



LEAVING CERTIFICATE
AGRICULTURAL SCIENCE



National Seminar Day 3
Workbook



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Key Messages

1. Using Strand 1, to develop students' abilities to understand how the principles of scientific practice permeate all strands within the agricultural science specification
2. To appreciate the need to use numeracy, literacy, digital technologies and other key skills to complete the IIS
3. Working collaboratively with professional colleagues, engaging with the documentation to help plan and support the design and completion of the IIS

The New Specification Aims

Leaving Certificate Agricultural Science aims to enable students to:

- Appreciate the natural environment and human interactions with it and the sustainable use of its resources, recognising the need for a rationale and balanced approach to the exploitation of these resources in a local and global context
- Recognise the need for, and global importance of, relevant strategies and policies to promote the agri-food industry while insulating it from future challenges (e.g. climate change, novel crop and animal diseases) and identify opportunities for innovation and entrepreneurship in the context of local, regional and world markets
- Develop their scientific knowledge and skills, in the context of agricultural practices, and increase their awareness of health and safety issues associated with these practices.

(Aims, Agricultural Science Specification 2018, Page 7)

Objectives

Students should:

- Develop an ecological awareness in the context of the provision of food and non-food materials
- Recognise the impact of various agricultural practices on the environment and appreciate how the application of science and technology affects the individual, the community and the environment
- Become aware of the contribution of agriculture to the economy of the locality and the nation and its importance in EU and world contexts
- Make informed evaluations of contemporary agricultural science issues locally and globally
- Understand that the study and practice of science are primarily co-operative activities which are subject to social, economic, technological, ethical and cultural influences, and legislative and economic considerations
- Develop independent thinking, problem-solving and self-directed learning skills through active engagement in their own learning and through project work
- Understand the need for safety in conducting laboratory and field investigations.

(Objectives, Agricultural Science Specification 2018, Page 8)

