



Leaving Certificate Agricultural Science

National Workshop Three



Professional Development
Service for Teachers

An tSeirbhís um Fhorbairt
Ghairmiúil do Mhúinteoirí

LEAVING CERTIFICATE AGRICULTURAL SCIENCE



Leaving Certificate Agricultural Science Team

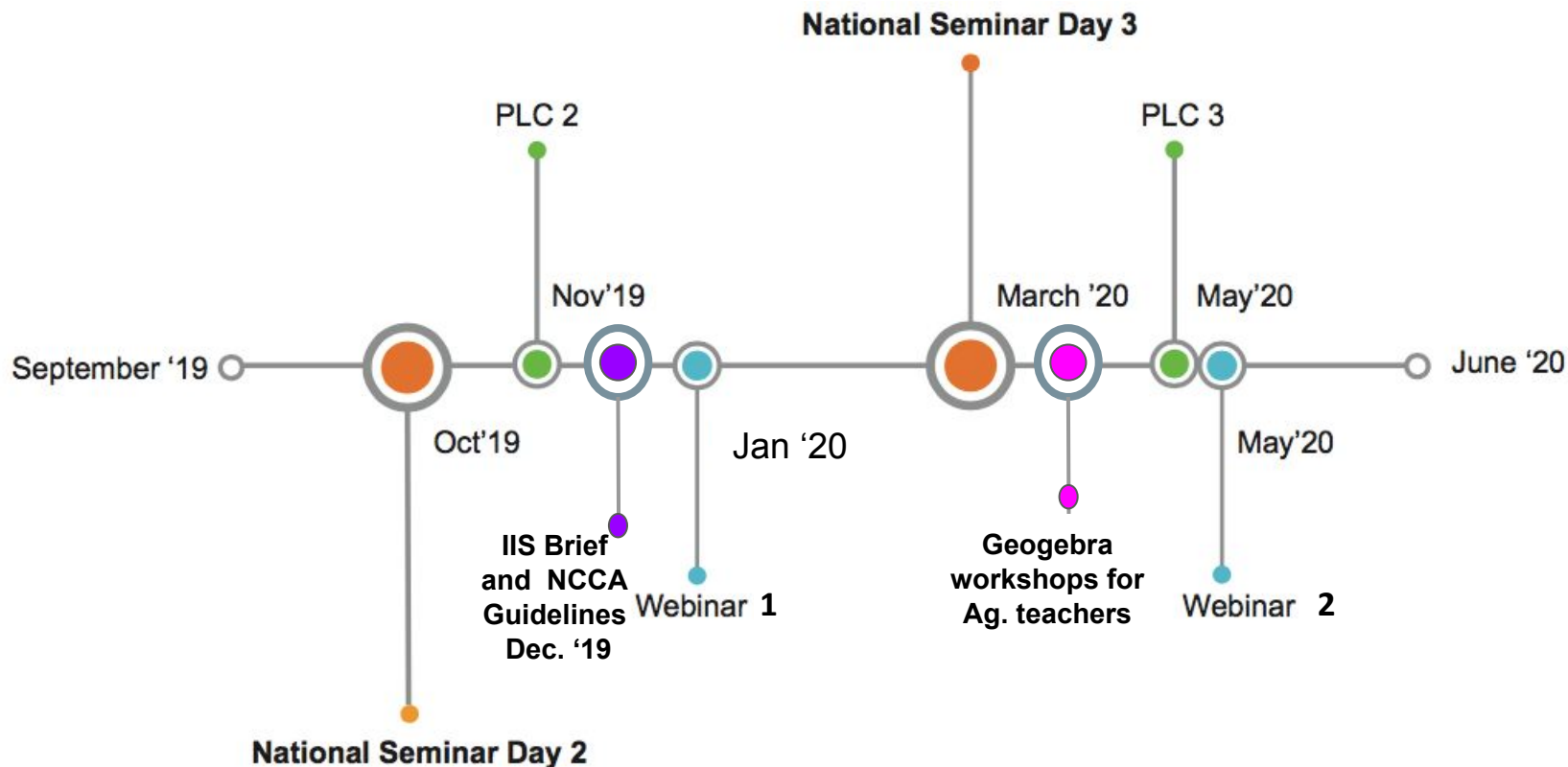
Helen Van Eesbeck

Chris Davies

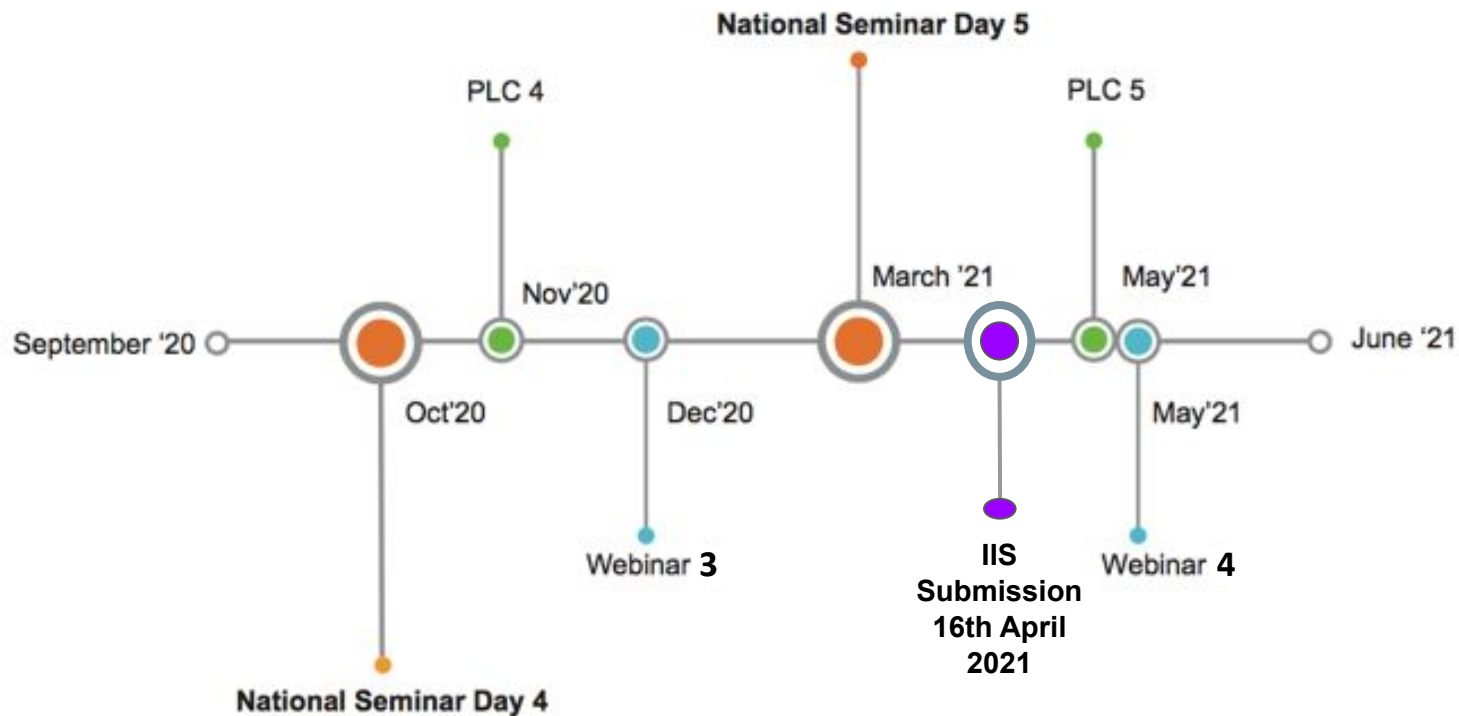
Ronan Dowling

Contact Email

agscience@pdst.ie



Year 2: September 2019 to May 2020



Year 3: September 2020 to May 2021

Overview of the Day

Session 1

9:00 – 11:00

- Introduction to sustainability to enhance focus on the cross cutting theme in the IIS
- Overview of the documents influencing the process of the IIS and student portfolios
- Supporting scientific practices through crops

11:00–11:15

Tea and Coffee

Session 2

11:15 – 1:00

- Carry out an assessment criteria task
- The process of conducting IIS
- What constitutes good research?
- Developing a research question using the three documents that influence the IIS process

