

Guidance for the Geographical skills paper

Identify suitable geographical questions/hypothesis for investigation	
How did you choose a topic area?	Interested in it/are studying in class, area suitable for investigation. Start looking at geographical books/local newspapers/internet sites. Must have suitable time and resource element. <i>Rivers</i>
How do you turn your topic into a question or hypothesis?	Important to ensure that a thorough analysis can take place. A good question will have <ul style="list-style-type: none"> • Suitable scale - small scale study tends to be more accurate. Needs to be practical to do and will give a more detailed overview of a particular area • Readily researched - can't do something that needs a longitudinal study. It must be able to be done with small amount of A-level students who can measure consistently at each site. • Clear definition - do not need ambiguity, make it clear what you are researching. • A clear geographical nature - a focus on spatial pattern • Based on wider geographical theories - Bradshaw's Model • Clear aim - single purpose that lends itself to a clear outcome and conclusion <p style="text-align: center;">IS YOUR TARGET SMART (Simple/Measurable/Achievable/Realistic/Timed)</p> <p><i>Does the discharge of the River Kym increase downstream?</i></p>
Develop a plan and strategy for conducting the investigation	
What is the point of the planning stage?	It balances the needs for accuracy and reliability against limitations imposed by time, resources and the environment. It could make you rethink the question. This is about putting strategies in place for the investigation, but not being too rigid that you are unable to adapt. <i>Initially had the question 'Does the River Kym fit the Bradshaw model?' but through planning realised limited time and resources meant it was impossible to investigate all variables.</i>
What are subsidiary questions?	A small number of addition questions that you can ask within your title. These need to have a clear link to your question. <i>How and why does the velocity change downstream?</i> <i>How and why does the Cross Sectional Area (CSA) Change downstream?</i>
What type of data do I need?	Essential to decide what data need to collect and where this data is going to come from. You will need to have a combination of <ul style="list-style-type: none"> • Primary data - something you have collected in the field/ must think at this stage how reliable/should you go more than once/ is a pilot study a good idea? • Secondary data - information needed to complete your investigation from a source that has already been analysed. It is important to consider any bias of this data and when/why it may have been compiled. Ensure make note of any secondary data used and place in a bibliography. <p><i>Primary - Velocity and CSA data collection</i> <i>Secondary - OS Maps and previous studies</i></p>
How much should I measure?	Can't measure the whole investigation area so have to take a representative sample. The bigger the sample the better representation and accuracy of the study. It is usual do take at last 30 samples but this is not always possible. Is a formula to help work out the correct sample size. <i>A sample size of 10 sites along the River Kym.</i>

