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# Introduction to Data Skills in Geography, funded by the Nuffield Foundation

**Simon Pinfield**

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U466a
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# Data Skills in Geography - Main aims

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To support teachers and students in their:

- understanding of data skills;
- confidence in their use and application, including integration of the skills into lesson plans; and
- knowledge of their value to further study and employment.

The programme will also raise awareness in both Higher Education and in schools about the current change in demand for data skills within Geography GCSE, A Level and the Geography QAA benchmark. We aim to upskill the teachers of today and enhance the abilities of the teachers of tomorrow.

# How will the RGS-IBG do this?

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- Production of online teaching resources for the new GCSE and A Level specifications, based around topics and fieldwork skills, to be published at www.rgs.org/dataskills

- CPD events, including partnership events, such as this one

- HE input / liaison and work with ITT institutions

- Strengthening existing networks and creating new ones

- Attending CPD events, like this one

- Using the RGS-IBG resources (visit [www.rgs.org/dataskills](www.rgs.org/dataskills)), when available, and collaborating with others to share good practice

- Offering to work with other schools and perhaps leading a cluster group (new or existing)

- Using the RGS-IBG short units of work / lesson plans for GCSE and A Level, written by teachers / other experts

- Using the Edexcel website for further advice and resources

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## **Session 1**

# Data, skills & progression

## 3.15 – 3.45pm

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# Session outline

1. This session will introduce the relevance and meaning of quantification skills in geography

2. We will think about how skills and data fit into the new GCSEs and AS/A level

3. There will also be an opportunity to consider the Pearson Progression Scale for Geography

# Q. Why are data skills relevant?

As Andreas Schleicher, OECD Deputy director for education, puts it:

**"The world economy no longer pays for what people know but for what they can do with what they know."**

**Francis Maude, MP**
**"Data is the material of the new Industrial Revolution."**

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# Take a moment...

"Geographers require skills in the **presentation**, **interpretation**, **analysis** and **communication** of quantitative data. They are familiar with a range of statistical techniques including simple descriptive statistics, inferential tests and relational statistics such as correlation and regression; principles of research design and ways to collect data; the retrieval and manipulation of secondary datasets; and geospatial technologies such as digital cartography, Geographic Information Systems (GIS) and remote sensing. Attention is given to spatial statistics, to issues of spatial dependency, to spatial difference and to the effects of scale."
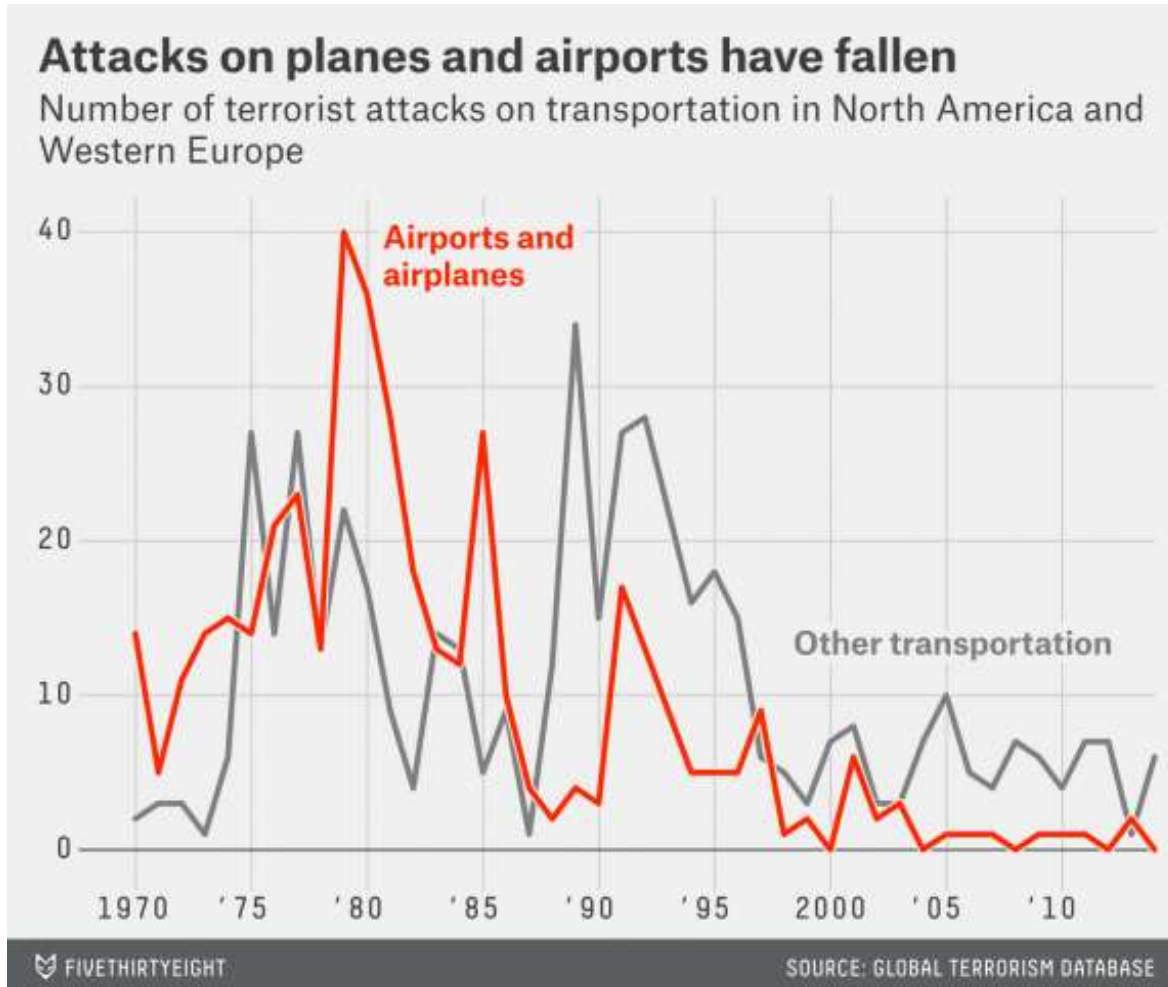
*QAA University Subject Benchmark for Geography*

# A range of quantitative skills
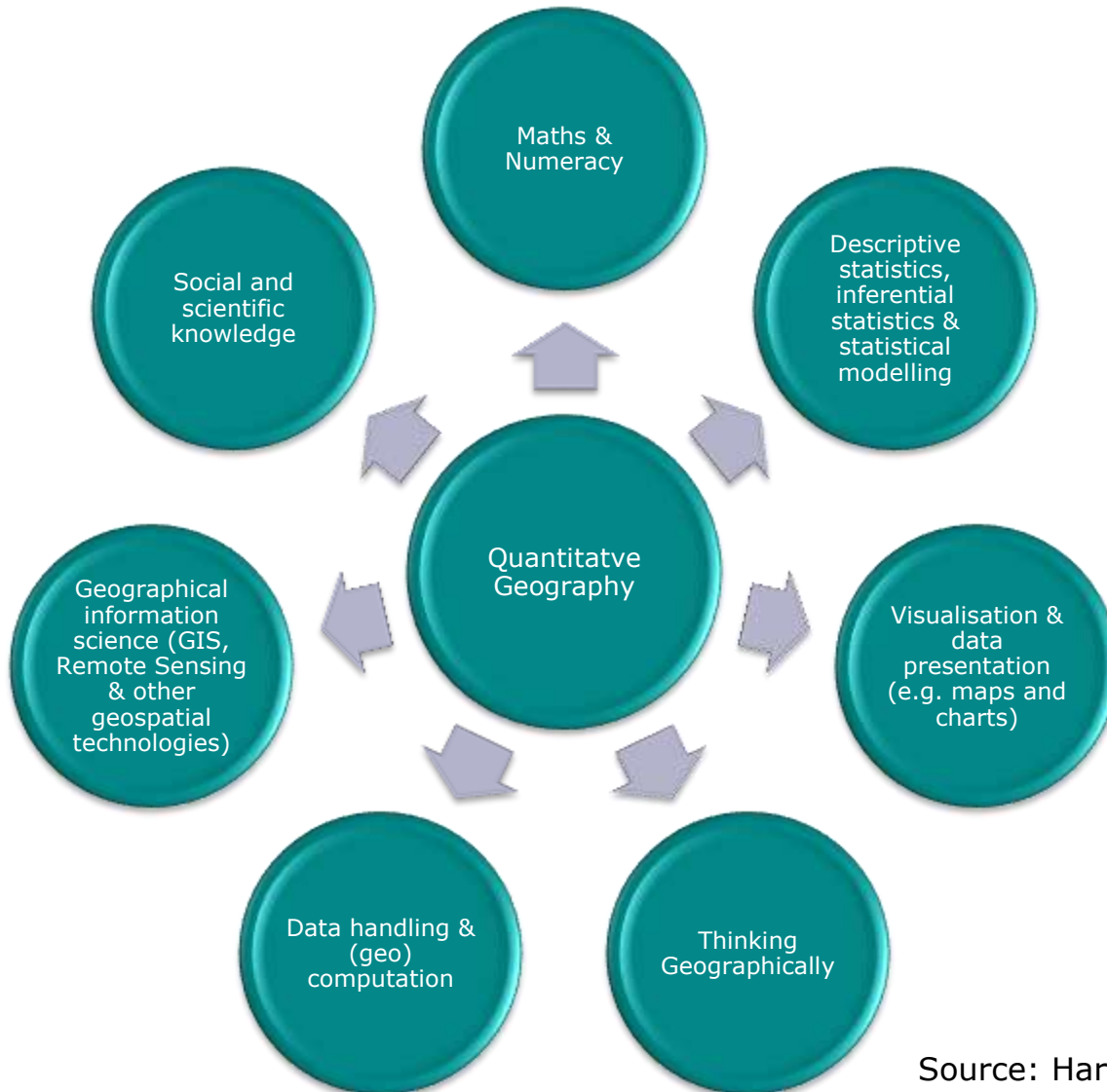


"Its more about the geography than the maths"

Source: Harris (2016): RGS

# Q. What do you make of this?

## Attacks on planes and airports have fallen

Number of terrorist attacks on transportation in North America and Western Europe

