is encouraged. Suggestions of opportunities for the generation of Level 3 key skill evidence are given here. Tutors should check that learners have produced all the evidence required by part B of the key skills specifications when assessing this evidence. Learners may need to develop additional evidence elsewhere to fully meet the requirements of the key skills specifications.

Communication Level 3	
When learners are:	**They should be able to develop the following key skills evidence:**
• collecting information about the various proprietary systems	C3.2 Read and synthesise information from at least **two** documents about the same subject. Each document must be a minimum of 1000 words long.
• reporting on findings to a higher authority.	C3.3 Write **two** different types of documents each one giving different information about complex subjects. One document must be at least 1000 words long.
Information and communication technology Level 3	
When learners are:	**They should be able to develop the following key skills evidence:**
• searching for information and data	ICT3.1 Search for information using different sources, and multiple search criteria in at least one case.
• combining spatial data sets	ICT3.2 Enter and develop the information and derive new information.
• presenting the output accordingly.	ICT3.3 Present combined information such as text with image, text with number, image with number.