<p>What sampling unit should I use?</p>	<p>This is deciding on</p> <ul style="list-style-type: none"> • Point Sampling - such as names on a list/co-ordinates on a map • Linear Sampling - along a line, such as a transect along a road. • Areal Sampling - where an area is used, such as when a quadrat is used to measure vegetation cover. <p><i>Linear sampling along a river channel, but then initial point sampling of 10 equal distances along River Kym.</i></p>															
<p>What sample method should I use?</p>	<p>This is deciding on</p> <ul style="list-style-type: none"> • Random sampling - use random number tables to select sample point. Useful as statistically sound and therefore can be analysed further. However, same item could be picked more than once and it is easy to miss key points. • Stratified sampling - underlying patterns in data are looked at and sampling ensures this patterns are sampled proportionally. Useful as ensures nothing significant is missed. However, data collection can be viewed as bias and cannot make statistical inferences easily. • Systematic sampling - samples are taken at regular intervals. Useful as quick and easy to plan. However, may have problems with location access and cannot make statistical inferences easily. • Pragmatic sampling - you sample when you can get access, or when something visibly changes. Useful for safety reasons and realistic investigations. However, not a fair sample and cannot make statistical inferences easily. <p><i>Systematic sampling would be the preferred method, with the distance between site 1 and 10 being worked out and then splitting the other 8 sites equally between the two. However due to it being a river study and having looked at previous investigations / OS Maps new this was not realistic or safe. Therefore had to use pragmatic sampling so could get access to the river and not have issues with trespassing.</i></p>															
<p>What does it mean by planned location?</p>	<p>It is essential that the exact boundaries of the location are outlined for the reader. Not acceptable to just print off map from the internet. Use this to highlight sites by hand.</p> <p><i>Can print off the OS Map showing source of the River Kym 1.5km from Newton Bromswold to the confluence with the River Great Ouse 1.6km from St. Neots and note down on to it the 10 sites going to take readings at.</i></p>															
<p>How can we incorporate times into our planning?</p>	<p>Need to accurately estimate how long different stages of the process will take you. Good practice to draw up a time line.</p> <p><i>Select equipment - 5 mins etc.</i></p>															
<p>Risk Assessment</p>	<p>Need to have an appreciation of potential risks that may occur whilst undertaking the research and strategies that you could put in place to minimise these risks. Look at severity of the risk, as well as the likelihood of it happening.</p> <table border="1" data-bbox="571 1559 1442 1935"> <thead> <tr> <th><i>Hazard</i></th> <th><i>Likelihood</i></th> <th><i>Severity</i></th> <th><i>Total Risk</i></th> <th><i>Management</i></th> </tr> </thead> <tbody> <tr> <td><i>Drowning</i></td> <td><i>1</i></td> <td><i>5</i></td> <td><i>5</i></td> <td><i>1. Follow all instructions carefully 2. Wear suitable footwear to stop slipping 3. Keep close to fellow students</i></td> </tr> <tr> <td><i>Getting lost</i></td> <td><i>3</i></td> <td><i>2</i></td> <td><i>6</i></td> <td><i>1. Keep to area on the map 2. Have mobile phone with contacts</i></td> </tr> </tbody> </table>	<i>Hazard</i>	<i>Likelihood</i>	<i>Severity</i>	<i>Total Risk</i>	<i>Management</i>	<i>Drowning</i>	<i>1</i>	<i>5</i>	<i>5</i>	<i>1. Follow all instructions carefully 2. Wear suitable footwear to stop slipping 3. Keep close to fellow students</i>	<i>Getting lost</i>	<i>3</i>	<i>2</i>	<i>6</i>	<i>1. Keep to area on the map 2. Have mobile phone with contacts</i>
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Collect and record data appropriate to geographical question or hypothesis

How did I collect my data?

It is important in this section to explain why you chose the method of data collection that you did. You can think about

1. How does the equipment work?
2. Why does it measure the variable effectively?

You can then think about whether or not this worked as you had hoped. May investigations show this in a table or by an annotated photograph

<i>Data Needed</i>	<i>Equipment Used</i>	<i>Method</i>	<i>Limitations</i>
<i>Width of river channel</i>	<i>Tape measure</i>	<i>At each site use the tape measure to measure from one side of the bank to the other.</i>	<i>Who is measuring? Are they being accurate? Etc.</i>
<i>Height of river channel</i>	<i>Tape measure, metre stick</i>	<i>Having measured the width of the river, take 5 (linear/systematic) samples along the width of the river using the metre stick to measure how deep the channel is. Work out the average height of the river channel at each point</i>	
<i>Velocity of river</i>	<i>Dog biscuits, tape measure, stop watch</i>	<i>Measure 5 metres back from sample line and drop the dog biscuit into the water. At the same time, click the stop watch. Stop the watch when the dog biscuit passes the line.</i>	

How did I record my data?

This is how you put down the information so that it can be processed in some way. It is useful to have recording frames/tally charts prepared before go out in the field.

<i>Site</i>	<i>Height (m)</i>	<i>Width (m)</i>	<i>Velocity (m/s)</i>
<i>1</i>			
<i>2</i>			
<i>3</i>			
<i>4</i>			
<i>5</i>			
<i>6</i>			
<i>7</i>			
<i>8</i>			
<i>9</i>			
<i>10</i>			

What is the point of field sketches and/or photographs?