**Airports and airplanes**
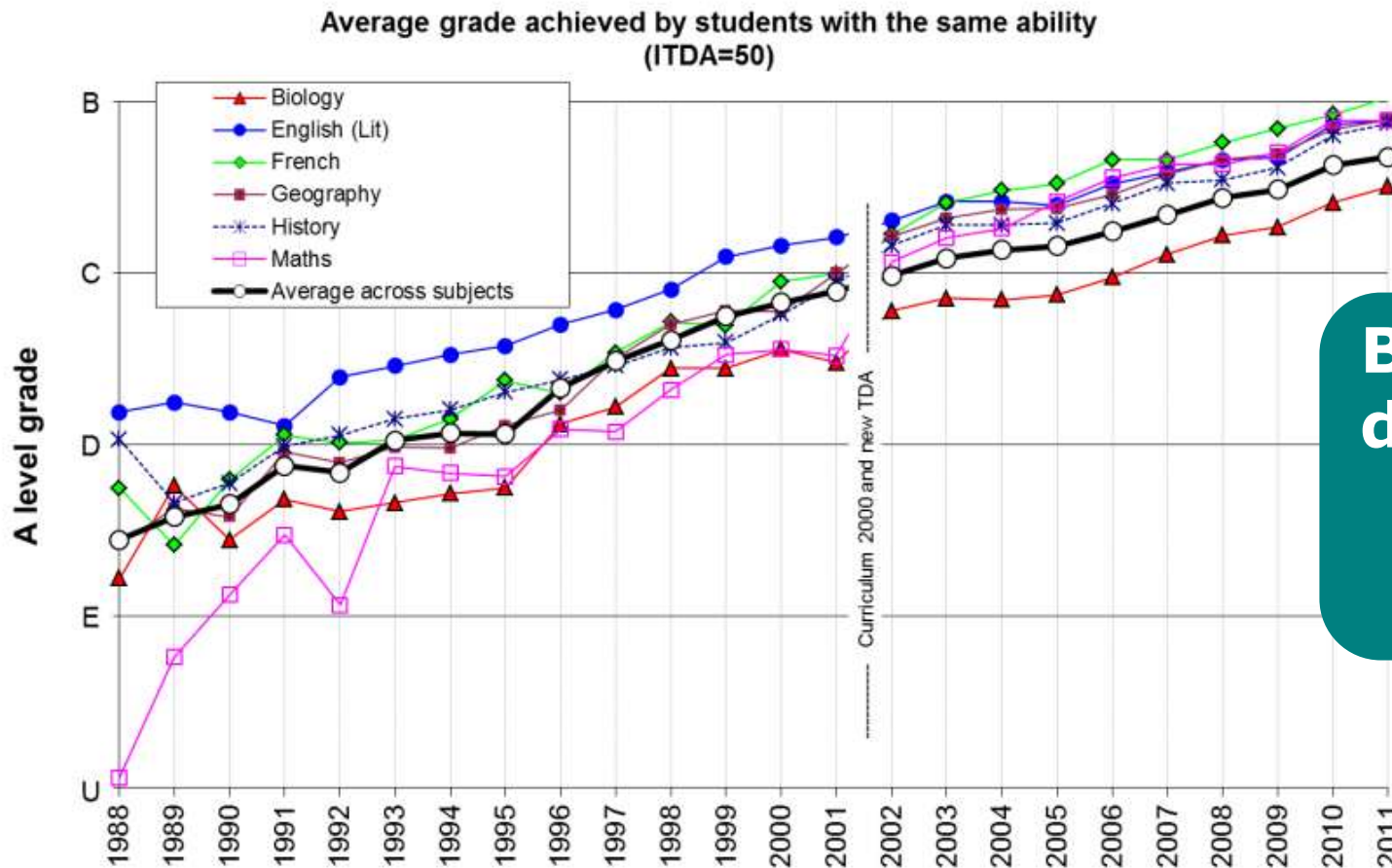
**Other transportation**

FIVETHIRTYEIGHT

SOURCE: GLOBAL TERRORISM DATABASE

**Is it becoming more risky to travel in North America and Western Europe?**

http://fivethirtyeight.com/features/attacks-on-transportation-targets-like-those-in-brussels-have-become-rarer/

# A-level standards: change over time



Average grade achieved by students with the same ability (ITDA=50)

**But what does this *really* mean?**

Source: CEM, Durham University

# A similar story for GCSE



Performance of England in international surveys
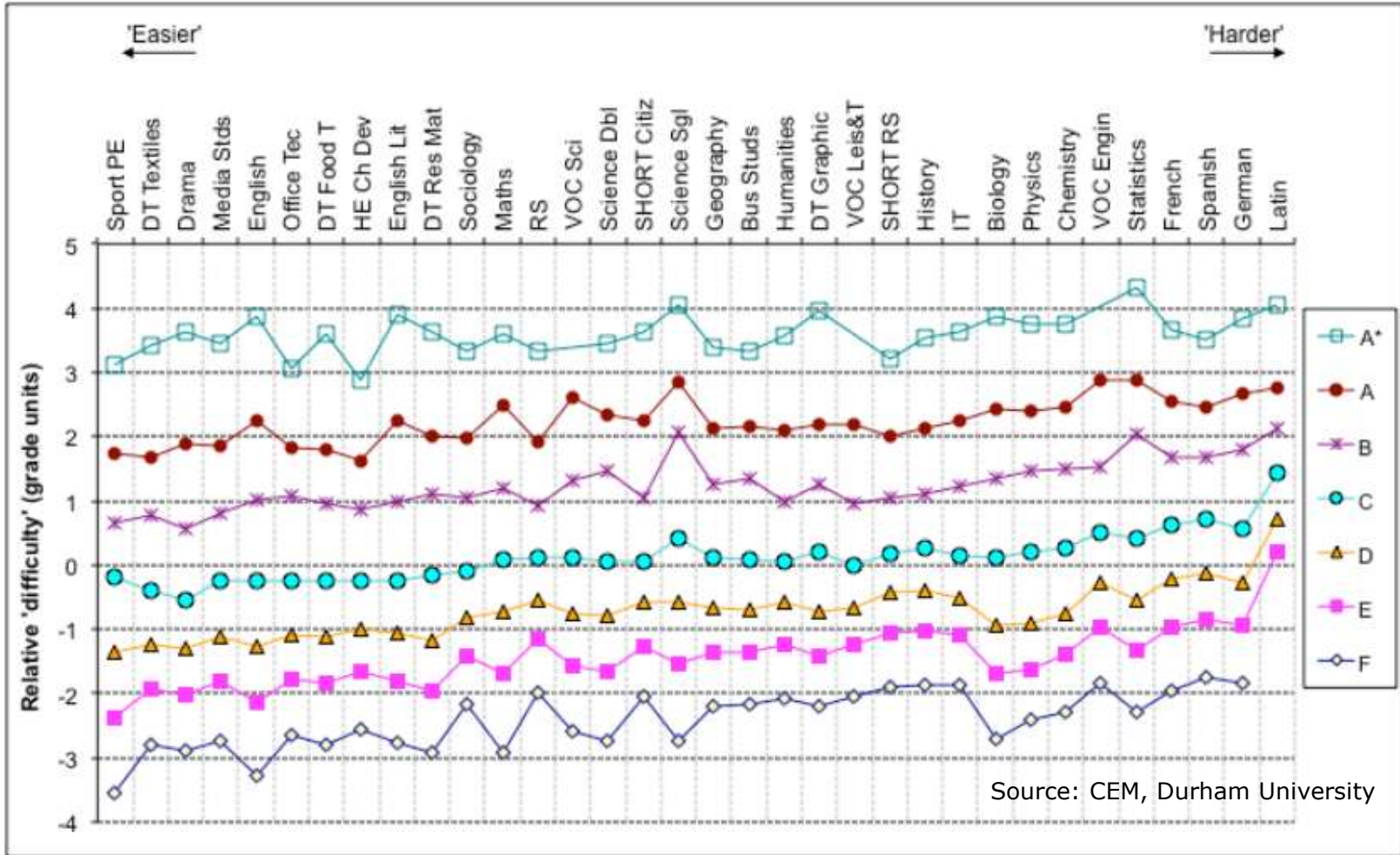
Tests easier? Kids better at doing the test? Teacher's better at teaching to the test?

Source: CEM, Durham University

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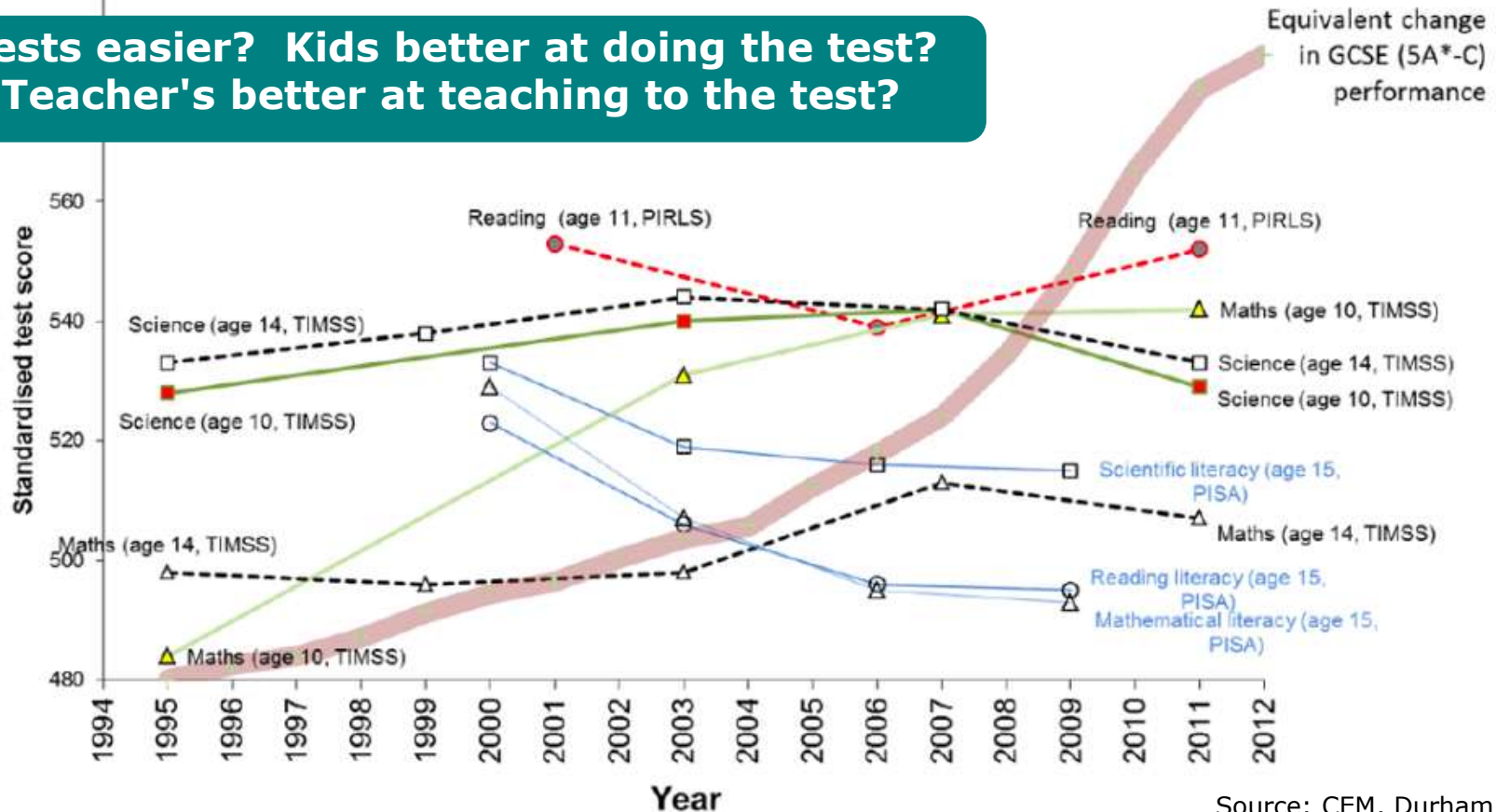
# What about 'difficulty'?
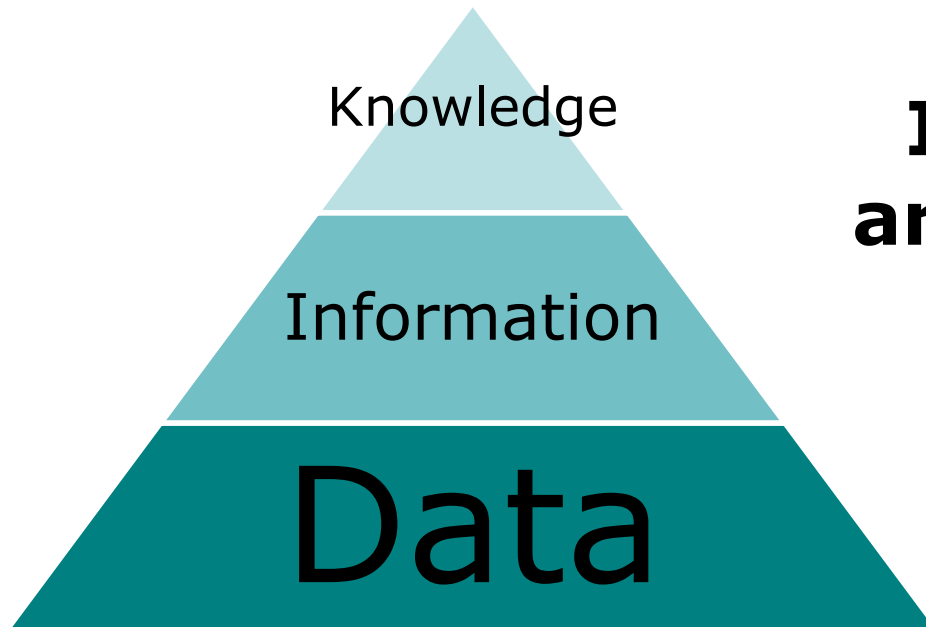
This is a quantified analysis comparing 'difficulty' across subjects and then ranked…

Source: CEM, Durham University

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# Why are we doing this....?