1:00 – 2:00

Lunch

Session 3

2:00 – 3:00

- Using digital technologies to enhance literacy and formative assessment in the agricultural science classroom
- Supporting scientific practices through policy and economics

Key Messages

Using Strand 1, to develop students' abilities to understand how the principles of scientific practice permeate all strands within the agricultural science specification

To appreciate the value of using numeracy, literacy, digital technologies and other key skills to complete the IIS

Working collaboratively with professional colleagues, engaging with the documentation to help plan and support the design and completion of the IIS

Participant Outcomes for Session 1

Participants will be able to:

- Use the three documents (Specification, SEC brief and NCCA guidelines) in conjunction with one another to implement the process of the IIS
- Inform teachers of a variety of portfolio's available to use for research records, progress reports and evidence of work
- Using scientific practices to support the process of the IIS





Session 1



Research Grid & Strand 1

Using the research grid in on
 page 14 of your workbook,
 write down any words that you
 are unsure of from Strand 1

Causation	Correlation	Prediction	Accuracy
Notes	Notes	Notes	Notes
Notes	Notes	Notes	Notes
Notes	Notes	Notes	Notes

Overview of Coursework Assessment

The coursework assessment of leaving certificate Agricultural Science includes:

- Portfolio of specified practical activities
- Individual Investigative Study (IIS)

<https://tinyurl.com/Ag-Science-Spec>



<https://tinyurl.com/NCCA-Ag-guidelines>

<https://tinyurl.com/IIS-Brief>

What is a Portfolio?

A portfolio - paper or electronic - is a **collection of evidence (research record)** that is gathered to show a person's **learning journey over time** and to demonstrate their abilities.

How might you use portfolios to ensure participants are **active in their own learning?**

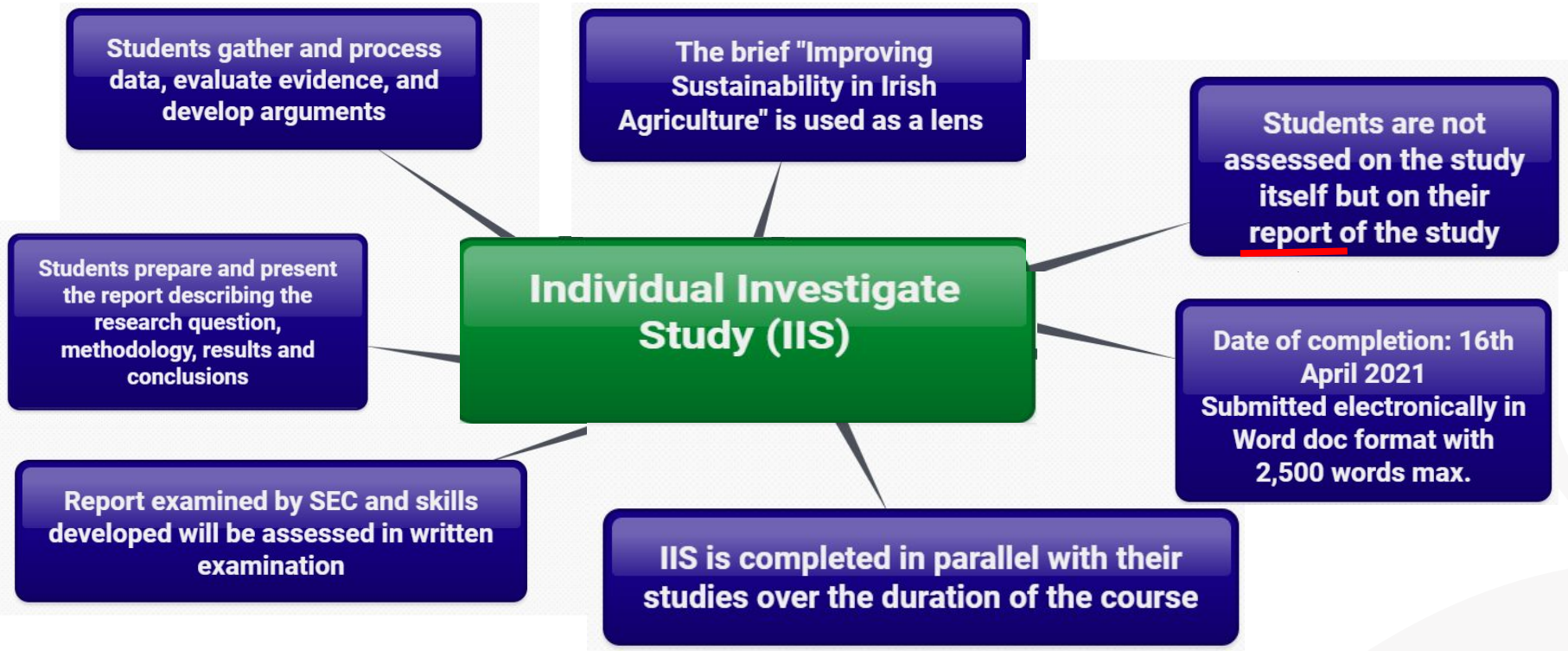


Defining Digital Portfolios

“Digital portfolios are student-owned dynamic digital workspaces whereby students can capture their learning, their ideas, access their collections of work, reflect on their learning, share it, set goals, seek feedback and showcase their learning and achievements.”

NCCA, 2013

IIS Overview



Individual

Investigative

Study

- **Authenticity is key**
- **An investigation that collects primary data through the use of controlled variables**
- **Students must collate their own primary data**
- **Authentic data is clearly connected back to the hypothesis**

- **Affords students opportunities to connect learning from their local experiences to the course**
- **If using an extended, modified or adapted SPA, then connect it to your agricultural enterprise of choice**
- **Reference conventions to be used and acknowledged**



What is Research?

5 phases



link:

<https://tinyurl.com/wmh5zhv>



Applying the
Scientific Method in
Animal Research

Pat Lonergan
UCD School of Agriculture and Food Science

IIS - Engagement Activity on the Structure of the Report

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

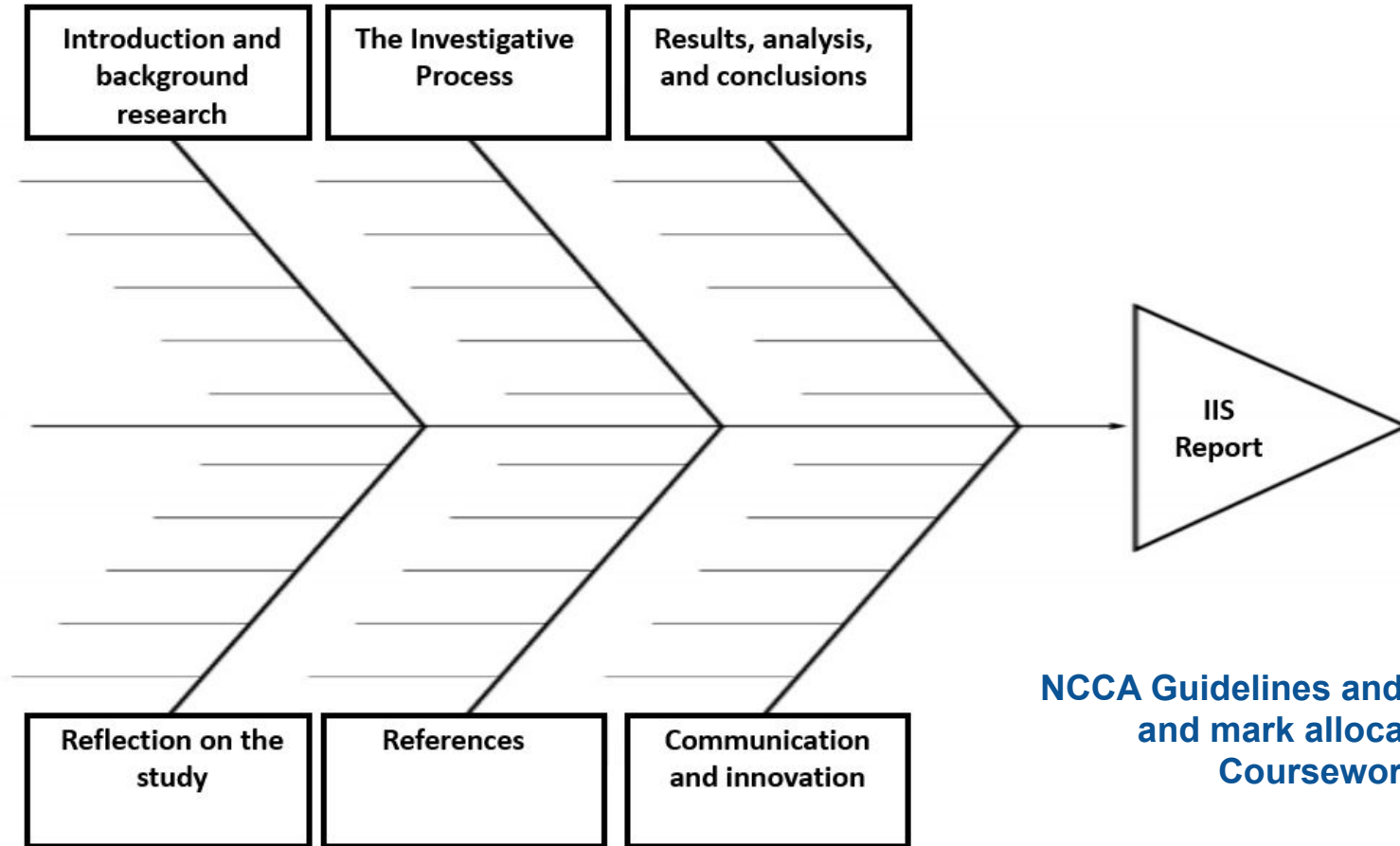
Use the theme, “**Improving Sustainability in Irish Agriculture**”, as a “lens” to look through while undertaking the learning contained in the specification’s strands and crosscutting themes.