A field sketch at each point can help to remind you of the conditions and the context of the measurements. They should be carefully annotated with conditions and title any you chose to use.

Present data collected in appropriate forms

<p>What makes successful data presentation?</p>	<p>The selection of what data presentation methods to use is essential as they must be appropriate to data that you have. Once they have been chosen it must be presented to a high standard. It must be shown in a visual form that shows patterns and/or trends in the data. It is also important to show spatial patterns where there is a spatial element to the study.</p>
<p>What forms of data might geographers use?</p>	<p>This is controlled by the nature of the data. The data you are using may be qualitative (a subjective description) or quantitative (statistical and therefore value free) <i>We had both</i> It could be</p> <ul style="list-style-type: none"> • Discrete - distinct separate parts • Ordinal - that has an order • Continuous - Where there are no breaks in the data • Areal - applies to an area rather than a point • Time - series - when something occurs at intervals • Period - repeats itself at intervals.
<p>What factors should I consider when selecting a technique to present my data?</p>	<p>The following factors can be taken into account when considering a data technique</p> <ul style="list-style-type: none"> • Scale: is it too big/small? Is it arithmetic/geometric? • Location: Where should you place the figure you are presenting? Are all the scales and sizes the same if comparing data • Size of symbol: too big/small? • Shading: should get darker as values increase, white implies no data held, avoid mixing dots and lines. • Colour: best to avoid colour as it difficult to compare colours, blue implies water etc. • Lettering: use the same size and do not let it obscure any other data. • Dimension: Be careful with 3D as it can lead to misrepresentation if not calculated effectively. • Key: All maps/diagrams should have a key. Usually located at the bottom right. • Legend/Caption: Title and figure number where necessary, should also have a scale.
<p>What non - spatial displays of data are there?</p> <p><i>IT IS ESSENTIAL TO LEARN ABOUT THERE USE AND LIMITATIONS PG 267/269.</i></p>	<ul style="list-style-type: none"> • Tables: good to show raw data and a large amount but no real visual value. • Diagrams: can range but can draw pictures or symbols to represent the data • Charts: more precise than above, although a form of proportional symbols - can usually produce on the computer. <p>Examples include</p> <ul style="list-style-type: none"> - Bar chart - Pie Chart - Divided Bar graph - Rose or star - Proportional circle/square or triangle - Proportional cube, sphere or pyramids <p><i>A proportional symbol is what we used to draw the CSA river cross section to show how it had changed downstream.</i></p> <ul style="list-style-type: none"> • Graphs: <ul style="list-style-type: none"> - Line Graph - Scatter Graph - Multiple Line Graph - Triangular Graph - Compound Line Graph - Positive and negative graph

<p>What spatial displays of data are there?</p>	<p>It is important to show data in a way that shows spatial patterns</p> <ul style="list-style-type: none"> • Maps: easiest form is of a map and data marked on to it. <i>We could have included section of OS map and then drawn data coming off points.</i> • Isopleths or isolines: These can be used to join up equal lines of point form data e.g. contour lines. There are issues surrounding the use including <ul style="list-style-type: none"> - selection of interval values - shape and size of units - locations of plotting points - what is the method of interpolation (where no value is given, how we draw the line?) - can we have a smooth transition • Choropleths Density maps where areas are shaded to represent the average number of per unit area. There are issues surrounding the use including <ul style="list-style-type: none"> - hidden variations due to the average - scale of areal division - the smaller the map the more accurate it is - the value interval of the shading - colour - one colour if necessary at all - shading range to show true representation <i>In the River Kym you did a ranked choropleth onto your proportionally drawn cross sections to represent the changes in discharge as they went down stream. The darker the blue shading the higher the discharge. Choose to do it ranked to avoid interval problems and areal data issue.</i> • Located symbols Many proportional symbols can be placed on a base map to show patterns. Can also use overlays to compare data. Important to consider the symbol you are going to use. SEE PAGE 272 • Trip lines A type of flow line that show direction and volume in a straight line from origin to destination. • Flow lines Sometimes used to show movements and volume and frequency. Follows the route of line - can vary width. Can be topological e.g. The London Underground <i>Could have drawn a flow line to represent the change in discharge along the River Kym.</i>
<p>How can I use pictures to show my data?</p>	<p>Can be used to show locations on a base map - but it is essential to remember they must have a purpose and therefore should be annotated. Field sketches can give an impression of an area</p>
<p>Analyse and interpret the data</p>	
<p>What is the point of an analysis?</p>	<p>To identify and investigate the patterns shown by the data that you have collected. Can be done in a quantitative and qualitative method.</p>
<p>What qualitative data can be used?</p>	<p>This is a description of the findings drawn in the data presentation stage. Could be analysis or comparison graphs. It is quick, visual and shows obvious anomalies. <i>After a very brief description of what the data showed then move onto a graph that plotted sites along the bottom and discharge up the side. It showed clear pattern and anomalies, and could plot Bradshaw model on to illustrate theory. Recognised could not be used alone as needed to prove the reliability of the data.</i></p>
<p>What qualitative data can be used?</p>	<p>The use of statistical techniques can be used to analyse even further. It usually indicates a relationship or a difference and whether it is a chance coincidence. When choosing methods keep with the idea of KIS (Keep it simple)</p>