Manage ➡ Visualise ➡ Understand

Knowledge

Information

Data

**Isn't this what we are trying to achieve when we "think geographically"?**

Based on 'Open Data in a Day' by Dave Tarrant (Open Data Institute)

# A quick reminder of the Assessment Objectives

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| AO4: Select, adapt and use a variety of skills and techniques to investigate questions and issues and communicate findings. | | | 25% (5% used to respond to fieldwork data and context(s)) |
|---|---|---|---|
| **Strands** | **Elements** | **Coverage** | **Interpretations and definitions** |
| n/a | 1a – Select a variety of skills and techniques to investigate questions and issues. | Full coverage in each set of assessments (but not every assessment). | ■ **Skills and techniques** are aspects of subject content. Awarding organisations should explain their approach to targeting them in their assessment strategy. ■ **Questions** are geographical matters requiring resolution or discussion. ■ **Issues** mean topics about which there can be debate or discussion. ■ The emphasis in this assessment objective should be on the use of skills and techniques – and the weighting of element 1c should reflect this emphasis. ■ Element 1d should be assessed in combination with one or more of the other elements. ■ There are different ways in which findings can be communicated. This may include written responses or data responses. ■ We do not expect individual tasks/questions to cover a variety of skills and techniques. ■ We do not expect individual tasks/questions to cover both questions and issues. |
| | 1b – Adapt a variety of skills and techniques to investigate questions and issues. | | |
| | 1c – Use a variety of skills and techniques to investigate questions and issues. | | |
| | 1d – Communicate findings. | | |

# A quick reminder of the **A**ssessment **O**bjectives

| | Students must: | AS Level | A-Level |
|---|---|---|---|
| AO1 | Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change, at a variety of scale | 40% | 34% |
| AO2 | Apply knowledge and understanding in different contexts to interpret, analyse and evaluate geographical information and issues | 35% | 40% |
| AO3 | Use a variety of relevant quantitative, qualitative and fieldwork skills to:<br>• investigate geogr<br>• interpret, analyse<br>• construct argume | | |

| Mark tariff | 1 | 2 | 3 |
|---|---|---|---|
| Define | * | | |
| Identify/State/Name | * | * | |
| Calculate | * | * | |
| Complete | * | * | |
| Draw/Plot | | * | * |

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# Introducing the Pearson Progression Scale

Note: steps 10 to 12 are still GCSE

Expected progress from Years 7 to 11

| Steps | Transition | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | 11th | 12th |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

## Progression Scale and Map

Our Geography Progression Scale is a reliable, easy to use tool to track students' progress over Key Stage 3 and Key Stage 4. It comprises of 12 steps ranging from low (1) to high (12) challenge. We anticipate that the average student will enter year 7 working at the 3rd or 4th step. The expectation is that a student will make one Step of progress a year.

The Progression Map builds on the Scale, breaking down the curriculum with clear process descriptors, any prior knowledge required and boosters for additional challenge. This provides you with a more detailed view of how learning progresses across each of the 12 steps.

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# Pearson Progression Scale: Starting out…

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| Strand | Assessment Objective | Progress descriptor | Step |
|---|---|---|---|
| Application of Geographical Skills | AO4 | Pupils can recognise patterns of both human and physical features on a limited range of scales. They can draw and label simplistic sketches and recognise basic map symbols. They can construct basic graphs such as bar graphs which will be accurately completed. They can recognise the highest and lowest values in a data set as well as complete basic calculations such as the range of the data. | 1st |
| Application of Geographical Skills | AO4 | Pupils can describe the patterns of human and physical features as well as draw and label a sketch map. Simplistic observations of photographs and sketches will be made. They will recognise and use map symbols and begin to have a working understanding of 4 figure grid references and straight line distances. Pupils can construct a range of graphs such as a bar and line graph and use increasing statistical skills such as working out the mean and median values. | 2nd |
| Application of Geographical Skills | AO4 | Pupils can describe distributions of physical and human features and be able to sketch, label and start to annotate sketch maps and photographs in greater depth. Pupils have an increasing working knowledge of OS map skills and can use 4 figure referencing with increasing confidence. Pupils will start to use GIS and interpret data presented in this format. Graphical skills will become more sophisticated and pupils will demonstrate an understanding of the data through statistical skills such as mode and modal class. | 3rd |

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# Pearson Progression Scale: At the top…

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| Strand | Assessment Objective | Progress descriptor | Step |
|---|---|---|---|
| Application of Geographical Skills | AO4 | Pupils can demonstrate a wide range of geographical skills. Pupils will be able to clearly recognise patterns of human and physical features and be able to interpret these on a range of scales. Pupils can draw and annotate cross sectional diagrams using OS maps, and annotate these with the specific physical and human features relevant to the area under study. Pupils can draw and interpret a variety of graphs and mapping techniques such as choropleth, and analyse the patterns using a range of statistical (e.g. cumulative frequency) and numerical (e.g. magnitude and frequency) skills. | 10th |
| Application of Geographical Skills | AO4 | Pupils can demonstrate an extensive range of geographical skills to describe, interpret and analyse geographical patterns and trends. Pupils can recognise geographical patterns and interpret the trends using a range of statistical skills to help such as mean, mode and median. Pupils can describe the data using measures of central tendency and clearly identify anomalous values within the data set. From this pupils are beginning to suggest reasons why these anomalies exist. The use and understanding of the role of GIS in geography will be demonstrated with growing confidence. | 11th |
| Application of Geographical Skills | AO4 | Pupils can demonstrate exceptional use of geographical skills to describe, interpret, analyse and evaluate geographical patterns and trends. Pupils can use a range of maps and atlases at various scales with confidence. Pupils can draw more sophisticated cartographical maps and graphs and use sophisticated statistical calculations to analyse the data displayed. Pupils can describe relationships within data sets using sophisticated numerical skills such as measures of central tendency and quartile and inter-quartile range. From this pupils can clearly recognise anomalies within the data set, offering comprehensive suggestions for why these exist. The use and understanding of the role of GIS in geography will be demonstrated with confidence. | 12th |

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# All 4 Strands Mapped together

| | |
|---|---|
| **Step 7** | Pupils recall basic information about physical and human environments, with a growing appreciation of different scales. They demonstrate simplistic knowledge of location through specific case studies with geographical ideas referred to in a simple manner. Pupils understand simple physical and human processes. Pupils begin to understand how the different views of people have different effects on how environments are used and managed. Pupils conduct a geographical enquiry, collecting appropriate data (primary and secondary). Pupils attempt to make brief comments about the data, with limited conclusions attempted and offer an evaluation often focused on one aspect of the enquiry. Pupils have a good understanding of how cartographical and OS skills can be used to describe and interpret geographical patterns. Pupils understand a range of graphical techniques and how to interpret the data presented. Pupils demonstrate a range of graphical skills and interpret different types of photographs from a range of different landscapes. Pupils clearly link photographic evidence to OS maps. Pupils use more sophisticated statistical skills e.g. percentage change or cumulative frequency as a means of analysing data. |
| **Step 8** | Pupils recall a wider variety of information about physical and human environments. They show some understanding of the location of these environments through case study detail with appropriate key terminology used. Pupils recognise the inter-relationships between processes at different scales. Pupils understand that these processes help develop geographical patterns and that these areas have specific characteristics. Pupils understand how the relationship between people and environments inter-link, and trying to achieve sustainable development will affect planning and management of these areas. Pupils conduct a geographical enquiry, identify key questions or hypotheses to support, suggest an appropriate sequence of investigation, and collect appropriate data (primary and secondary) to help support the enquiry. This is collated and presented using simplistic techniques but they begin to produce more sophisticated techniques. Pupils communicate their findings in more detail with plausible conclusions offered, as well as evaluation offered for several aspects of the enquiry. Pupils clearly understand cartographic and OS map skills and use these to interpret patterns of human and physical features at a local, national and worldwide scale. Pupils have good graphical skills and can draw and interpret data on sophisticated graphs e.g. choropleth and flow line maps. Pupils use numerical and statistical skills to interpret data sets, highlighting trends and anomalous values. |
| **Step 9** | Pupils recall some accurate detail about physical and human environments studied with an appreciation of a wider scale. They demonstrate increasing use of case study specific knowledge and use appropriate key terminology with some accuracy. Pupils begin to describe the factors (physical, historical and economic) that affect the characteristics of places. Pupils discuss a range of processes relating to both physical and human environments, appreciating how they contribute to geographical patterns. Pupils begin to show understanding of how these processes interact causing diversity and independence. Pupils understand how links are made between people and the environment, appreciating that sustainable development will affect planning and management of environments. Pupils conduct a geographical enquiry, and identify key questions or hypotheses to support. Pupils begin to offer some contextualisation of their enquiry. They suggest an appropriate sequence of investigation and discuss the reasons for using particular data collection techniques. Pupils communicate their findings in greater depth, offering links to appropriate geographical theories, with plausible conclusions offered, as well as evaluation of several aspects of the enquiry. Pupils demonstrate excellent use of geographical skills and use these to describe the distribution and patterns at a range of scales using a variety of different maps. Pupils draw and interpret a variety of different cartographical skills and interpret the data presented using a wide range of numerical and statistical skills. |
| **Step 10** | Pupils recall detailed information about physical and human environments studied, across all scales and include appropriate case study detail and location. Pupils demonstrate their understanding of a range of geographical processes, beginning to apply their understanding to unfamiliar contexts. Pupils interpret the characteristics of their chosen case study or example, and link them to both physical and human geography. Pupils recognise that sustainable development in these areas is important, and that opinions, including their own, will vary depending on the stakeholders involved. Pupils appreciate the need for a more sustainable approach to the planning and management of physical and human environments, using some supporting examples. Pupils conduct a geographical enquiry, and identify appropriate key questions or hypotheses to support, offering greater contextualisation for their enquiry. Pupils collect primary and secondary data, and collate and present their findings using more sophisticated techniques e.g. located graphs (bar graphs and pie charts). From this, pupils analyse their data, offer an interpretation of the results and use their geographical understanding to link the evidence to relevant theory with more confidence. Pupils evaluate the process of enquiry and make suggestions for improving the limitations, reliability and validity of the conclusions. Pupils clearly recognise patterns of human and physical features and interpret these on a range of scales. Pupils draw and interpret a variety of graphs and mapping techniques e.g. choropleth and analyse the patterns using a range of statistical skills. |
| **Step 11** | Pupils accurately recall the characteristics of physical and human environments across all scales, using the location of specific case studies and complex key terminology. Pupils demonstrate understanding of geographical processes, applying these with greater accuracy to unfamiliar contexts. Pupils understand how human processes interact with physical processes to help develop geographical patterns and consider the interdependence between human and physical geography. Pupils demonstrate how this impacts on management of environments by evaluating the values and attitudes involved in managing and making decisions, appreciating that opinions of stakeholders vary. Pupils appreciate the need for a more sustainable approach to the planning and management of these environments. Pupils conduct a geographical enquiry, and identify appropriate key questions or hypotheses, offering some supported predictions. Pupils accurately collect primary and secondary data, collate and present their findings using a range of skills. From this, pupils analyse their data, interpret the results and begin to substantiate their conclusions with some linkage to the underpinning geographical theory. Pupils evaluate the process of enquiry and make suggestions for improving the limitations, reliability and validity of the conclusions. Pupils demonstrate an extensive range of geographical skills to describe, interpret and analyse geographical patterns and trends. From this, pupils begin to suggest reasons why these anomalies exist. |
| **Step 12** | Pupils accurately recall the precise characteristics of physical and human environments across a variety of spatial settings, using detailed knowledge of case studies supported by comprehensive terminology. Pupils demonstrate an understanding of complex geographical processes, applying these with precise accuracy to unfamiliar contexts. Pupils thoroughly understand how human processes interact with physical processes to develop more complex geographical patterns. Pupils demonstrate how this impacts on management of physical and human environments by assessing the values and attitudes involved in managing and making decisions, appreciating that the opinions of stakeholders will vary considerably. Pupils appreciate the need for a more sustainable approach to the planning and management of environments, and evaluate the costs and benefits. Pupils conduct a geographical enquiry, identify appropriate hypotheses or key questions, and provide detailed supporting predictions. Pupils accurately collect primary and secondary data, collate and present their findings, analyse their data, interpret the results and substantiate their conclusions with linkage to underpinning geographical theory. Pupils understand how to critically evaluate their enquiry and make suggestions for improving the limitations, reliability and validity of the conclusions. Pupils draw more sophisticated cartographical maps and graphs and use sophisticated statistical calculations to analyse the data displayed, recognising why anomalies might exist. |