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.

Report structure and mark allocations		
Section	Indicative content to be included	Marks
Introduction and background research Suggested range between 300 and 500 words	<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
The investigative process Suggested range between 500 and 800 words	<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
Results, analysis, and conclusions Suggested range between 600 and 1000 words	<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
Reflection on the study Suggested range between 150 and 200 words	<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
References	<ul style="list-style-type: none"> ▪ Full references for all sources used during the study and/or referred to in the report. 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.	-
Communication and innovation	This is not a distinct section of the report. Marks will be awarded for evidence of taking an individual approach, for coherence and for innovative thinking.	10



NCCA Guidelines and Report structure and mark allocations - SEC Coursework Brief

Expt: 3.3.2(h) - Supporting Scientific Practices through Crops

Investigate

- Using your specification look at the LO: 3.3.2(h)
- Turn to pg 10 of your workbook and propose a suitable:
 - Hypothesis
 - Variables for this experiment
 - Method



Figure 4, Specification 2018, Page 11

LO
3.3.2(h)

Adobe
Spark

Experiment Method and Use of Digital Technologies

- Method of LO 3.3.2(h)
- What changes would you make to the method?
- What systematic errors did you notice?
- If you were to repeat this investigation, what would you do differently and why?

- Digital technology - differentiation and formative assessment
- Revision tool
- Research records

Expt: 3.3.2(h) - Supporting Scientific Practices through Crops

- Using strand 1, sections : 1.2, 1.3 and 1.4.
 - Analyse and interpret the data, graphs and other information
 - Make judgements and draw conclusions from your analysis
 - Take into account any relevant limitations of your study and suggest improvements

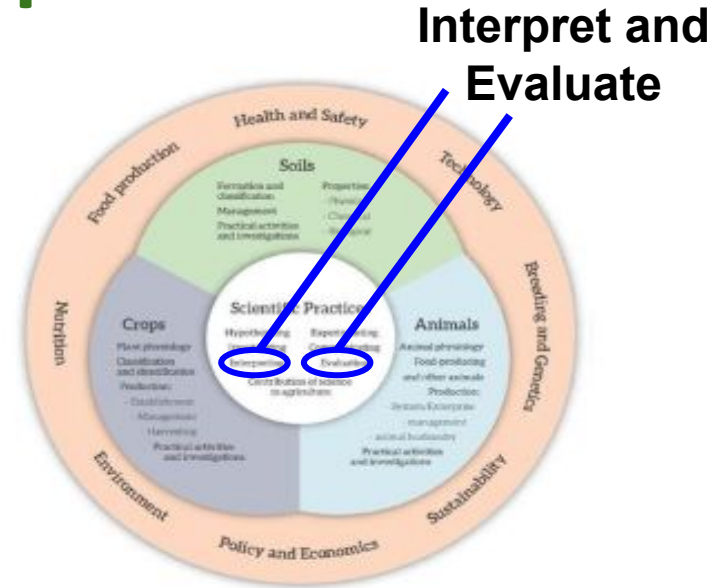
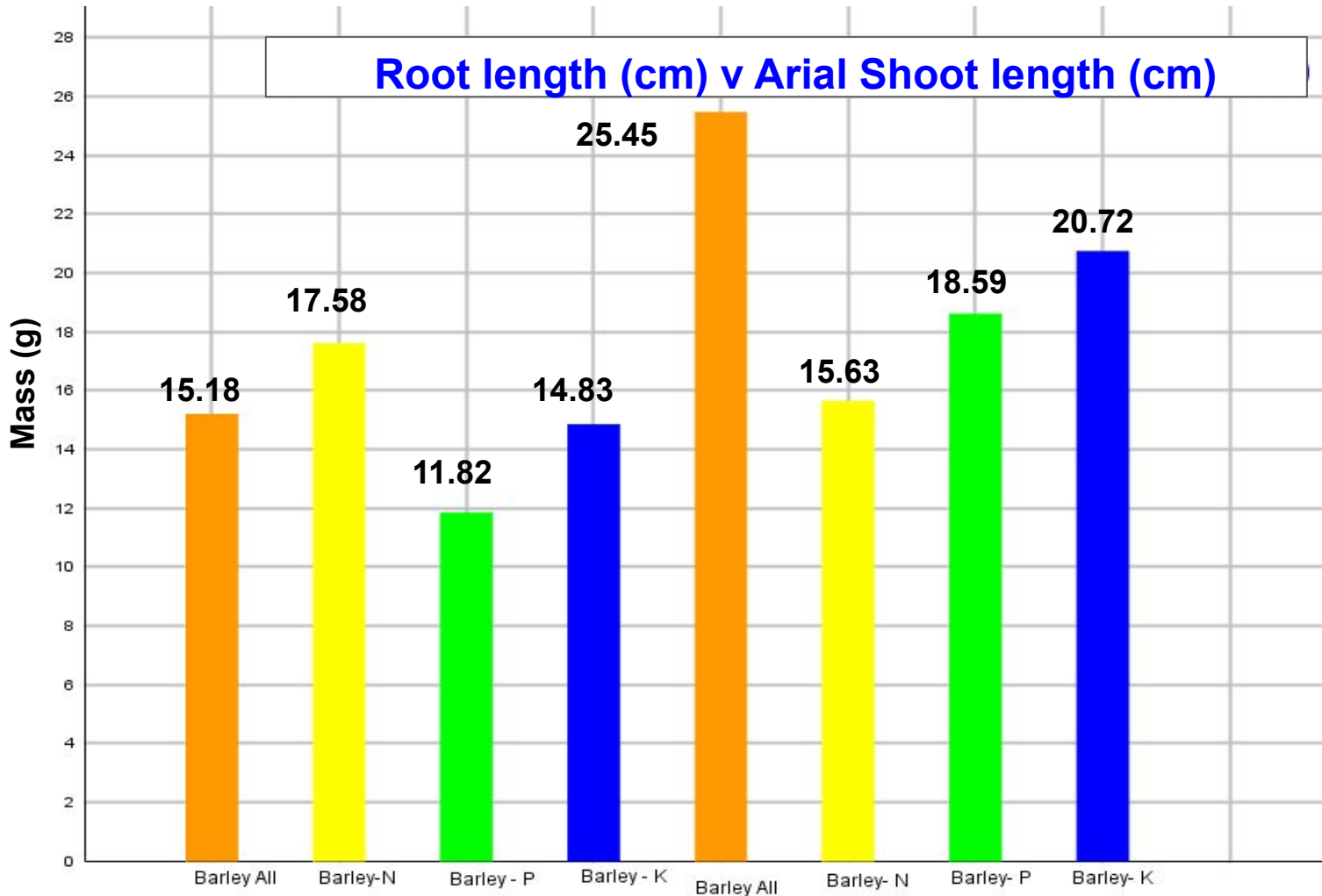
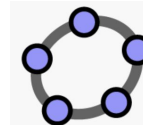