Overview of the specification

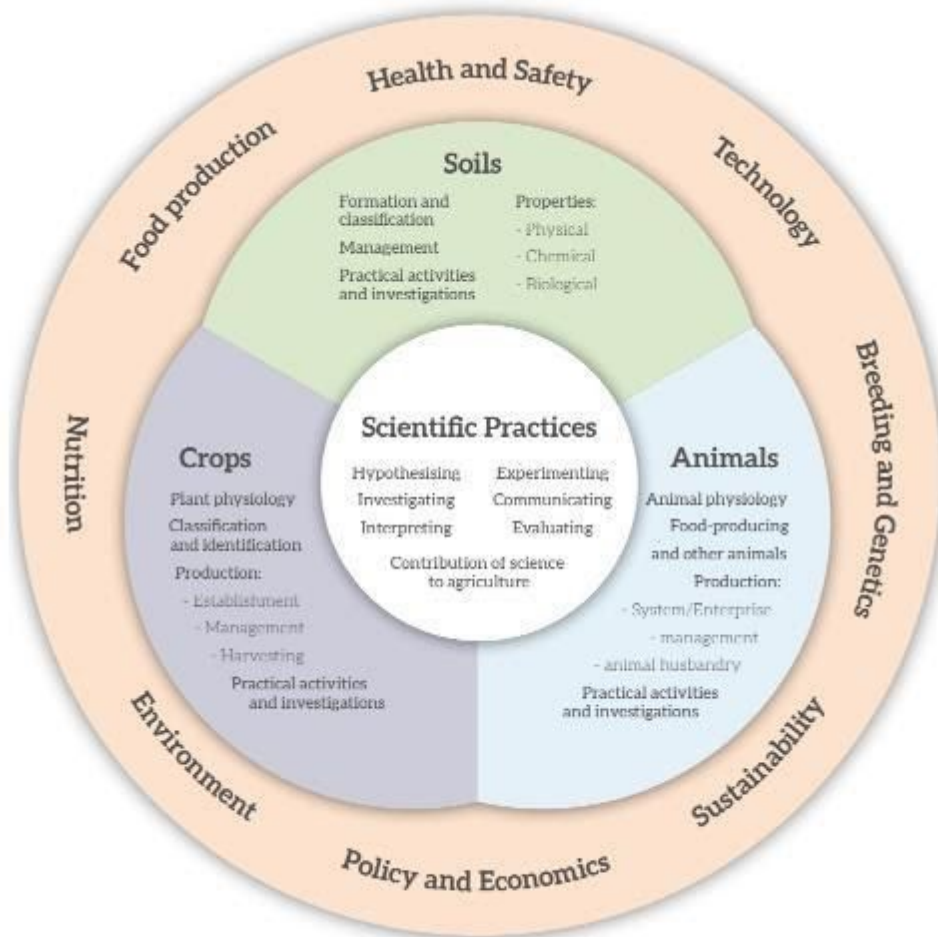





Figure 4: Structure of the specification

(Overview of the specification, Agricultural Science Specification 2018, Page 11)

3 Documents supporting the IIS



Specification 2018	IIS Guidelines December 2019	SEC IIS Brief December 2019
https://www.curriculumonline.ie/getmedia/9ad3071d-b58d-4988-9afc-f4e229ceb864/NCCA-Specification-for-Leaving-Cert-Agricultural-Science.pdf	https://www.curriculumonline.ie/getmedia/c509fc4d-848e-49b8-8c35-d7fc47683c85/AgScience-GL-Final-Dec-19.pdf	https://www.examinations.ie/misc-doc/EN-EX-25906961.pdf
		

PADLET QR CODE
National Seminar 3 Spring
2020



How to use Adobe Spark:



<https://youtu.be/GTFSVA3LVak>



Session 1 - Activity 1

“Introduction to Sustainability”

3-2-1

Three things that you learned:

1.

2.

3.

Two things that interest you that you'd like to learn more about:

1.

2.

One question you still have:

Activity 2

Learning Outcome 3.3.2(h)

Hypothesis:

Proposed method:

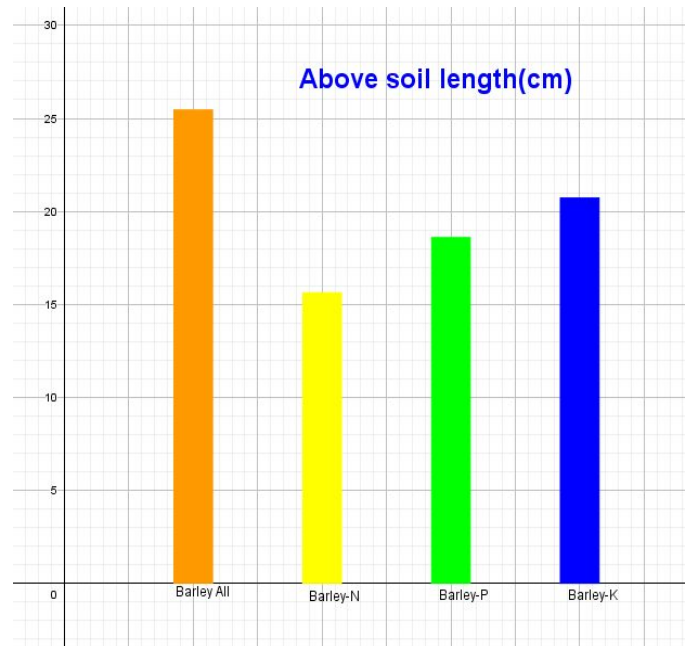
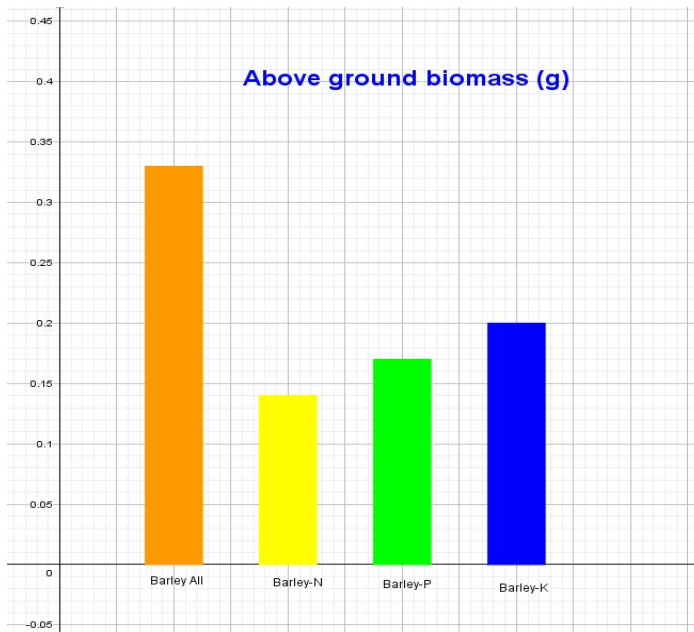
Variables/Controls:

Activity 3

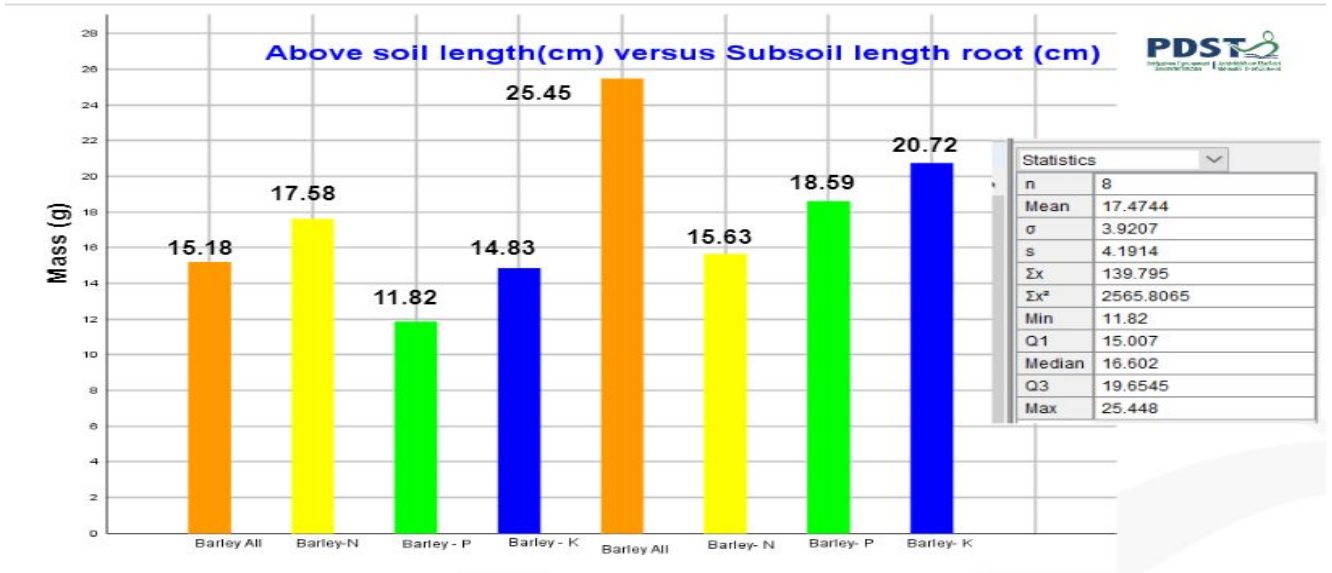
LO 3.3.2 (h):Results - Average Data

	Above ground biomass (g)	Sub soil biomass root(g)	Above soil length(cm)	subsoil length root (cm)
Barley All	0.334	0.174	25.448	15.183
Barley-N	0.144	0.159	15.629	17.575
barley-P	0.17	0.1	18.59	11.82
Barley-K	0.196	0.141	20.719	14.831