# An early quantitative skills progression map

A possible quantitative, mathematical and geographical skills progression map: KS3 - GCE

General data and information skills, spatial and geospatial, data analysis and specific skills

| | KS3 | + KS4 | + GCE |
|---|---|---|---|
| | Context and detail | | |
| Seeing significance in data | Recognising that facts information and statistics can be analysed in order to develop new knowledge. Know how to access open data. Understating different types of numerical data: pdf, .xls, .csv, http/.... Etc. | | Being able to critically reflect on the provenance of open and other source data sets. Recognising the need for ethical treatment of data, information the owners of such information. |
| Basic data manipulation and management | Handing small data sets (1-20 items). Sorting and ordering, manually and using a spreadsheet. Begin to ask geographical questions linked to meaning in the data | Large data set management (>100 rows downloaded) and use of spreadsheet tools to manage, filter, sort and identify anomalies. Being able to contextualise "big numbers" relevant to geography, include concepts around magnitude | Manage large complex data sets. Estimations and predictions; using knowledge to explore and understand data and information in unfamiliar circumstances. |
| Data visualisation | Collaborative searching and understanding of different types of visualisation | Individual searching and understanding through creative exploration. Recognising limitations of visualisation | Individual searching, referencing, understanding and critical reflection of published information. |
| Graphical skills | Present data and information using different techniques. The importance of scales and to be able to summarise meaning from data presented | Recognising limitations of different graphical techniques, and the ability to introduce bias (deliberately or not). Analyse graphical information to explore rates of change, including linear vs log scales. | Explore data "correctness" as an idea, evaluate different presentation techniques using technical language. |
| GIS mapping | Measure distances, scales, areas, routes. Create own simple content and links to other resources, e.g. images | Import data from other sources, make layers and use mapping tools to present complex data in a meaningful way | Understand different types of map, e.g. vector vs raster, import big data, carry out basic analysis, filter, experiment with different types of map. |
| Cartographical skills (including digital visions) | General map and atlas skills, distances, area, scale, gradient etc. Different types of key maps understood. Be able to describe information from the map using appropriate geographical language and terminology. | Moving between different scales, areas and different map projections. Make reasonable estimations in different units. | Critical reflection on map presentation, representation, identity. Develop own criteria and scale for judging reliability of data and information. Recognising limitations and bias in infographics |
| General Data analysis | The language and basic tools of data analysis, e.g. indexes and indices, frequencies, percentages, ratios, fractions, proportions etc. Use of specific plots to represent data, e.g. scatter as precursor to other understanding. | Calculate measures of central tendency: standard deviation, interquartile, and critical reflection on approach. Precision and accuracy in data. Categorical, ordinal, interval data. Limitations of models in respect of geographical understanding and data analysis | Data uncertainty, problems of data sampling (representativeness, population context). Critique of the scientific route to enquiry ("data cycle") as a process to generate geographical answers. |
| Specific qualitative and quantitative skills (including fieldwork) | | Understand the need for some statistical tools to extract meaning from data and information, but recognise limitations. Explaining common landscapes, mental maps, participant observation, high quality photography (including self-directed) and analysis, e.g. coding | Undertake inferential statistics, evaluating different approaches to hypothesis testing, Chi, Lorenz curves, Gini, Nearest Neighbour, Mann Whitney* "Reading landscapes" in novel contexts and situations. Being cautious and sceptical of outcomes from different people and organisations |

*will be different demands according to different specifications.
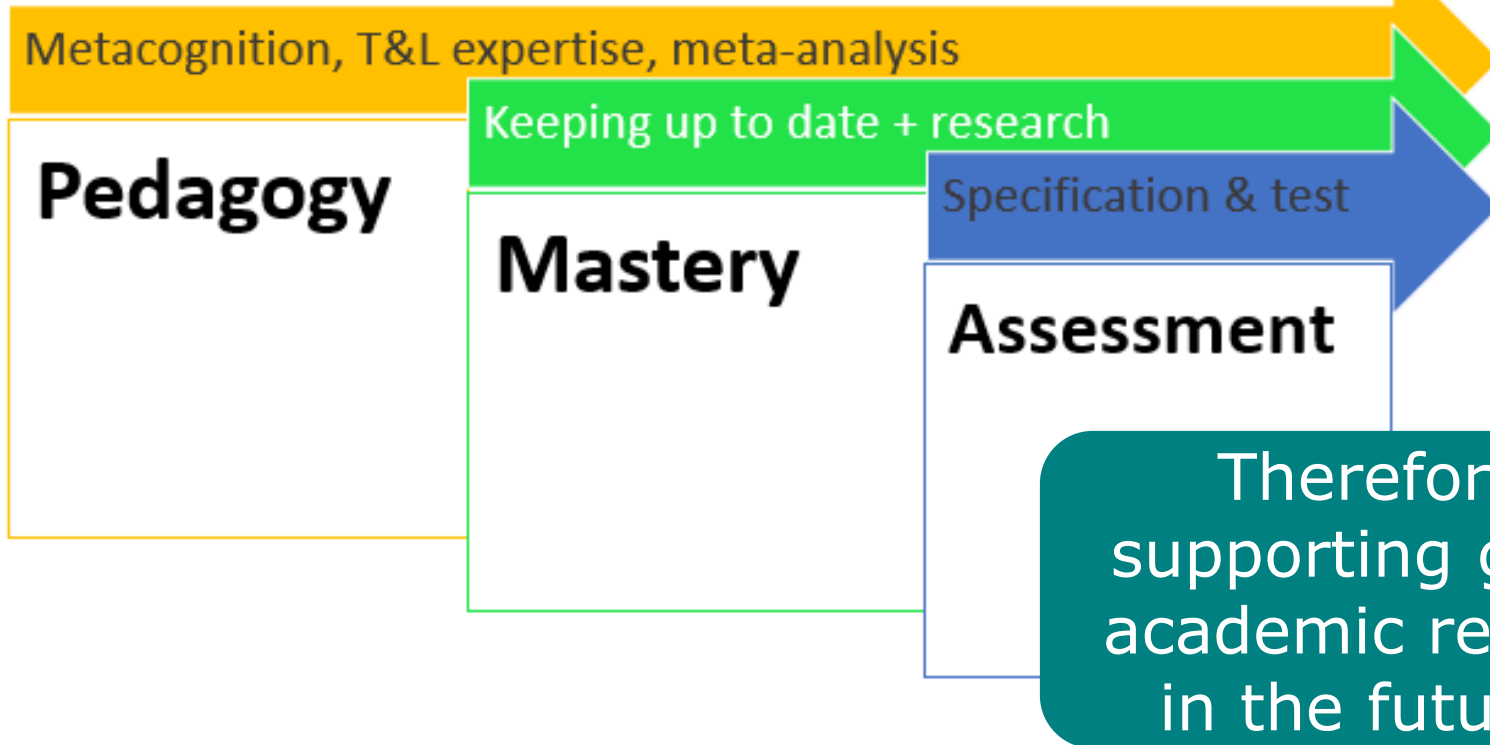
# Session outline