- use a null hypothesis
- work to the 95% significance level convention
- check you have your formulae correct and that you show your workings
- If you don't understand a technique, then don't use it.

Measure of Central Tendency

This is used to calculate the average in one form another. Useful when identifying simple differences between different sets of data.

Mode/Median/Mean.

Measures of Dispersion

As data sets vary around the average, this method considers the extent to which the data is grouped around the mean. Can look at the range, but this can be misleading so an improvement is the interquartile range. A more robust method is the standard deviation, involves a calculation and the larger the standard deviation the larger variation around the mean.

Testing for differences

There are a range of statistical techniques that not only tell you if sets of data are different but also give you a statistical measure of how far they are different.

When using a statistical technique take the following things into account

1. state a null hypothesis
2. state an alternative hypothesis
3. select a statistical technique
4. decide on a significance level
5. work out the critical value for the test result
6. carry out the test
7. make a decision on its significance on the basis of the result

The Mann Whitney U Test is a test of difference between the medians of two sets of data. It assumes that the different sets are similar and then ranks them and puts the results into the formulae to assume or reject the assumption.

Measurement of Patterns

A number of techniques have been devised to measure whether a pattern exists and what type it may be.

Nearest Neighbour

Involves a comparison between the observed spacing and set of points and the spacing that would be expected if the pattern had been random. You have to measure the difference between the neighbouring points. This is then put into a formulae and the result will prove randomness or clustering.

Testing for association/relationships and correlations

There are basically 3 types of relationships possible between 2 variables

1. positive or direct
2. negative or inverse
3. no relationship

An example of this test is Spearman rank.

In the River Kym studies the discharge and distance from the source is ranked from one to ten. Making sure that the largest to smallest is used in the same ranking order for both sets. The difference between these two ranks is then calculated and then each difference is squared. The total of the squared differences is put into to a formula to give a number between +1 and -1. It came out as 0.83 and therefore showed a strong positive correlation between the distance downstream and an increase of discharge. This figure was then used to test how significant the test could be using a significance graph. It worked out to be 99% significant and therefore the analysis could continue in depth about why you got the results you did. With reference to Bradshaw Model and anomalies specific to River Kym (see your notes)