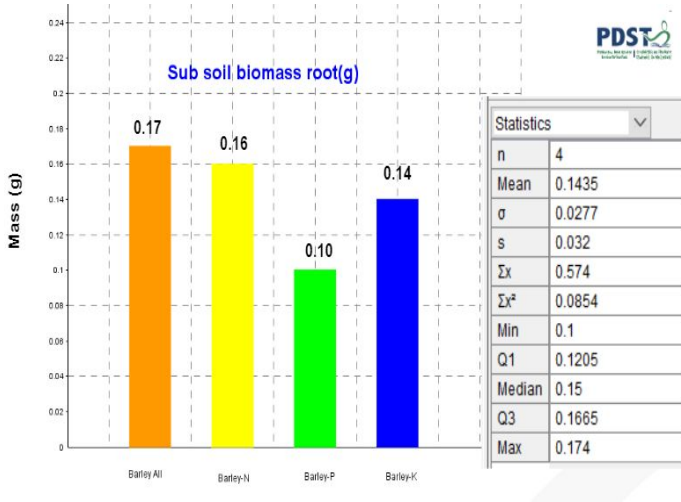
	Above ground biomass (g)	Sub soil biomass root(g)	Above soil length(cm)	subsoil length root (cm)
Grass All	0.025		14.71	2.96
Grass -N	0.031		9.024	2.229
Grass -P	0.0339		11.638	4.766
Grass -K	0.0149		12.316	4.854



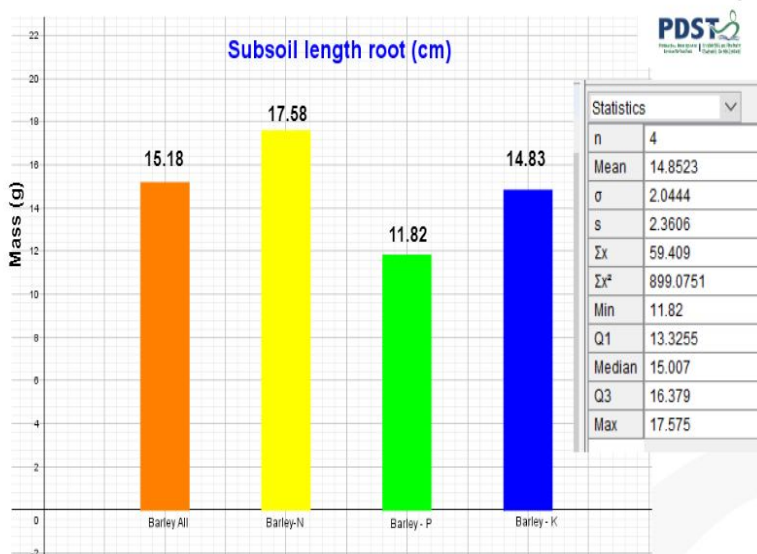
Graph Analysis:



Graph Analysis:



Graph Analysis:



Graph Analysis:

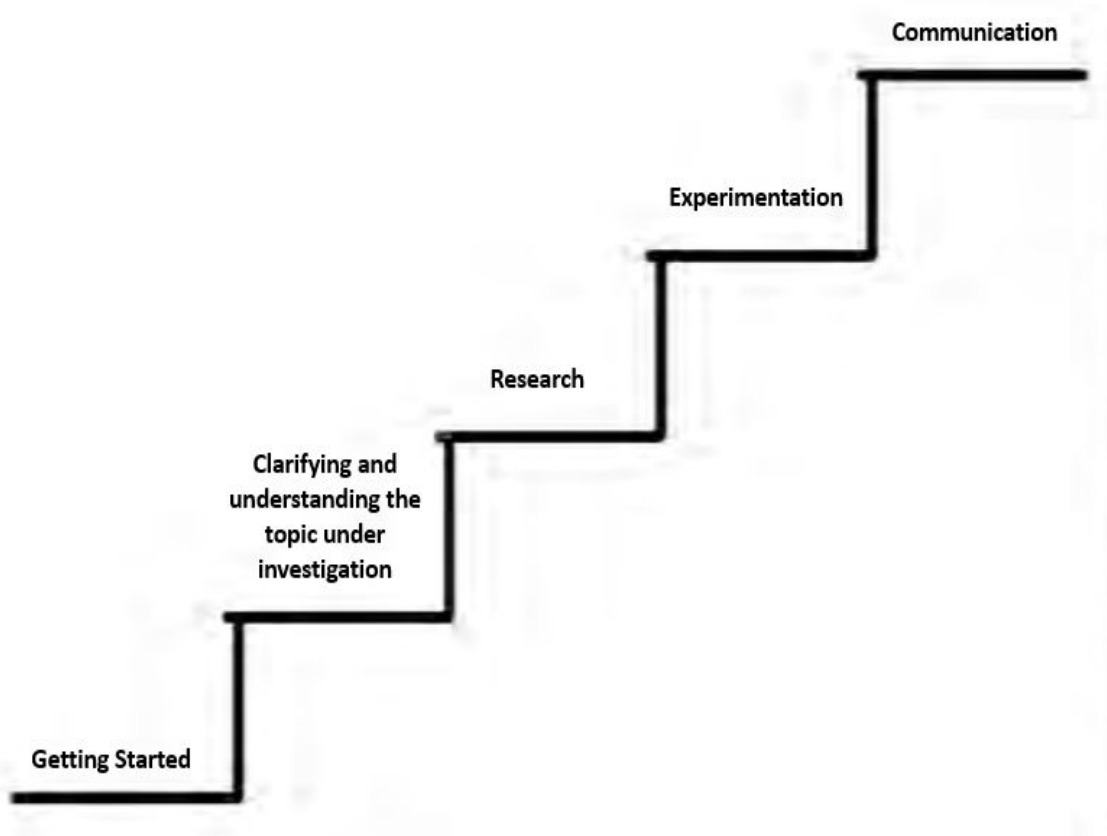
Research Grid

Notes	Notes	Notes	Notes	Notes	Notes
Notes	Notes	Notes	Notes	Notes	Notes
Notes	Notes	Notes	Notes	Notes	Notes
Notes	Notes	Notes	Notes	Notes	Notes

Level of Achievement Grid

	High level of Achievement	Moderate level of Achievement	Low level of Achievement
Level of substantive and procedural understanding			
Generate a valid, testable hypothesis			
Make predictions and generalisations that are supported by the available evidence			
Use of arguments to put theory into practice			
Apply knowledge and understanding of science to develop arguments and draw conclusions based on collected evidence			

What is Good Research? - Five Phases



Think Pair Share Activity

Question	My thoughts / ideas	My partners thoughts / ideas	Combined ideas

SEC Coursework Brief

Thematic brief 2021

The theme for the 2021 brief is **“Improving Sustainability in Irish Agriculture”**.

Use the theme, **“Improving Sustainability in Irish Agriculture”**, as a “lens” to look through while undertaking the learning contained in the specification’s strands and crosscutting themes.

In your Individual Investigative Study, you should do the following;

- Choose a specific agricultural enterprise¹ and a topic relevant to that enterprise and to the theme.
- Develop a research question that is related to the theme and which you would like to investigate in the context of the chosen enterprise.
- Carry out initial research on the topic as it relates to the theme.
- In the context of your chosen enterprise, investigate the topic by carrying out one or more experiments, supplemented, if appropriate, by other investigative activities. Carry out specific scientific investigation(s) of the topic. This will involve developing and testing specific hypothesis and drawing conclusions based on evidence gathered.
- At least one of the experiments you carry out must involve gathering and processing data.
- Document and present your work in the digital coursework booklet provided by the State Examinations Commission for marking.

Submit the final report to your teacher on or before **16 April 2021**. You are not allowed to make any changes to it after that date.

Some references to get you started in your research – this list is not exhaustive.