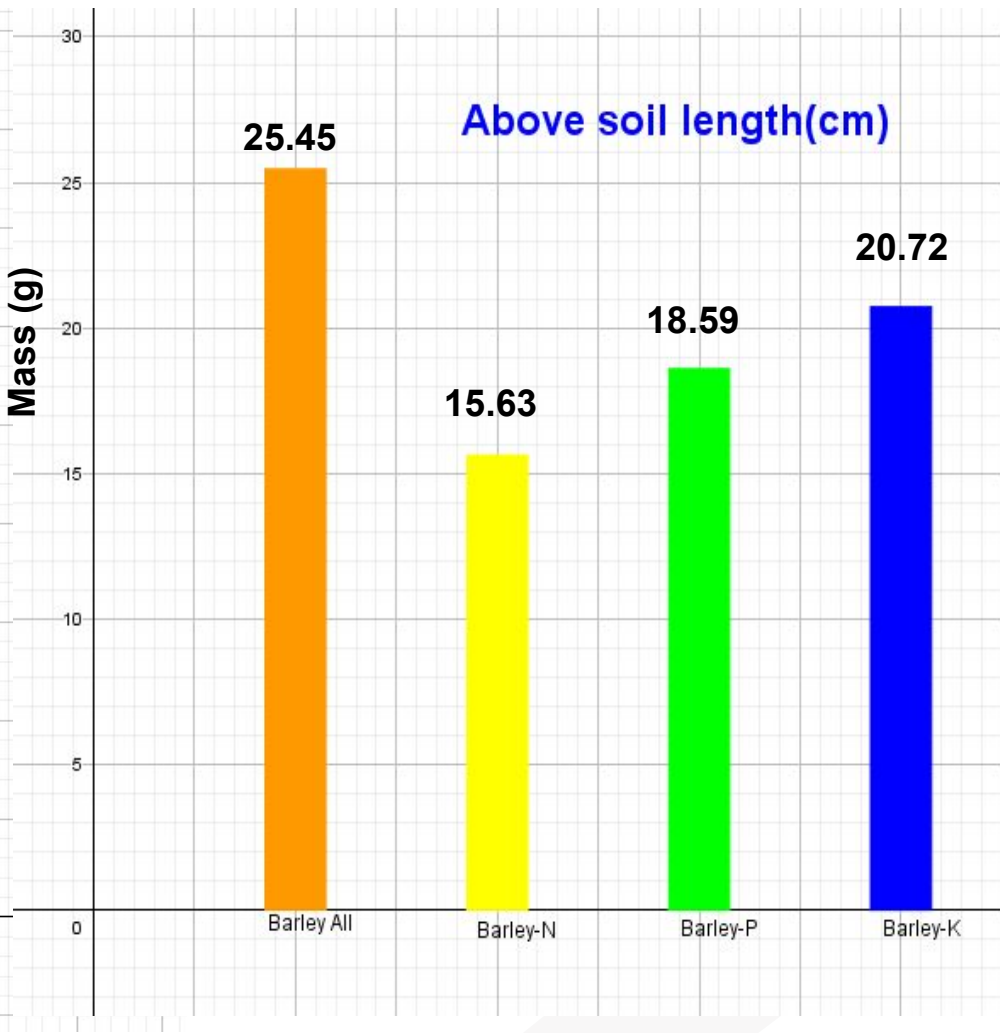
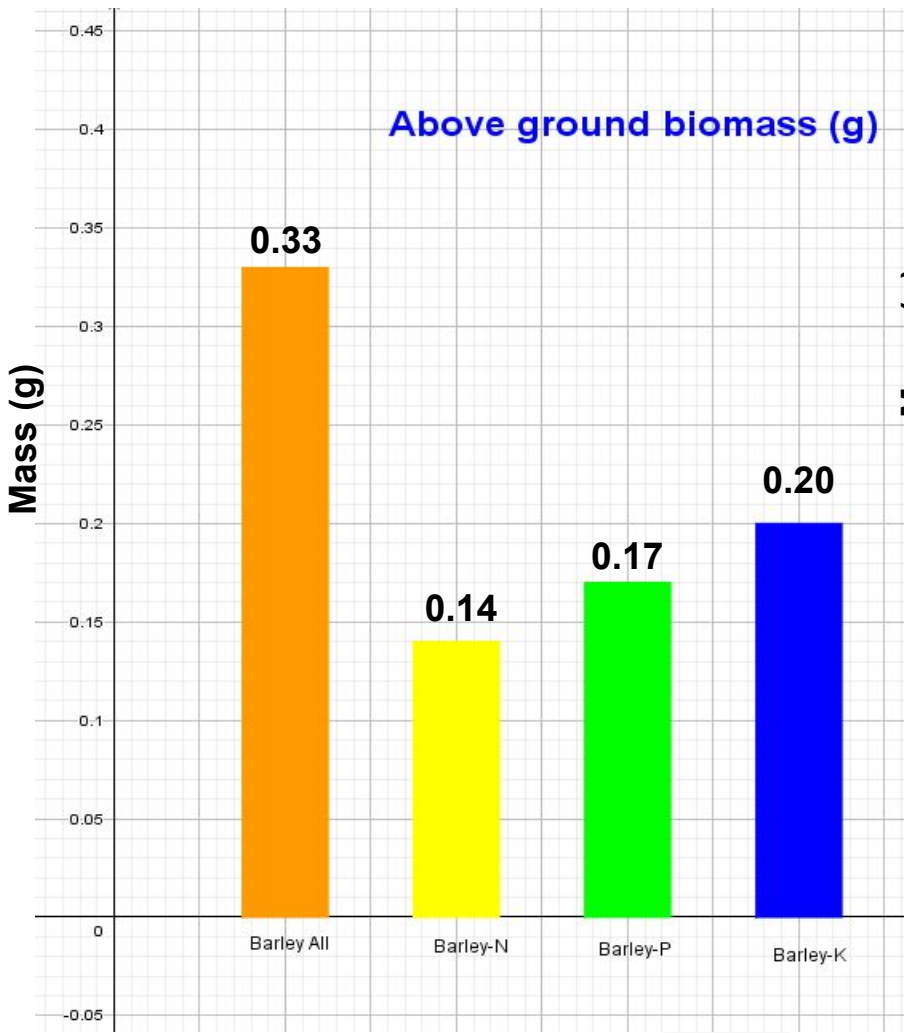
Figure 4, Specification 2018, Page 11