1. This session will consider the 'fear' of maths

2. We will explore the new Edexcel 'Maths for Geographers' Guide.

3. We will think about how maths skills can be best approached in the classroom
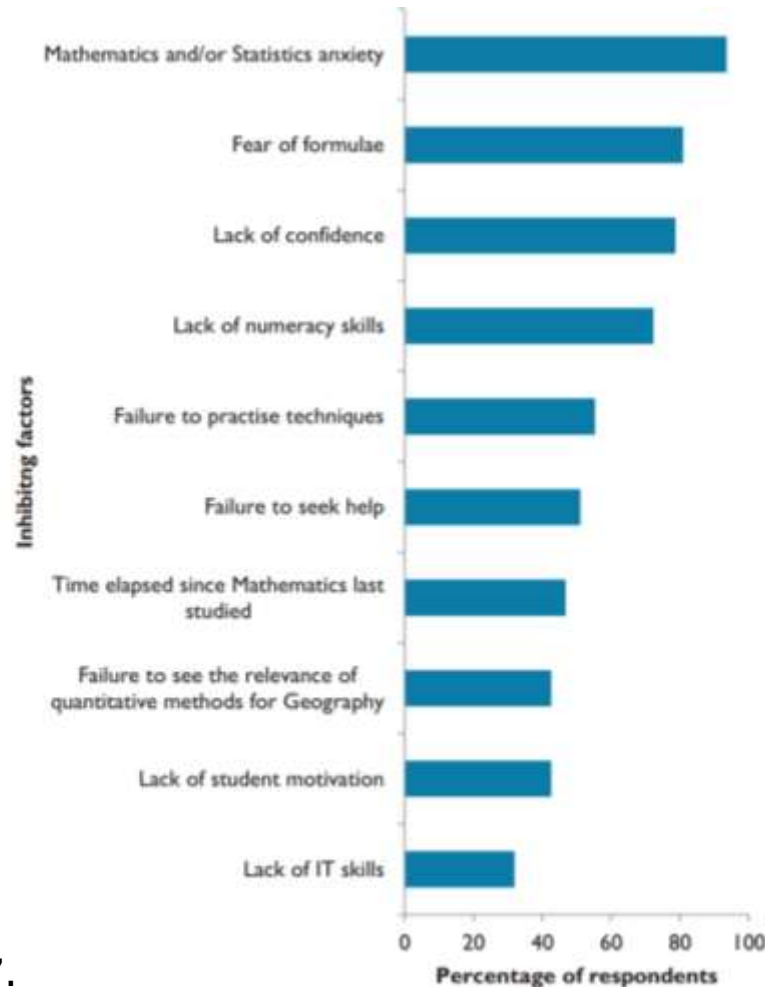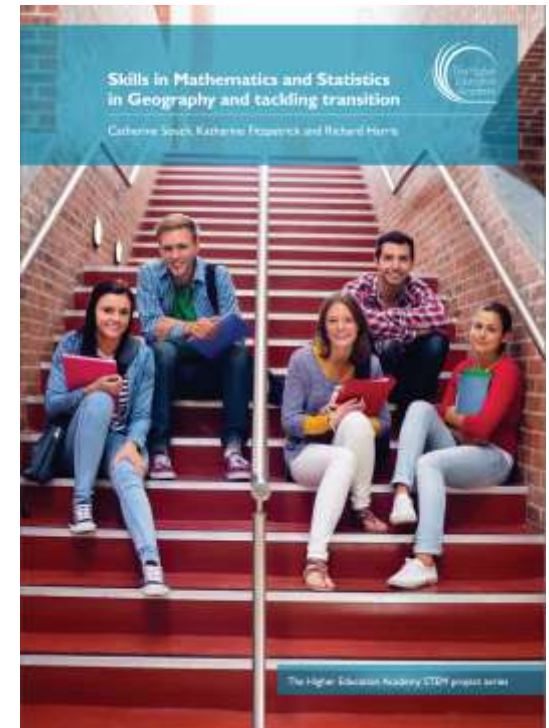
# Recent report on Maths, Stats & Geography

Figure 2: Instructors' response to the question "For students who struggle with quantitative methods, which factors typically inhibit their development om this area?" N = 47.



Skills in Mathematics and Statistics in Geography and tackling transition

Catherine Souch, Katherine Fitzpatrick and Richard Harris

The Higher Education Academy STEM project series

https://www.heacademy.ac.uk/resources/detail/detail/disciplines/Maths_Stats_OR/Skills-in-Mathematics-and-Statistics-in-geography

# Framing the 'statistics problem'

- Statistics is not maths, it's logical thinking. Most people can solve problems using logic and understanding.

- If you can add, subtract, multiply, divide and tell whether one number is bigger than another, you can do all the maths necessary for different GCEs when it is required.

- "Decision making in the face of uncertainty" sounds a lot more interesting than "statistics" even though that's essentially what statistics is about.

**Unpicking the fear of Maths!**

# Why are maths and stats skills difficult to nurture?

- Students generally do statistics out of necessity.
- Statistics is a mixture of quantitative and communication skills.
- It is not clear which are right and wrong answers.
- Statistical terminology is both vague and specific as well as specialised.
- (At school) it is difficult to get good resources; using real data in meaningful contexts.
- One of the basic procedures, hypothesis testing, is counter-intuitive.

**Quantitative Methods in Geography**

Making the Connections between Schools, Universities and Employers

Richard Harris
Katharine Fitzpatrick
Catherine Souch

Chris Brunsdon    Scott Orford
Claire Jarvis      Alex Singleton
Chris Haylock     Nicholas Tate

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# Statistical vs. non-statistical questions

1. How old are you?
2. How old are the people who live in Manchester?
3. Do dogs run faster than cats?
4. Does Cromer get less sunshine than Brighton?
5. How many "legs" are there in this room?
6. What was the difference in rainfall between Swanage and Taunton in 2014?
7. Do you get paid more working as a teacher or as a fireman?

# Edexcel Maths for Geographers Guide

**Free support provided on the Edexcel website**

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## Guide to Maths for Geographers

### Contents

### Introduction

This guide to maths for geographers outlines the content that students will have covered in their maths lessons throughout KS3 and KS4. You can use this guide to help you understand how different areas are approached in maths, and therefore support your teaching of mathematical content in geography lessons.

The content is split into distinct mathematical concepts. Each chapter takes you through the terminology used in that area, as well as examples taken from Pearson maths textbooks to show you the methods students should be familiar with when solving mathematical problems.

Sections which are highlighted have particular connection or reference to geography and may include geographical examples.

Its about connecting maths and geography, using the Pearson Maths approach

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'Demand' sections help you understand when distinct concepts are studied in KS3 and GCSE maths lessons and to what level…

'Terminology' sections help you know the language used in Maths lessons so that you can more usefully build upon students' prior knowledge

### 1.8 Pie charts

**Demand**

**All KS3 students** should learn how to construct a simple pie chart.

**Lower ability maths students (KS3 and KS4)** will probably struggle with working out the angles as they will not have learned how to calculate percentages or fractions that are not nice round numbers.

**All KS4 students** draw and interpret pie charts.

**Terminology**

- A pie chart is a circle divided into **sectors**.
  NB – a 'slice' of a pie is a sector, not a **segment**.
- The angle of each sector is proportional to the number of items in that category
- Shows proportions of a set of data, e.g. fraction or percentage of waste recycled
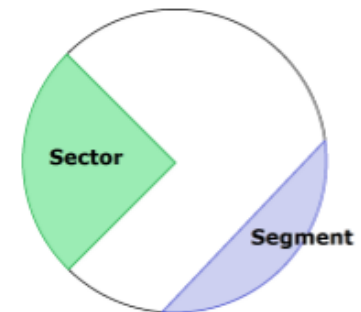- May need a key.

Sector

Segment

**Figure 14 – Pie chart terminology**

# How does it work?

**Approach**

**Drawing a pie chart**

Source: Pearson GCSE Maths Foundation

**Example 5**

The table shows the match results of a football team. Draw a pie chart to represent the data.

| Result | Won | Drawn | Lost |
|---|---|---|---|
| Frequency | 28 | 12 | 20 |

Total number of games = 28 + 12 + 20 = 60

÷60 ( 60 games : 360° ) ÷60
        1 game : 6°

The total number of games is the total frequency.

1 game = 360 ÷ 60 = 6°

Work out the angle for one game.

Won:    28 × 6° = 168°

Drawn:  12 × 6° = 72°

Work out the angle for each result.

Lost:   20 × 6° = 120°

Check: 168 + 72 + 120 = 360

Check that your angles total 360°.

Team results



Draw the pie chart. Give it a title and label each section, or make a key.

In questions asking students to interpret a pie chart, ask for the 'fraction' or 'percentage' who learn Geography, not the 'proportion' who learn Geography.

Worked examples are taken from the Pearson Maths textbooks

Errors that are perhaps more likely to be made in geography lessons, or particularly geographical examples, are highlighted throughout the Guide

# More detail...

## Approach

### Drawing scatter graphs

Lower ability maths students would not be expected to know which variables to put on which axis for a scatter graph. They may need help with deciding which is the independent variable, and reminder that this goes on the horizontal axis.

### Drawing a line of best fit

Place your ruler on the graph, on its edge. Move the ruler until it is following the shape of the data, with roughly the same number of points above or below it. Ignore any points on the line.

### Common error

Students often try to make their lines of best fit go through (0, 0). A line of best fit does not necessarily pass through the origin. It should stop at the first or last plot point or cross.

In geography we often don't have data (especially for fieldwork) that goes to zero, so students need to be made aware of this.

Common errors in exams are also highlighted

# DELEGATE Activity

(1) Specification

(2) Maths Guide

(3) Question

**TASK:** Below is a skills extract from the 2016 GCSE Specifications (p.33 in Geog A & p.38 in Geog B). Using the maths guide extracts, design a context and activity to teach either 1 or 2.

**1**

**Numerical skills:**

- demonstrate an understanding of number, area and scale and the quantitative relationships between units

- design fieldwork data collection sheets and collect data with an understanding of accuracy, sample size and procedures, control groups and reliability

- understand and correctly use proportion and ratio, magnitude and frequency (e.g. 1:200 flood; and logarithmic scales such as the Richter scale, in orders of magnitude)

- draw informed conclusions from numerical data

**2**

**Statistical skills:**

- use appropriate measures of central tendency, spread and cumulative frequency (median, mean, range, quartiles and inter-quartile range, mode and modal class)

- calculate percentage increase or decrease and understand the use of percentiles

- describe relationships in bivariate data: sketch trend lines through scatter plots; draw estimated lines of best fit; make predictions; interpolate and extrapolate trends

- be able to identify weaknesses in selective statistical presentation of data

# Make sure it helps with the exam

Which of the following are the correct units used for cross-sectional area in Figure 1b.

(1)

☐ **A**  m²

☐ **B**  m³

☐ **C**  cm²

☐ **D**  mm²

Can you devise a similar question to check a student's understanding?

(iii) Using Figure 1b, explain **one** reason why a student might choose to use the results from the median, rather than the mean.

(2)

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**Session 3**

# Bringing quantitative data to life in geography

4.30 – 5.00pm

**Simon Pinfield**

**s.pinfield@rgs.org**

U466a
Background image: ©stillfx
© artwork: Mark Bolitho | Origami photography Pearson Education Ltd/Naki Kouyioumtzis ©Sozaijten

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# Session outline

- This session will introduce the relevance and meaning of quantitative skills in the context of the Edexcel GCSE geography topics.

- You will be shown examples of how to integrate skills into your lessons.

# GCSE topics & integrated skills

- Both of the new Edexcel specifications suggest distinct geographical skills that might be integrated within the teaching of each topic.

- The Royal Geographical Society (with IBG) is developing a range of useful resources and lesson plans to help with this. These resources will be available at www.rgs.org/dataskills.

- Visit the Edexcel webpage 'Supporting our accredited Edexcel GCSE (9–1) Geography A and Geography B' for further details and links to course materials http://bit.ly/25dgkld

- Further guidance can be found in spec-specific textbooks *

*You don't need to purchase resources to deliver our qualifications.

# Census Data

## Geography A: Topic 4 – Changing Cities (p.19)

**Integrated skills:**

(1) Use and interpretation of line graphs and calculating of rate of change/annual or decadal percentage growth

(2) Using satellite images to identify different land use zones in urban areas

(3) Using a combination of population pyramids, choropleth maps and GIS

(4) Using Census output area data for 2011

(5) Calculating the ecological footprint of people in the city, and comparing it to other locations

(6) Using GIS/satellite images, historic images and maps to investigate spatial growth

(7) Using quantitative and qualitative information to judge the scale of variations in quality of life.