- Improving Farm Sustainability (2019), published by Teagasc.
<https://www.teagasc.ie/publications/2019/improving-farm-sustainability.php>
- Farm Sustainability Report (2016), published by Teagasc.
<https://www.teagasc.ie/media/website/publications/2017/2015-sustainability-report.pdf>
- Measuring sustainability of agricultural emissions (2019), published by Teagasc.
https://www.teagasc.ie/media/website/publications/2019/p34_AgriEmissions_Web.pdf
- Environment and Agriculture, chapter 12, published by the Environmental Protection Agency.
<http://www.epa.ie/irelandsenvironment/stateoftheenvironmentreport/graphsanddata/chapter12-agriculture/>
- Ireland’s Environment 2016 - An Assessment 191 / 234 191 / 234 187 Chapter 12: Environment and Agriculture, published by the Environmental Protection Agency.
<http://www.epa.ie/ebooks/soe2016/files/assets/basic-html/page-191.html>
- Our Sustainable Future progress reports (2014 and 2015), published by the Irish Department of Communications, Climate Action and Environment.
<https://www.dccae.gov.ie/en-ie/environment/topics/sustainable-development/our-sustainable-future/>

Report structure and mark allocations

Section	Indicative content to be included	Marks
<p>Introduction and background research</p> <p>Suggested range between 300 and 500 words</p>	<ul style="list-style-type: none"> ▪ Give a title to your Individual Investigative Study. ▪ Identify the agricultural enterprise chosen as the context for the study and state the topic selected for investigation. ▪ State the research question, and make clear how it relates to the theme of the brief and the chosen enterprise. ▪ Outline what the initial research you carried out tells you about the topic and the research question. Include references. (Use short in-line citations here, with full references at the end of the report.) 	20
<p>The investigative process</p> <p>Suggested range between 500 and 800 words</p>	<ul style="list-style-type: none"> ▪ Describe the specific experiments and other relevant investigative activities undertaken, stating clearly the purpose of each and describing how it was carried out. ▪ Make clear what specific hypotheses were developed and tested. ▪ Describe in detail how you gathered the data. 	25
<p>Results, analysis, and conclusions</p> <p>Suggested range between 600 and 1000 words</p>	<ul style="list-style-type: none"> ▪ Present the data and results from your investigation. Use tables, graphs, and photographs as appropriate. ▪ Analyse and interpret the data, results, and other information. ▪ Make judgements and draw conclusions from your analysis. ▪ Take due account of any relevant limitations of your study. ▪ Link the conclusions clearly to the research question. 	35
<p>Reflection on the study</p> <p>Suggested range between 150 and 200 words</p>	<ul style="list-style-type: none"> ▪ Reflect on the insights gained from engagement with the study and comment on: <ul style="list-style-type: none"> ○ The degree to which the research question was answered ○ Possible changes or alternative approaches that might have made the investigation better ○ Future directions and possible areas of further investigation ○ Significance of the outcomes of the study for the agri-food sector and/or the study of agricultural science. 	10
<p>References</p>	<ul style="list-style-type: none"> ▪ Full references for all sources used during the study and/or referred to in the report. <p>This section will not attract a separate mark. Any deficiencies in referencing will be taken account of when marking the relevant section of the report.</p>	-

Appendix 1: Suggested student plan for the study

Student name:		Date:
		Class:
The topic I wish to investigate:		
How it connects to the brief:		
My plan for conducting the study		
Areas of the study		Timeline
Research		
Experimentation		
Communication		
Approved by:		Date:
Feedback:		

Appendix 3: Suggested experimental plan

Student name:	Date:
	Class:
Experiment:	
How it connects to the brief:	
Equipment and materials request:	
Safety:	
Proposed method:	
Approved by:	Date:
Feedback:	

Maths Cross Curricular links

Strand 1: Statistics and Probability – Ordinary level

The aim of the probability unit is two-fold: it provides certain understandings intrinsic to problem solving and it underpins the statistics unit. It is expected that the conduct of experiments (including simulations), both individually and in groups, will form the primary vehicle through which the knowledge, understanding and skills in probability are developed. References should be made to appropriate contexts and applications of probability. It is envisaged that throughout the statistics course learners will be involved in identifying problems that can be explored by the use of appropriate data, designing investigations, collecting data, exploring and using patterns and relationships in data, solving problems, and communicating findings. This strand also involves interpreting statistical information, evaluating data-based arguments, and dealing with uncertainty and variation. As they engage with this strand and make connections across other strands, learners develop and reinforce their synthesis and problem-solving skills.