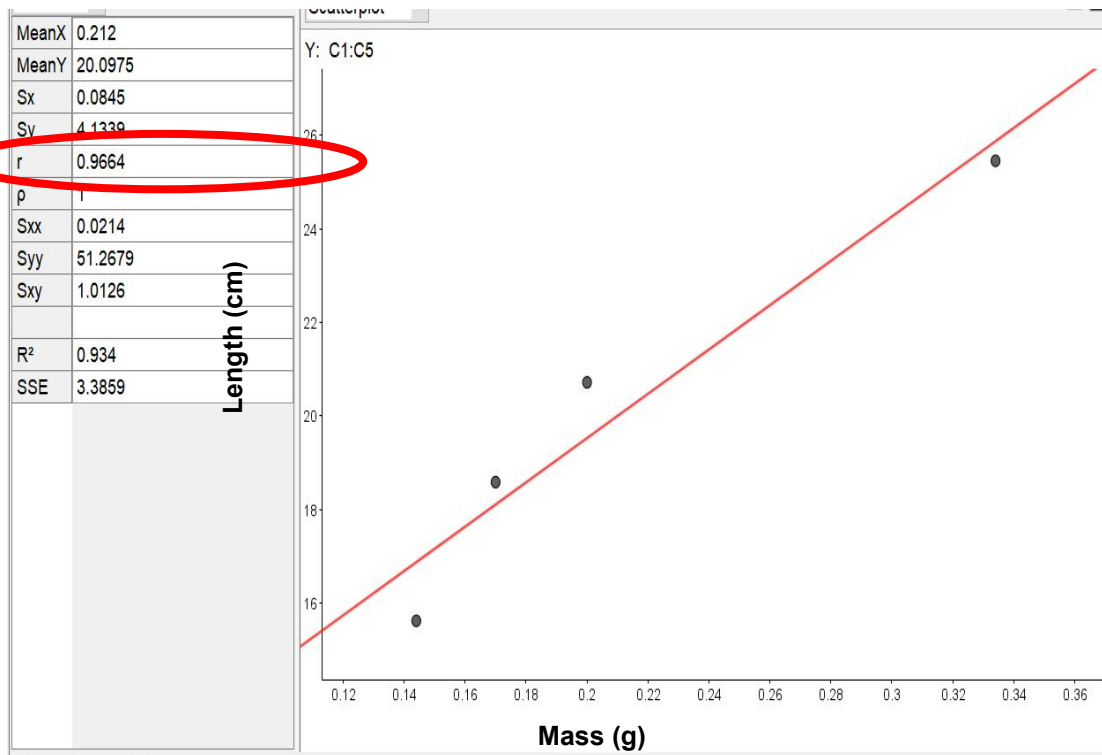
Graphs
created
using
Geogebra



'Where
appropriate,
these
reports
should
include
video, audio
and
electronic
analysis'
Pg 27 Spec.



Strong Correlation between above soil mass and above soil length



PDST
Professional Development Service for Teachers | An Seirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

pdst.ie

Leaving Certificate Agricultural Science Introduction to GeoGebra for Agricultural Science Teachers

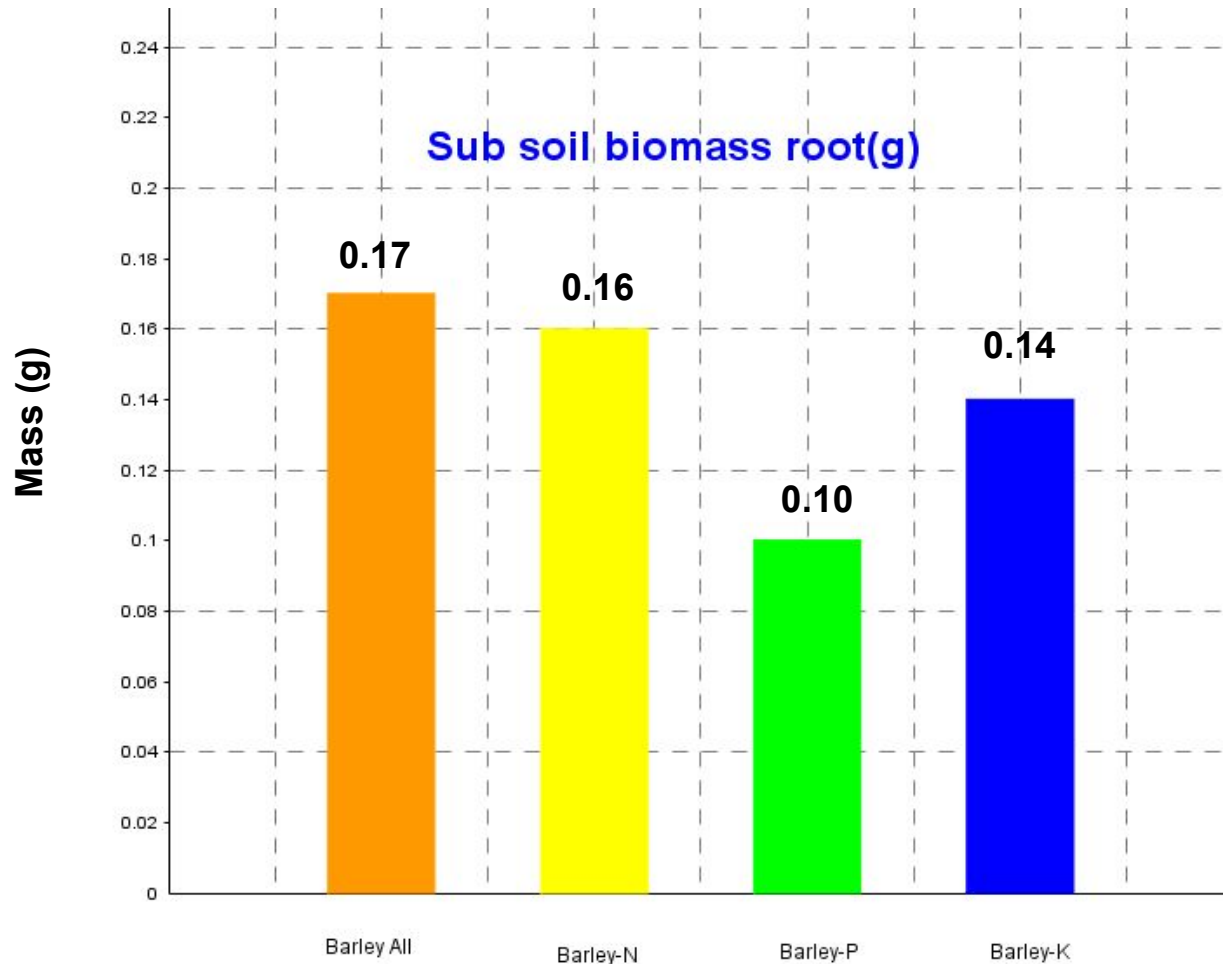
This workshop will give teachers an opportunity to engage with GeoGebra as a digital tool for organising, presenting, interpreting and analysing data in order to support students in completing the Individual Investigative Study (IIS) in a supportive and friendly environment.

DATE	TIME	VENUE
Wednesday 4 th March 2020	7.00p.m. - 9.00p.m.	Athlone Education Centre
Monday 9 th March 2020	7.00p.m. - 9.00p.m.	Navan Education Centre
Tuesday 10 th March 2020	7.00p.m. - 9.00p.m.	Dublin West Education Centre
Wednesday 11 th March 2020	7.00p.m. - 9.00p.m.	Blackrock Education Centre
Thursday 12 th March 2020	7.00p.m. - 9.00p.m.	Siligo Education Centre
Wednesday 18 th March 2020	7.00p.m. - 9.00p.m.	Galway Education Centre
Thursday 19 th March 2020	7.00p.m. - 9.00p.m.	Limerick Education Centre
Monday 30 th March 2020	7.00p.m. - 9.00p.m.	Cork Teachers Support Centre
Tuesday 31 st March 2020	7.00p.m. - 9.00p.m.	Kilkenny Education Centre
Wednesday 1 st April 2020	7.00p.m. - 9.00p.m.	Tralee Education Centre