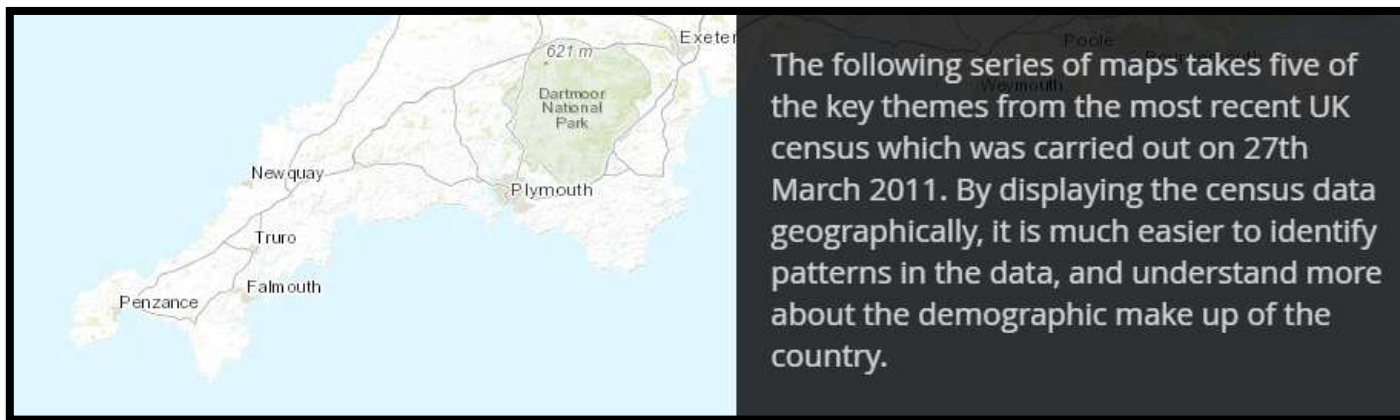## Geography B: Topic 5 – The UK's evolving human landscape (p.23)

**Integrated skills**:

(1) Use and interpretation of UK population pyramids form different time periods

(2) Use of census data sets to understand changes to the UK's population

(3) Use of Eurostat to investigate FDI and immigration to the UK.

# Census Data

➢ RGS-IBG guidance on using Census output area data for 2011: http://bit.ly/1VYBI8r

➢ Census data GIS Story Map: http://arcg.is/1Lytccc



Source: Screen capture from the Esri UK Census 2011 story map

The following series of maps takes five of the key themes from the most recent UK census which was carried out on 27th March 2011. By displaying the census data geographically, it is much easier to identify patterns in the data, and understand more about the demographic make up of the country.

➢ Other details available from the ONS: http://bit.ly/1qy7dZ7

# Numerical economic data

## Geography A: Topic 5 – Global Development (p.22)

**Integrated skills:**

(1) Comparing the relative ranking of countries using single versus composite (indices) development measures

(2) Interpreting choropleth maps

(3) Using numerical economic data to profile the chosen country

(4) Using proportional flow line maps to visualize trade patterns and flows

(5) Interpreting population pyramids

(6) Using socio-economic data to calculate difference from the mean, for core and periphery regions.

## Geography B: Topic 2 – Development Dynamics (p.13)

**Integrated skills:**

(4) Using numerical economic data to profile the chosen country

(5) Using proportional flow-line maps to visualise trade patterns and flows

(6) Using socio-economic data to calculate difference from the mean, for core and periphery regions.

# CASE STUDY
## e.g. Emerging country - Brazil

➤ World Bank data for Brazil
http://data.worldbank.org/country/brazil

➤ Pick economic data to profile the country
http://data.worldbank.org/indicator

➤ Use the graph tool to show comparisons between data for Brazil and other countries, to put the chosen country's data into context. Data can also be downloaded for use in Excel
http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD/countries/1W-BR-GB?display=graph

# Maps

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**Enquiry question:** Why do the causes and impacts of tectonic activity and management of tectonic hazards vary with location?

## Geography B: Topic 1 – Hazardous Earth (p.11)

**Integrated skills**:

(7) Interpret a cross-section of the Earth

(8) Use and interpretation of world map showing distribution of plate boundaries and plates

(9) Use of Richter Scale to compare magnitude of earthquake events

(10) Use of social media sources, satellite images and socio-economic data to assess impact.

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# Maps

- esri story map – Tectonics: http://arcg.is/1NASd8a

- Step-by-step guide to using ArcGIS and USGS earthquake data to create a live earthquakes map: http://bit.ly/1xDQovO

- For ArcGIS online subscribers: http://arcg.is/1YHXSty

- QGIS offers similar functions: http://www.qgis.org/en/site/

Source: Screen capture from the Esri Motion of Tectonic plates story map

## Motion of Tectonic Plates

This story map tells the tale of Earth's tectonic plates, their secret conspiracies, awe-inspiring exhibitions and subtle impacts on the maps and geospatial information we so often take for granted as unambiguous. But is it? You will find yourself hovering over the Mid-Atlantic Ridge, or swimming in magma deep

# Planning

Looking at the integrated skills, along with the overall skills summary, it might be useful to plan ideas like this:

| Topic | Cartographic skills | Graphical skills | Numerical skills | Statistical skills |
|---|---|---|---|---|
| **Changing cities** | Using satellite images to identify different land use zones in urban areas<br><br>Using GIS/satellite images, historic images and maps to investigate spatial growth | Use and interpretation of line graphs and calculating of rate of change / annual or decadal percentage growth<br><br>Using a combination of population pyramids, choropleth maps and GIS | Using Census output area data for 2011 (to include exercises to draw informed conclusions from numerical data)<br><br>Calculating the ecological footprint of people in the city, and comparing it to other locations<br><br>Using quantitative and qualitative information to judge the scale of variations in quality of life | Using Census output area data for 2011 (and other indicative data) to undertake exercises using measures of central tendency, spread and cumulative frequency (median, mean, range, quartiles and inter-quartile range, mode and modal class)<br><br>Calculate percentage increase or decrease and understand the use of percentile – using census / other data |

# Assessment Objectives
## The importance of skills and techniques

| Students must: | | % in GCSE |
|---|---|---|
| **AO1** | Demonstrate knowledge of locations, places, processes, environments and different scales | 15 |
| **AO2** | Demonstrate geographical understanding of:<br>• concepts and how they are used in relation to places, environments and processes<br>• the inter-relationships between places, environments and processes | 25 |
| **AO3** | Apply knowledge and understanding to interpret, analyse and evaluate geographical information and issues and to make judgements | 35<br>(10% applied to fieldwork contexts) |
| **AO4** | Select, adapt and use a variety of skills and techniques to investigate questions and issues and communicate findings | 25<br>(5% used to respond to fieldwork data and contexts) |
| | **Total** | **100%** |

# **Assessment**

Look at the SAMs early in the planning process so that you know from the start how skills and techniques might be used in examination papers.

(c) Analyse the information in **Figure 3** which shows data for three countries at different levels of development.

| Country | GDP per capita ($) | Infant mortality per 1000 | Doctors per 1000 of population |
|---|---|---|---|
| **United Kingdom** | 42 000 | 4 | 2.7 |
| **Brazil** | 12 000 | 12 | 1.8 |
| **Malawi** | 250 | 44 | 0.1 |

**Figure 3**

Explain why the infant mortality rate varies between the countries in Figure 3.

(4)

**Geog B SAMs – Paper 1 (p.12)**

# Closing comments...

- The development of skills and techniques should be part of day-to-day teaching, rather than being a standalone element or unit of work.

- There are many straightforward ways to integrate geographical skills, as demonstrated today.

- Look out for separate guidance on fieldwork techniques, including resources, which will be available at www.rgs.org/dataskills later this year.

- Consult the Edexcel website for further support and documents (e.g. SoWs, topic booklets & data/fieldwork worksheets are all free to download)

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# AS and A level 2016 Geography

**Session 4**

Exploring 'Place' through fieldwork

5.15 – 5.45pm

**David Holmes**

**@dave905947**

**david@david-holmes-geography.co.uk**

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# Session Outline

- This session will be a participatory workshop exploring question/hypothesis generation, contexts and methodologies for the A level Independent Investigation

# Task & context

- Your task is to consider the available contexts for an investigation on the Regenerating or Diverse Places topics… and then design a research question/hypothesis as well as establish field methodologies and data collection procedures.

- Feel free to collaborate with other delegates.

- You have about 15 minutes and then we will feed back at the end.

The remaining slides in this presentation provide a 'smorgasbord' of resources.



Miss Maud Smorgasbord Restaurant, Australia

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## **Topic 4: Shaping Places**

## **Option 4A: Regenerating Places**

### **Overview**

Local places vary economically and socially with change driven by local, national and global processes. These processes include movements of people, capital, information and resources, making some places economically dynamic while other places appear to be marginalised. This creates and exacerbates considerable economic and social inequalities both between and within local areas. Urban and rural regeneration programmes involving a range of players involve both place making (regeneration) and place marketing (rebranding). Regeneration programmes impact variably on people both in terms of their lived experience of change and their perception and attachment to places. The relative success of regeneration and rebranding for individuals and groups depends on the extent to which lived experience, perceptions, and attachments to places are changed.

Students should begin by studying the place in which they live or study in order to look at economic change and social inequalities. They will then put this local place in context in order to understand how regional, national, international and global influences have led to changes there. They should then study one further contrasting place through which they will develop their wider knowledge and understanding about how places change and are shaped.

## Topic 4: Shaping Places

## Option 4B: Diverse Places

### Overview

Local places vary both demographically and culturally with change driven by local, national and global processes. These processes include movements of people, capital, information and resources, making some places more demographically and culturally heterogeneous while other places appear to be less dynamic. This creates and exacerbates considerable social inequalities both between and within local areas.

Variations in past and present connections with places lead to very different lived experiences of places at a local level. This is because demographic and cultural changes impact variably on people in terms of the lived experience of change and their perception of and attachment to places. The relative success of the management of demographic and cultural changes for individuals and groups depends on that lived experience of change and how perceptions of, and attachments to, the place are changed.

Students should begin by studying the place in which they live or study in order to look at demographic and social changes. They will then put this local place in context in order to understand how regional, national, international and global influences have led to changes in this place. They should then study one further contrasting place, which will develop wider knowledge and understanding about how places change and are shaped. A local place may be a locality, a neighbourhood or a small community, either urban or rural.

# The route to enquiry

The first 2 (of 6) stages from the suggested route to enquiry - p.6 of the A level specification

| Stage | Description |
|---|---|
| Purpose, identification of a suitable question/aim/hypothesis and developing a focus | Identify appropriate field research questions/aims/hypotheses, based on their knowledge and understanding of relevant aspects of physical and/or human geography. Research the relevant literature sources linked to possible fieldwork opportunities presented by the environment, considering their practicality and relationship to compulsory and optional content. Understand the nature of the current literature research relevant to the focus. This should be clearly and appropriately referenced within the written report. |
| Designing the fieldwork methodologies, research and selection of appropriate equipment | Consideration of how to observe and record phenomena in the field and to design appropriate data-collection strategies taking account of sampling and the frequency and timing of observation. Demonstrate knowledge and understanding of how to select practical field methodologies (primary) appropriate to their investigation (may include a combination of qualitative and quantitative techniques). |

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# Independent Investigation Overview

p.68 – A level specification

The independent investigation may relate to human or physical geography or it may integrate them.