At each syllabus level students should be able to

- explore patterns and formulate conjectures
- explain findings
- justify conclusions
- communicate mathematics verbally and in written form
- apply their knowledge and skills to solve problems in familiar and unfamiliar contexts
- analyse information presented verbally and translate it into mathematical form
- devise, select and use appropriate mathematical models, formulae or techniques to process information and to draw relevant conclusions.

Strand 1: Statistics and Probability – Ordinary level and Higher level

Students learn about	Students working at OL should be able to	In addition, students working at HL should be able to
1.5 Finding, collecting and organising data	<ul style="list-style-type: none"> – select a sample (Simple Random Sample) – recognise the importance of representativeness so as to avoid biased samples – discuss different types of studies: sample surveys, observational studies and designed experiments – design a plan and collect data on the basis of above knowledge 	<ul style="list-style-type: none"> – recognise the importance of randomisation and the role of the control group in studies – recognise biases, limitations and ethical issues of each type of study – select a sample (stratified, cluster, quota – no formulae required, just definitions of these) – design a plan and collect data on the basis of above knowledge

1.6 Representing data graphically and numerically	<p>Graphical</p> <ul style="list-style-type: none"> – describe the sample (both univariate and bivariate data) by selecting appropriate graphical or numerical methods – explore the distribution of data, including concepts of symmetry and skewness – compare data sets using appropriate displays including back-to-back stem and leaf plots – determine the relationship between variables using scatterplots – recognise that correlation is a value from -1 to +1 and that it measures the extent of the linear relationship between two variables – match correlation coefficient values to appropriate scatterplots – understand that correlation does not imply causality <p>Numerical</p> <ul style="list-style-type: none"> – recognise standard deviation and interquartile range as measures of variability – use a calculator to calculate standard deviation – find quartiles and the interquartile range 	<p>Graphical</p> <ul style="list-style-type: none"> – analyse plots of the data to explain differences in measures of centre and spread – draw the line of best fit by eye – make predictions based on the line of best fit – calculate the correlation coefficient by calculator <p>Numerical</p> <ul style="list-style-type: none"> – recognise the effect of outliers – use percentiles to assign relative standing
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Students learn about	Students working at OL should be able to	In addition, students working at HL should be able to
1.7 Analysing, interpreting and drawing inferences from data	<ul style="list-style-type: none"> - recognise how sampling variability influences the use of sample information to make statements about the population - use appropriate tools to describe variability drawing inferences about the population from the sample - interpret the analysis and relate the interpretation to the original question - interpret a histogram in terms of distribution of data - make decisions based on the empirical rule - recognise the concept of a hypothesis test - calculate the margin of error ($\frac{1}{\sqrt{n}}$) for a population proportion* - conduct a hypothesis test on a population proportion using the margin of error 	<ul style="list-style-type: none"> - build on the concept of margin of error and understand that increased confidence level implies wider intervals - construct 95% confidence intervals for the population mean from a large sample and for the population proportion, in both cases using z tables - use sampling distributions as the basis for informal inference - perform univariate large sample tests of the population mean (two-tailed z-test only) - use and interpret p-values

Economics Cross Curricular links

Strand1 What is economics about?