For Further Information, please contact Limerick Education Centre

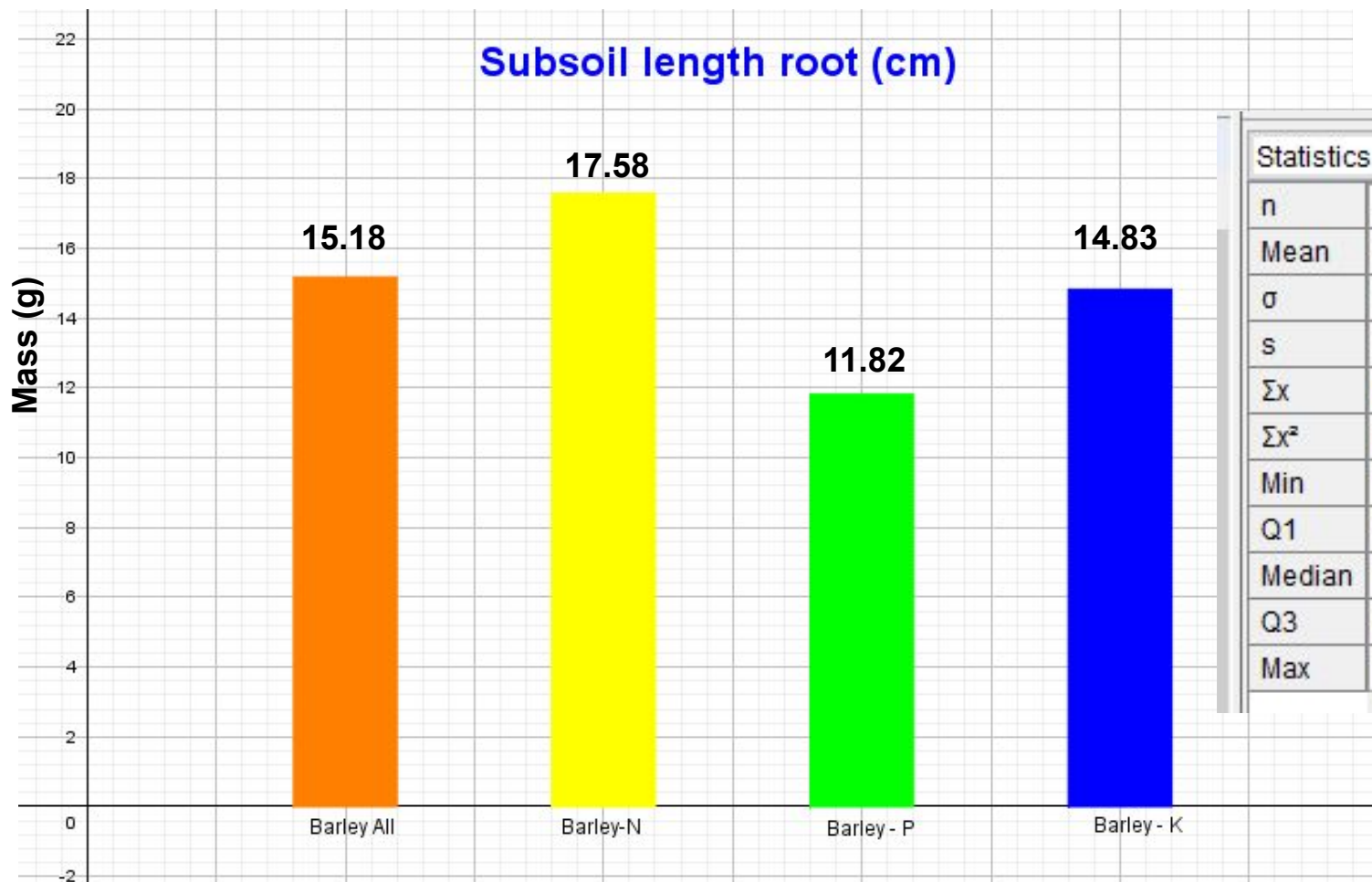
To book your place at the workshop go to PDST Event booking www.pdst.ie/onlinebooking

- As places are limited, book early to avoid disappointment
- If you don't register places cannot be guaranteed
- Please bring an electronic device with GeoGebra 5 downloaded
- Please circulate to all Agricultural Science teachers in your school



Statistics	
n	4
Mean	0.1435
σ	0.0277
s	0.032
Σx	0.574
Σx^2	0.0854
Min	0.1
Q1	0.1205
Median	0.15
Q3	0.1665
Max	0.174

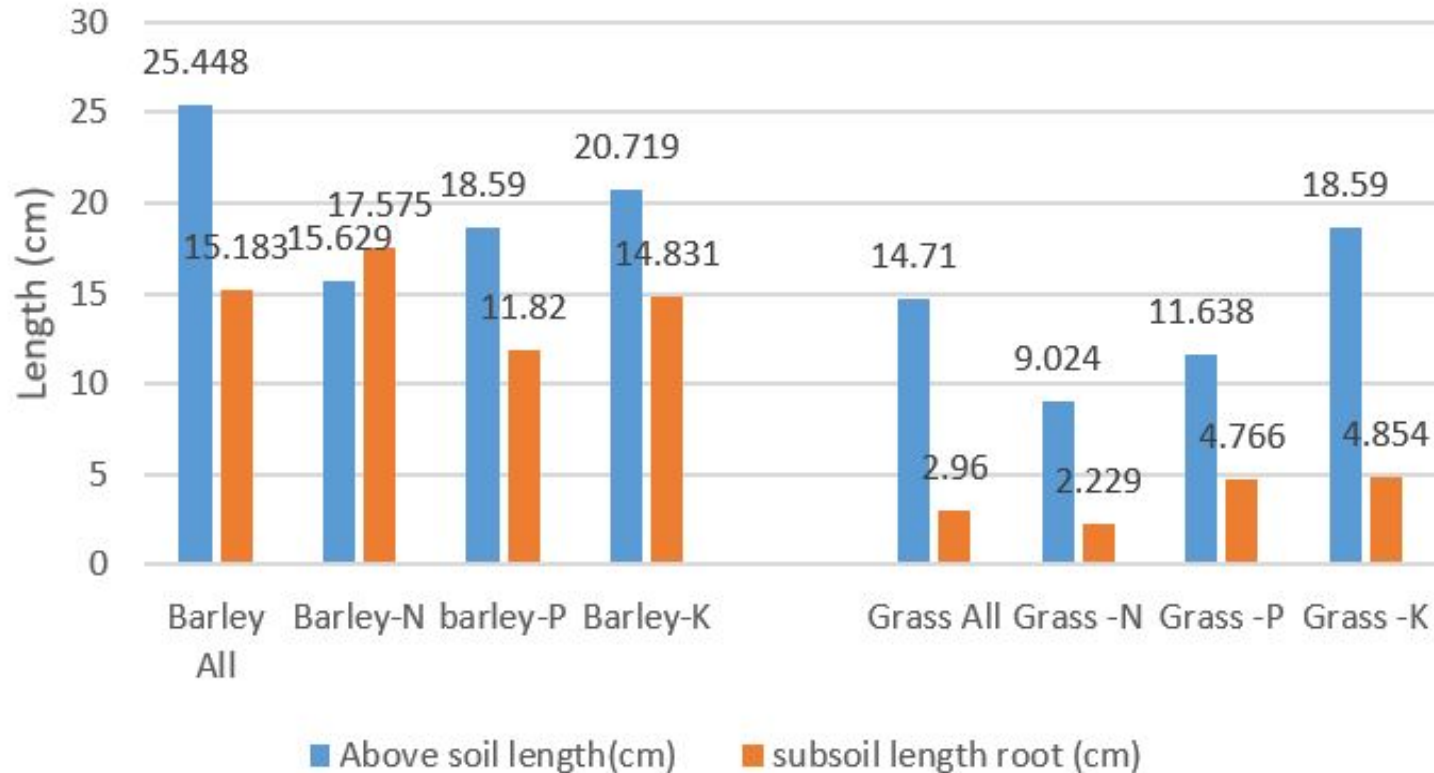
Subsoil length root (cm)



Statistics

n	4
Mean	14.8523
σ	2.0444
s	2.3606
Σx	59.409
Σx^2	899.0751
Min	11.82
Q1	13.3255
Median	15.007
Q3	16.379
Max	17.575

Shoot v Root Length (cm)



Statistics

n	16
Mean	13.0354
σ	6.5475
s	6.7623
Σx	208.566
Σx^2	3404.6604
Min	2.229
Q1	6.939
Median	14.7705
Q3	18.0825
Max	25.448

Participant plenary for Session 1

Participants should now be able to:

- Use the three documents (Specification, SEC brief and NCCA guidelines) in conjunction with one another to implement the process of the IIS
- Appreciate there are a variety of portfolio's available to use for research records, progress reports and evidence of work
- Use scientific practices to support the process of the IIS





Tea / Coffee

11:00 - 11:15



Session 2

Key Messages

Using Strand 1, to develop students' abilities to understand how the principles of scientific practice permeate all strands within the agricultural science specification

To appreciate the need to use numeracy, literacy, digital technologies and other key skills to complete the IIS

Working collaboratively with professional colleagues, engaging with the documentation to help plan and support the design and completion of the IIS

Participant Outcomes for Session 2

Participants will be able to:

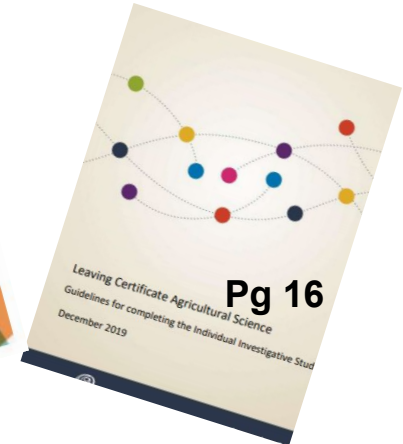
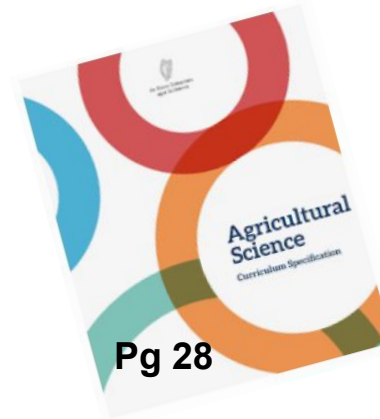
- Understand and use the assessment criteria to guide students through the IIS
- Explain what constitutes good research and make links to the scientific process
- Devise research questions that are linked to the brief and a chosen enterprise



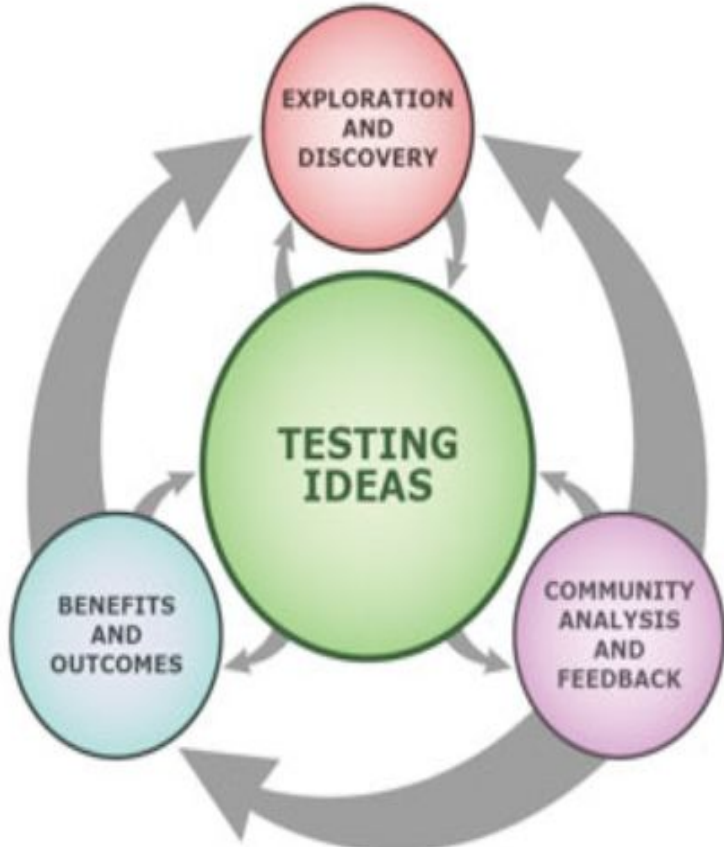
Level of Achievement Criteria

- What would quality look like for the IIS?
- In groups, complete the table on pg 15 of your workbook on what is required at each level by the students.

	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			



Scientific Process



<https://tinyurl.com/rzapbd6>

Article by Declan Cathcart
The Wonderful World of Woodlice

**Extended Investigation,
Inquiry and Assessment**

University of Berkeley

<https://tinyurl.com/tgeddqv>

How do we support students to generate a good research question in the Agricultural Science classroom?

Key skills

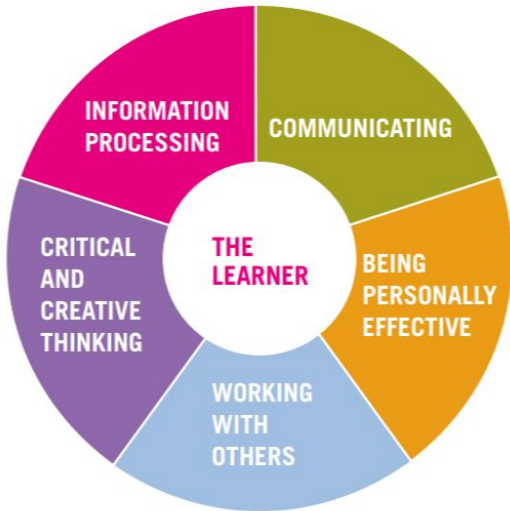


Figure 5: Key skills of senior cycle

‘free access to data doesn’t turn into knowledge without effect’

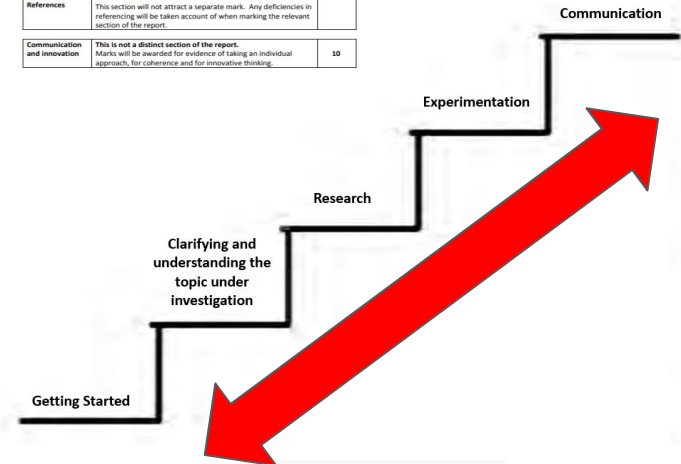
Rosling, Hans, 2018

Think - Pair - Share Activity

Conducting the study - 5 phases (NCCA guidelines)

1. Getting started
2. Clarifying and understanding the topic under investigation
3. Research
4. Experimentation
5. Communication

Report structure and mark allocations		
Section	Indicative content to be included	Marks
Introduction and background research	<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
The investigative process	<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
Results, analysis and conclusions	<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. Take due account of any relevant limitations of your study. State the conclusions clearly to the research question. 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 	35
Reflection on the study	<ul style="list-style-type: none"> Full references for all sources used during the study and/or referred to in the report. 	10
References	<ul style="list-style-type: none"> 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. 	-
Communication and innovation	<ul style="list-style-type: none"> This is not a distinct section of the report. Marks will be awarded for evidence of taking an individual approach, for coherence and for innovative thinking. 	10



Getting Started - Developing a Research Question

- 6 references (given in the brief)
- Specified Practical Activities (SPAs)
 - extend, modify or adapt (pg 12 NCCA guidelines)
- Original idea - resources (articles, students own prior knowledge, discussions)



Appendix 1 and 3 - NCCA Guidelines

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:		

Suitability of topic in response to Brief



- Is the topic relevant to the brief?
- Does it provide opportunities to engage with the themes and learning outcomes of the specification?
- Are there a number of viewpoints that can be researched?
- Can the research question be investigated through controlled experimentation?
- Can primary scientific data be collected safely in laboratory and / or field settings which support the formation of conclusion?
- Can the research question be pursued over an appropriate period of time (e.g. a season of production) in laboratory and / or field settings?