What does interpretation refer to?	This includes the interpretation of results in relation to the original question. What did they say about the hypothesis? It must also discuss any patterns/trends found and anomalies. Important to refer to theories and models that might help explain results.
Present a summary of findings and an evaluation of the investigation	
What is the point of an evaluation?	To give a clear summary of the findings and an evaluation of the success of the investigation in relation to wider geographical ideas and the methods employed and data collected.
What must an evaluation include?	Evidence from previous sections to provide a clear summary, which answers your original question. Does the theory fit a model or theory? Why your findings do or do not fit them.
What limitations is it useful to consider?	It should all be recognised that conclusions are often partial, tentative and incomplete. Limitations and possible solutions must be considered. <ol style="list-style-type: none"> 1. Time: There can be insufficient time allocated to complete the tasks or they could be carried out at the wrong time of the year. <i>Could repeat the investigation at different times of the day, week or year to see if varied.</i> 2. Place: The location of the investigation may have been deemed unsuitable due to access issues, size or scale, risk to health. <i>Could repeat the investigation in different locations, thereby comparing your results with a similar or different area.</i> 3. Physical: This could include poor weather, difficult slope angles, soft or muddy grounds. 4. Human error: There may have been a lack of teamwork, misunderstanding of the task, careless measuring. 5. Equipment: This could be faulty, unreliable or inaccurate. <i>Could get better equipment that could improve its effectiveness.</i> 6. Methodology: This could be due to superficial planning, incorrect sample size or type of sampling. <i>Could repeat with a larger sample of data, chose different primary or secondary data.</i>

General Points

How can we distinguish between accuracy and reliability?	<p><u>Reliability</u> is essential for the investigation at all stages. It must always be at the forefront of the mind, how can I make sure my investigation is reliable as well as practical? It is about how dependable the data is. <i>Does it reflect the whole river?</i> Would you get the same results if you did the same sampling again? Can increase reliability by doing a pilot study, repeating samples taken, comparing with other studies. It all links to the size (<i>10 sites</i>), type (<i>linear/point</i>) and method (<i>pragmatic</i>) of sampling.</p> <p><u>Accuracy</u> is slightly different. Methods can be reliable, but results can still be inaccurate. This inaccuracy could be due to a number of reasons. For example</p> <ul style="list-style-type: none"> • The equipment is not good enough (<i>dog biscuits</i>) • Inconsistency of those taking the measurements (<i>Someone being more accurate than other, getting bored by the end of the day</i>) • Unexpected weather conditions (<i>it snowed and was freezing cold - led to some issues with access at particular sites</i>) • Raw data is inaccurate, we get anomalies - is it from poor data collection or real phenomena (<i>is it someone not doing their job properly, or is it the road/bridge that has been built, or the local farmer draining their fields.</i>)
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<p>What role can GIS have in geographical investigations?</p>	<p>GIS is useful as it links a variety of data to a specific point on the Earth's surface. You can also lay one data set over another to integrate a wealth of data and make it easier to consider the links that may exist. GIS can use the computer to store, organise, display, combine and analyse multiple sets of geographic class.</p> <p>It is good because</p> <ul style="list-style-type: none"> • Copes with a large amounts of data • Copes with a variety of data • Can cover a large study area • Can easily change the scale of the area or subdivisions • Dynamic so can keep up with changes • Easy to keep up to date • Faster and more efficient • Can avoid political boundaries <p>It can be used in different sections of the investigation</p> <p><u>Collecting and recording data</u></p> <p>Use it in the field to measure and record information to a specific location. If this is done on a palmtop this data can be transferred to GIS program.</p> <p>Can use it to measure distances in straight line or along a feature (river) - more accurate than in the field or an OS map.</p> <p>Secondary data (census data) can be used from a number of sites and put onto the program - ground level digital photographs, satellite images can be linked to one place.</p> <p><u>Presenting the data</u></p> <p>Areal/line/point data can be displayed on the computer screen and then manipulated by the researcher.</p> <p>Can use colours to create an output map, with title, scale bar, north arrow etc.</p> <p>In GIS editor you can draw and edit maps, with different styles, colours and dimensions.</p> <p>Can use dimensions to make patterns and trends.</p>
<p>What other modern technology can be used throughout a geographical investigation?</p>	<p>Anything on a computer</p> <p>Telephones</p> <p>Palm held information systems etc.</p> <p><i>Stream flow meters</i></p>
<p>How should my geographical investigation be organised?</p>	<p>Organise data presentation in accordance with the analysis. Always refer back to the original aims. Integrate diagrams into the main body of the text. Make sure you label the presentations e.g. Figure 1 etc.</p>