1.3	Economic, social and environmental sustainability	<ul style="list-style-type: none"> ▪ outline the concepts of economic, social and environmental sustainability and explain their interconnections ▪ explain the concept of non-governmental organisation (NGO); provide specific examples outlining their function ▪ explore how aspects of sustainability relates to their own individual lives, habits and values, and their interactions with others' habits and values ▪ identify indicators of economic growth, social cohesion, inequality, and environmental sustainability; examine relationships between the indicators ▪ consider potential implications of sustainable development for: <ul style="list-style-type: none"> ○ individual behaviour ○ business decisions ○ government policy
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Cross Curricular links with Geography

Stage	Activities
Introduction: Posing the problems and devising a strategy	<ul style="list-style-type: none"> the selection of a topic for investigation a clear statement of hypothesis or aim an outline of the objectives identification of the types of information required
Planning: Preparation of the work to be carried out	<ul style="list-style-type: none"> the selection of methods for the collection and gathering of information the design of a questionnaire or recording sheets decisions on locations for the investigation
Collection of data	<ul style="list-style-type: none"> the use of instruments to make measurements records of observations made in the field the use of questionnaires and surveys as appropriate the use of a variety of secondary sources, e.g. documentary sources a discussion of the problems encountered
Preparation of the report	<ul style="list-style-type: none"> the organisation of data the use of illustrations, graphs, maps, and tables the use of ICT, where appropriate, to prepare and present results and conclusions
Conclusion and evaluation	<ul style="list-style-type: none"> analysis and interpretation of results the drawing of valid conclusions the comparison of findings with established theory the evaluation of hypotheses the examination of the validity of the investigation and suggestions for improvements

4.5 Environmental impact

Statement: Economic activities have an environmental impact.

Students should study

- the use of renewable and non-renewable resources in the economy
- the impact of the burning of fossil fuels and the use of alternative energy sources
- environmental pollution at a local/national and global scale
- sustainable economic development so as to control its environmental impact. Students should examine past experiences, future prospects and the necessity for environmental impact studies
- conflicts that may develop between local and global economic interests and environmental interests. Students should be familiar with the issues relating to at least two examples.

National energy resources.

Smoke free zones.
Patterns of production and consumption.

National issues, the role of the EPA.
Depletion of fish stocks, mining sites.

Appropriate national examples e.g. Irish fish stocks, tourism, and heritage.

Production and consumption of energy - appropriate European examples.
Acid rain - a European issue.

Relevant global issues, e.g. global warming.

Appropriate global examples.

Politics and Society Cross Curricular Links

TOPIC 8: SUSTAINABLE DEVELOPMENT	
STUDENTS LEARN ABOUT	STUDENTS SHOULD BE ABLE TO
8.1 actions that address sustainable development	<p>describe voluntary work in their local community which aims to address environmental justice, global poverty or underdevelopment</p> <p>describe how their own purchases contribute to or address environmental justice, global poverty or underdevelopment through ethically traded goods or through terms of trade dominated by western companies</p> <p>describe how their own energy use contributes to climate change, and the impact of climate change on people in less-developed countries</p>
8.2 arguments concerning sustainable development	<p>apply in their own words the following arguments about sustainable development:</p> <ul style="list-style-type: none"> ▶ underdevelopment is caused by people in less developed countries not having the knowledge, technology and industry of people in developed countries ▶ underdevelopment is caused by unfair terms of trade imposed by the west in collaboration with local leaders in developing countries ▶ underdevelopment is caused by corrupt local elites in less-developed countries ▶ industrialisation in less-developed countries has driven women, who were the traditional environmental stewards in societies, into a position of powerlessness and poverty and has damaged the environment ▶ technology and the laws of the free market will solve our environmental problems ▶ development in harmony with nature requires a move away from big industries and urbanisation and towards small scale, self-reliant communities using renewable resources <p>engage with different viewpoints and evaluate and use evidence to come to a conclusion as to which of these arguments are most supportable</p> <p>identify which of these arguments would be associated with a 'left-wing' position, which would be associated with a 'right-wing' position, and which could be associated with either</p> <p>critically evaluate a piece of qualitative or quantitative research, that they have not previously seen, on development, making reference to the quality of the evidence and of the conclusions drawn in this study</p>

Additional Information:



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