The independent investigation must:

- be based on a question or issue defined and developed by the student individually to address aims, questions and/or hypotheses relating to any of the compulsory or optional content

- incorporate field data and/or evidence from field investigations, collected individually or in groups

- draw on the student's own research, including their own field data and, if relevant, secondary data sourced by the student

- require the student independently to contextualise, analyse and summarise findings and data

- involve the individual drawing of conclusions and their communication by means of extended writing and the presentation of relevant data.

# Coursework assessment criteria

| Level | Mark | **Purpose of the Independent Investigation (12 marks)** **(AO1: 4 marks, AO2: 4 marks and AO 3: 4 marks)** |
| --- | --- | --- |
| | | Descriptor |
| **Level 3** | 9–12 | • Demonstrates accurate and relevant geographical knowledge and understanding of location, geographical theory and comparative context throughout. (AO1)<br><br>• Applies understanding to find coherent and relevant links between the investigation's context and a broader geographical context. (AO2)<br><br>• Investigates a wide range of relevant geographical sources in order to identify/obtain accurate geographical information and data that support the investigation; research information is used to construct a justified aim, question or hypothesis that provides an appropriate framework for investigation at a manageable scale; planned enquiry process is logically structured and comprehensive. (AO3) |

# Coursework assessment criteria

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p.75 – A level specification

| | | Field Methodologies and Data Collection (10 marks) (AO3: 10 marks) |
|---|---|---|
| **Level** | **Mark** | **Descriptor** |
| **Level 3** | 8–10 | • Chooses appropriate methods to collect a range of data and information relevant to the geographical topic. (A03) <br> • Designs a valid sampling framework explicitly linked and appropriate to the geographical focus being investigated. (AO3) <br> • Considers both frequency and timing of observations. (AO3) <br> • Research planning shows appropriate and relevant understanding of the ethical dimensions of field research methods. (AO3) <br> • Obtains reliable data and information as a result of consistent use of methods with high levels of accuracy/precision. (AO3) |

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# Chaz Hutton's 'A Map of Every City'

Drawn on a post-it note…



Tweeted by @chazhutton (23rd Jan 2016)
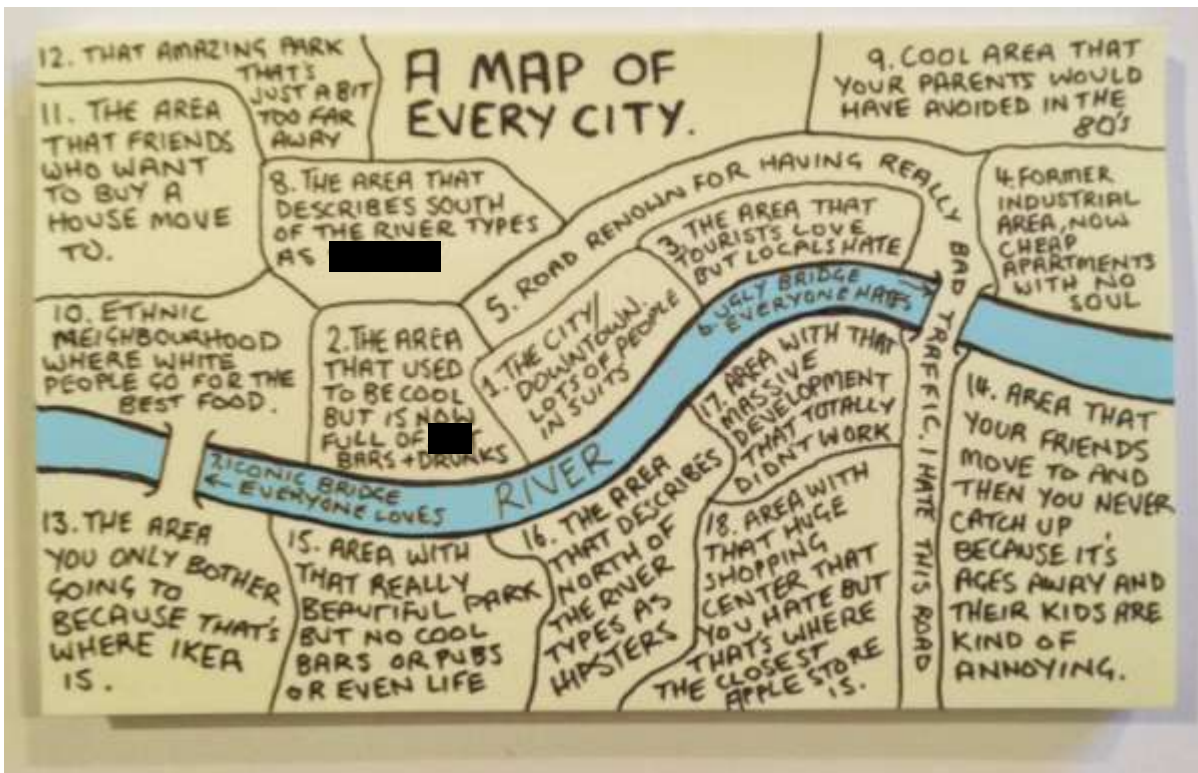
Chaz Hutton: "…it's not actually a map of a city, not in the traditional sense anyway. Rather it's a map of people's experience of living in cities: The changing circumstances of people as they get older and have children, the way 'cool' areas emerge from formerly 'rough' areas and are then invariably compared to the less-cool, traditionally wealthy areas, the kind of areas that an Ikea needs to be built for it to be profitable. All these things are endemic to most large cities, with most of them the outcomes of events situated at some point along the gentrification arc."

# Representations of place

What can human geographers learn from the different ways in which places are depicted?

GeographyReviewExtra
For a presentation on how to do local-scale fieldwork on place, go to www.hoddereducation.co.uk/geographyreviewextras

## What do we mean by representation?

Representation refers to the description or portrayal of someone or something in a particular way. As geographers we learn about places through different representations: through the images that we see, through reading both fiction and non-fiction, through maps, newspapers, media reports, television, films, paintings and so on.

Some representations of place are attempting to communicate something specific about a place or to challenge our view of a place. Examples of these would be an advert for a holiday destination or a place marketing campaign. Most of us, however, learn about places though a broader set of representations.

## Liverpool

Even if you have never been to Liverpool you will still 'know' about that city. Most people will be able to identify the city from its skyline or waterfront — the Liver Building and the other great buildings that make up what is now a UNESCO World Heritage site. This architecture represents Liverpool's affluent past — a time when the wealth of Liverpool exceeded that of London (in part due to its participation in the Atlantic slave trade).

## Musical associations

Photographs of the Liverpool skyline often include a ferry. This again represents Liverpool's past, particularly the role of musicians in creating a representation of the city in the 1960s. At that time, many people across the world felt that they knew the city, especially places like Penny Lane, a suburban street in Liverpool made famous by a Beatles song.

## Changing images

Inevitably, representations of places change over time. In July 1981, riots in Toxteth, an inner-city area of Liverpool, dominated the news. Liverpool was represented as a city that was dangerous and volatile. That summer, riots in other areas such as Brixton (London), Handsworth (Birmingham) and Chapeltown (Leeds) resulted in inner cities being represented as 'disordered landscapes' where young people were uncontrollable and living in 'concrete jungles'.

These representations suggested that the inner city was a 'no-go' area inhabited by an 'animalised' population who threatened the residents in the suburbs. They implied that it was the people who lived in the inner cities who were the 'problem' rather than focusing on the high levels of deprivation that triggered the riots in the first place.

## The full picture

We can see how song lyrics, media representations, television programmes and films create different representations of place. All of these contribute to our ways of knowing the city — even if they are not 'accurate' representations of the place.

As geographers, we try to make sense of this complex set of information. Of course, when we analyse representations, we need to look for what is absent as well as what is present. We also need to consider the implications of the way places and people are represented and the ways in which those representations have significance.

## Activity

Consider how your local region or city is represented. Think about what those representations might tell you about the place.

GeographyReviewExtra
You can download a pdf of this spread to print as a poster: www.hoddereducation.co.uk/geographyreviewextras

Fiona Smyth is associate dean for teaching, learning and students, Faculty of Humanities, The University of Manchester.

Centrepiece: Representations of place by Fiona Smyth - a printable pdf to use as a poster (Geography Review, Vol.29, No.4, April 2016)

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# Predicting gentrification through social networking data (Twitter & Foursquare)

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"The Cambridge researchers…used data from approximately 37,000 users and 42,000 venues in London to build a network of Foursquare places and the parallel Twitter social network of visitors, adding up to more than half a million check-ins over a ten-month period."

"We're looking at the social roles and properties of places," said Desislava Hristova from the University's Computer Laboratory, and the study's lead author. "We found that the most socially cohesive and homogenous areas tend to be either very wealthy or very poor, but neighbourhoods with both high social diversity and high deprivation are the ones which are currently undergoing processes of gentrification."

Source: http://www.cam.ac.uk/research/news/predicting-gentrification-through-social-networking-data

**The 5 most gentrifying boroughs in London in 2015**



Inner
Outer

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# Field techniques for use in 'Place'

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Adapted from ideas first seen in John Lyon's Place training 2015

Place profiling

My place- a different view

Observe... Participate

Photo capture

Shopping Challenge

Urban recall

Place check

Urban detective

Past and futures visioning

Sign language

Clone Towns

Missing links

Matching models

The world in one place

Sound-scapes

Drawing with words

Picture the quote

Green Mapping

8 way thinking

Source: Field Studies Council Staff Training 2016

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# What Makes a Great Place?

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number of women, children & elderly
social networks
volunteerism
evening use
street life

diverse
stewardship
cooperative
neighborly
pride
friendly
interactive
welcoming

**Sociability**

fun
active
vital
special
real
useful
indigenous
celebratory
sustainable

local business ownership
land-use patterns
property values
rent levels
retail sales

**Uses & Activities**

**Place**

continuity
proximity
connected
readable
walkable
convenient
accessible

**Access & Linkages**

traffic data
mode splits
transit usage
pedestrian activity
parking usage patterns

**Comfort & Image**

safe
clean
'green'
walkable
sittable
spiritual
charming
attractive
historic

crime statistics
sanitation rating
building conditions
environmental data

"Placemaking is an instrument to create successful public spaces by the community itself. When it's digital and combines the ideas of 'Design for all' it can be used on a wide scale in cities that deal with ageing to make their places senior-proof"

Source: Written by an adviser of JSO (Rotterdam) who specialises in public space, co-creation and dialogue. This is an extract from an idea submitted to http://ideas.chest-project.eu/