Participant plenary for Session 2

Participants should now be able to:

- Use the assessment criteria to guide students through the IIS
- Explain what constitutes good research making links to the Scientific Process
- Devise research questions that are linked to the brief and a chosen enterprise



Session 3



Key Messages

Using Strand 1, to develop students' abilities to understand how the principles of scientific practice permeate all strands within the agricultural science specification

To appreciate the need to use numeracy, literacy, digital technologies and other key skills to complete the IIS

Working collaboratively with professional colleagues, engaging with the documentation to help plan and support the design and completion of the IIS

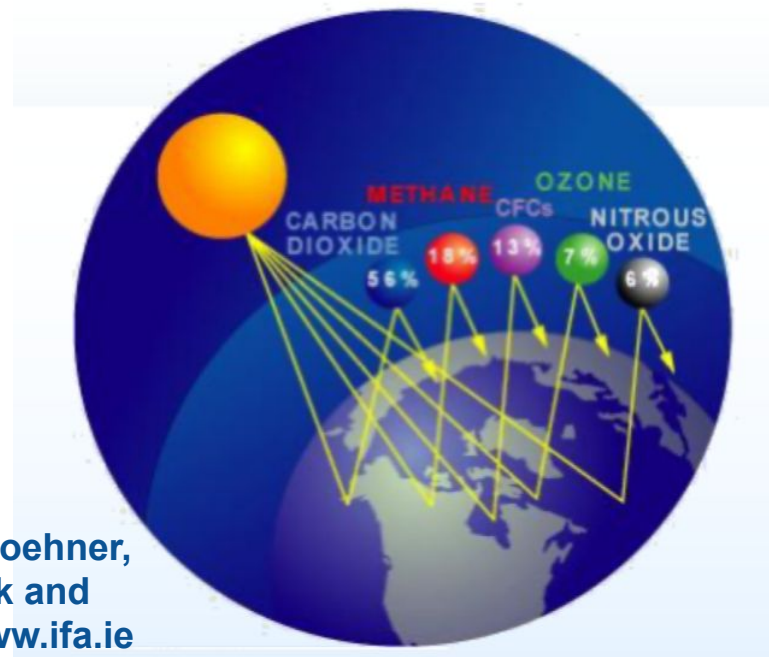
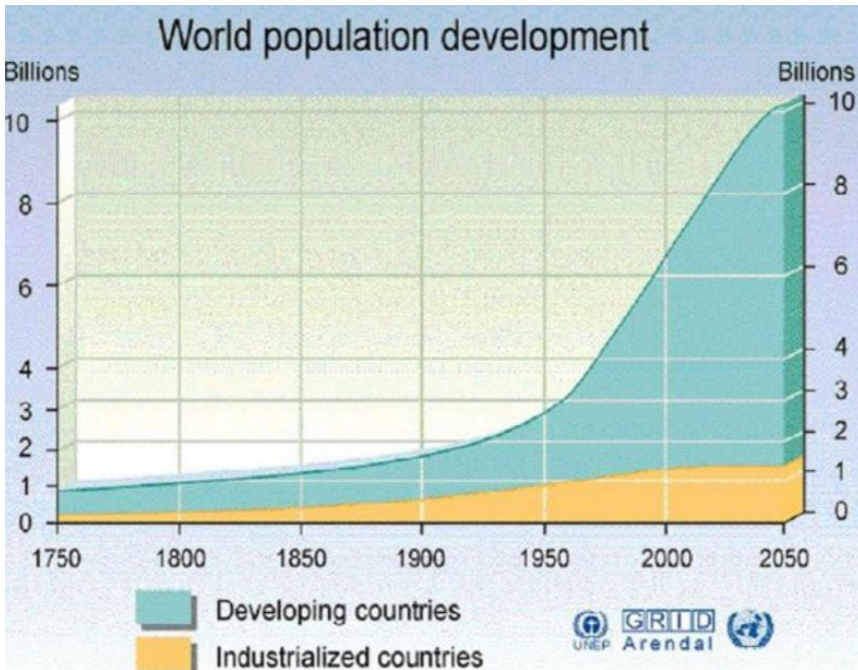
Participant Outcomes for Session 3

Participants will be able to:

- Use an active teaching tool to explore economic trends
- Use the overarching theme of policy & economics and strand 1 to devise possible research questions for the IIS



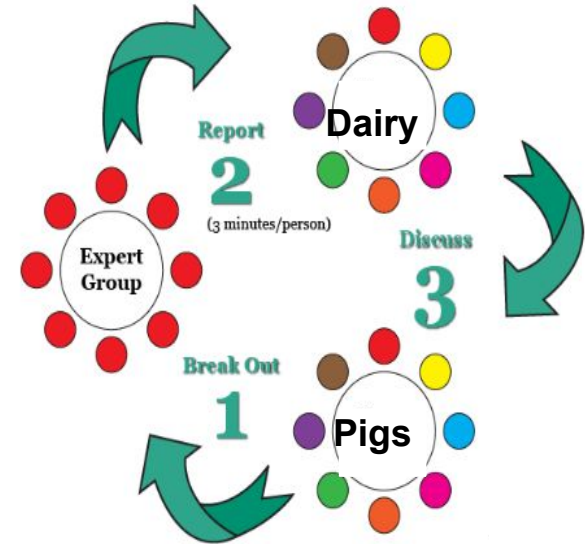
Edpuzzle <https://edpuzzle.com/media/5e2ee37f0a6f9e40b4f32a69>



Prof. F. Mitloehner,
 Livestock and
 Climate, www.ifa.ie

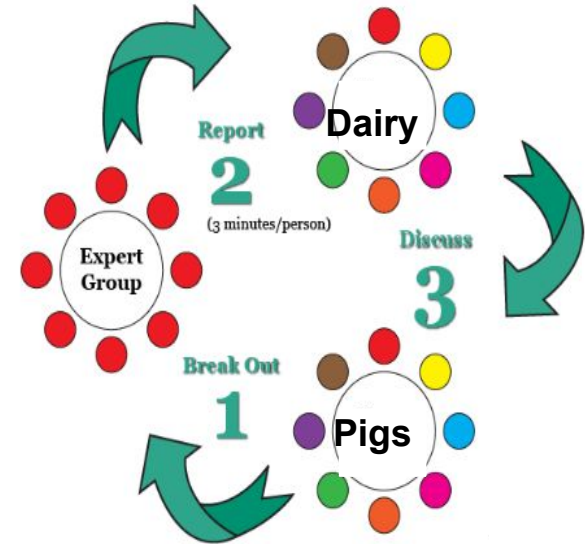
Marketplace Activity (4.3.1 b-d)

- Recognise the importance of market trends and requirements, including value added/niche markets/artisan produce/export markets



Marketplace Activity (4.3.1 b-d)

- Use secondary data to discuss the impact of milk quality on milk price
- Appreciate the impact on farm economics of different animal production systems



Unifying the Strands through Policy & Economics

- Use the given data sheets to carry out a marketplace activity on the economic trends in the various sectors
- Discuss possible research questions which could be used for an IIS
- Ensure these questions can be testable through a controlled experiment to collect primary data

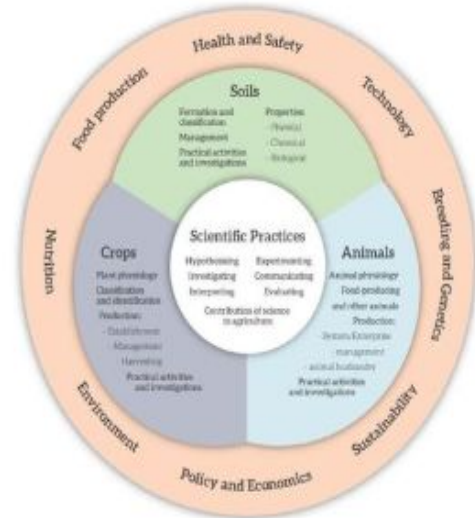


Figure 4, Specification 2018, Page 11

What action verbs from strand 1 have been used in this activity?

Reflection

What action verbs from strand 1 have been used in this activity?

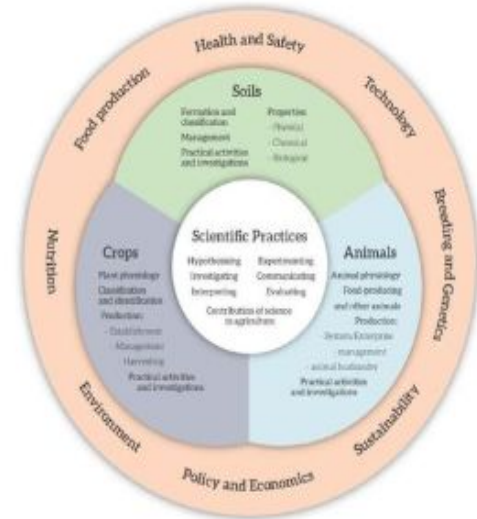


Figure 4, Specification 2018, Page 11

Participant plenary for Session 3

Participants should now be able to:

- Use an active teaching tool to explore economic trends
- Use the overarching theme of policy & economics and strand 1 to devise possible research questions for the IIS