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# A Tale of Four Cities

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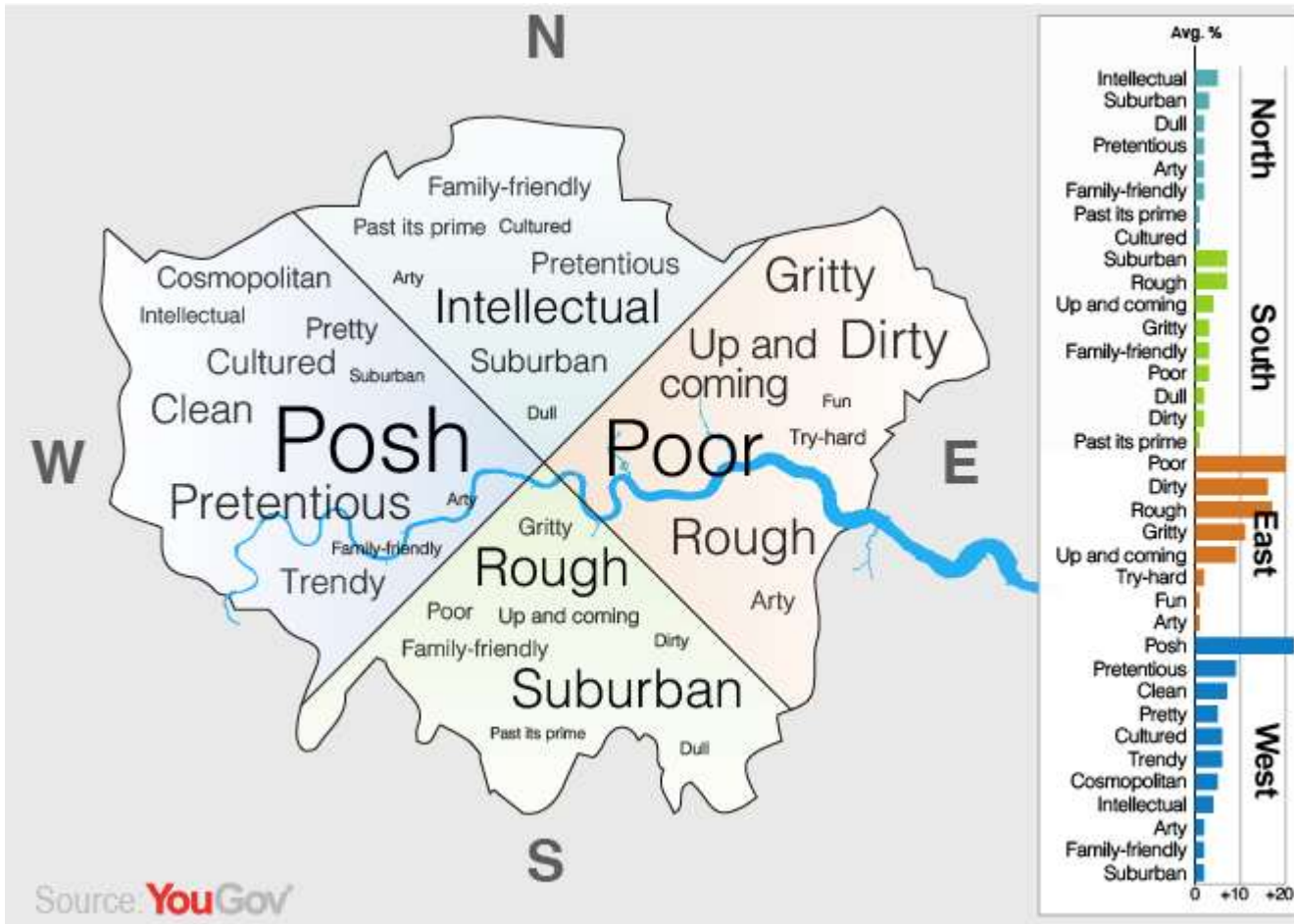


"A new survey of Londoners reveals the city's regional stereotypes: the West is 'posh', the East is 'poor', the South is 'rough' and the North is 'intellectual'"

by William Jordan - Elections editor @williamjordann (YouGov.co.uk, Jan 21st 2014)

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# Use of photographic evidence







by Dave Holmes - a huge number of his photos can be found at his flickr account, arranged into topic-specific albums

# Open Data

Source: Screen capture from Indices of Deprivation 2015 explorer - OpenDataCommunities.org
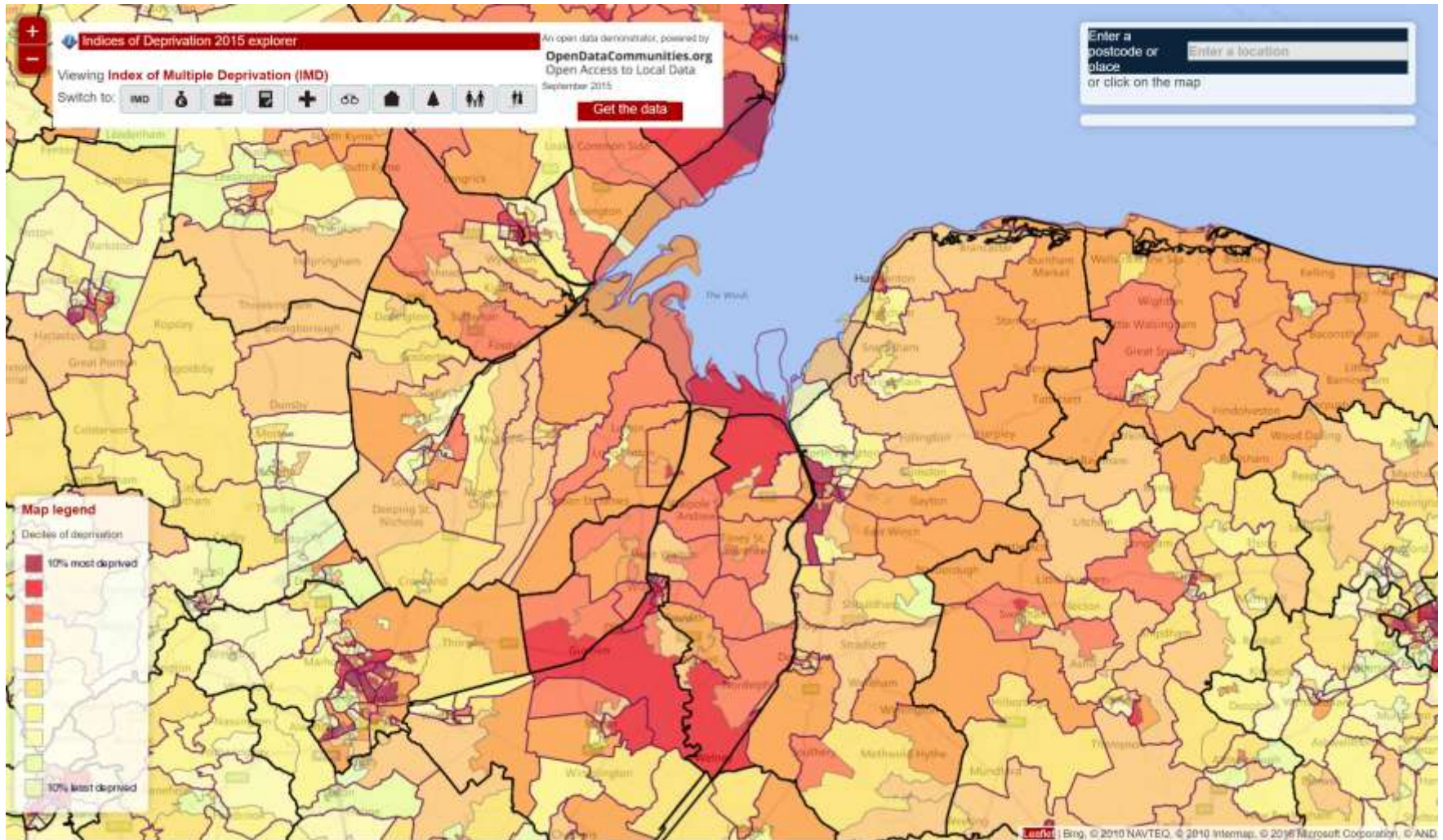
# Connecting Places



This map shows one of the reasons why movies are made in California. Every part of the state is labeled according to its similarity to some distant place. (Photo courtesy Paramount Pictures.)
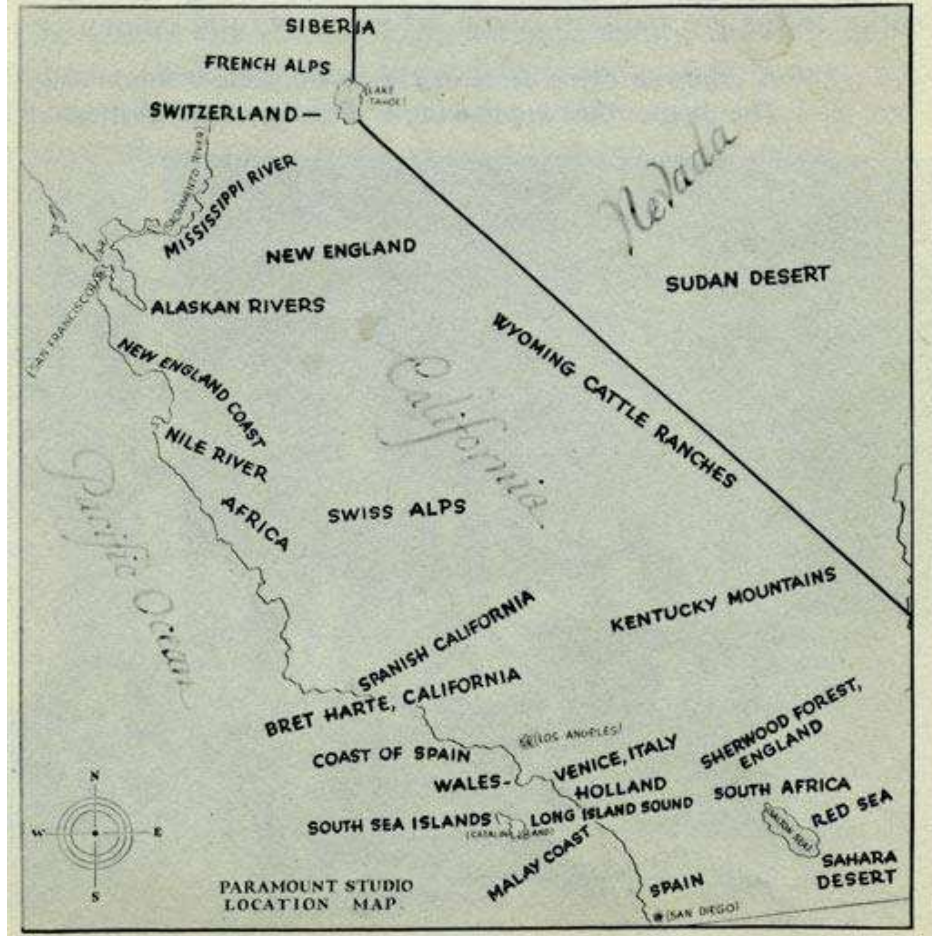
Source: Paramount Studio location map from 1927, showing potential shooting locations in Southern California.

Published in 'The American Film Industry' (1976) by Tino Balio

# Sense of Place

**A Global Sense of Place – by Doreen Massey**
From Space, Place and Gender. Minneapolis : University of Minnesota Press, 1994.

Take, for instance, a walk down Kilburn High Road, my local shopping centre. It is a pretty ordinary place, north-west of the centre of London. Under the railway bridge the newspaper stand sells papers from every county of what my neighbours, many of whom come from there, still often call the Irish Free State. The postboxes down the High Road, and many an empty space on a wall, are adorned with the letters IRA. Other available spaces are plastered this week with posters for a special meeting in remembrance: Ten Years after the Hunger Strike. At the local theatre Eamon Morrissey has a one-man show; the National Club has the Wolfe Tones on, and at the Black Lion there's Finnegan's Wake. In two shops I notice this week's lottery ticket winners: in one the name is Teresa Gleeson, in the other, Chouman Hassan.

A level Geography 2016

# Sense of Place

Research using social media or search engines like Google can provide an insight into how people represent or experience 'place'…

Source: twitter.com (search "London food")

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# Google Maps