Introducing Oide

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Science Resources for Teachers

Scoilnet supports primary and post primary teachers in sharing and finding useful classroom resources: www.scoilnet.ie

Leaving Certificate Agricultural Science : www.lcagscience.ie
Leaving Certificate Biology: www.pdstbiology.com/
Leaving Certificate Chemistry: pdst.ie/post-primary/sc/chemistry
Leaving Certificate Physics: https://pdst.ie/sc/physics
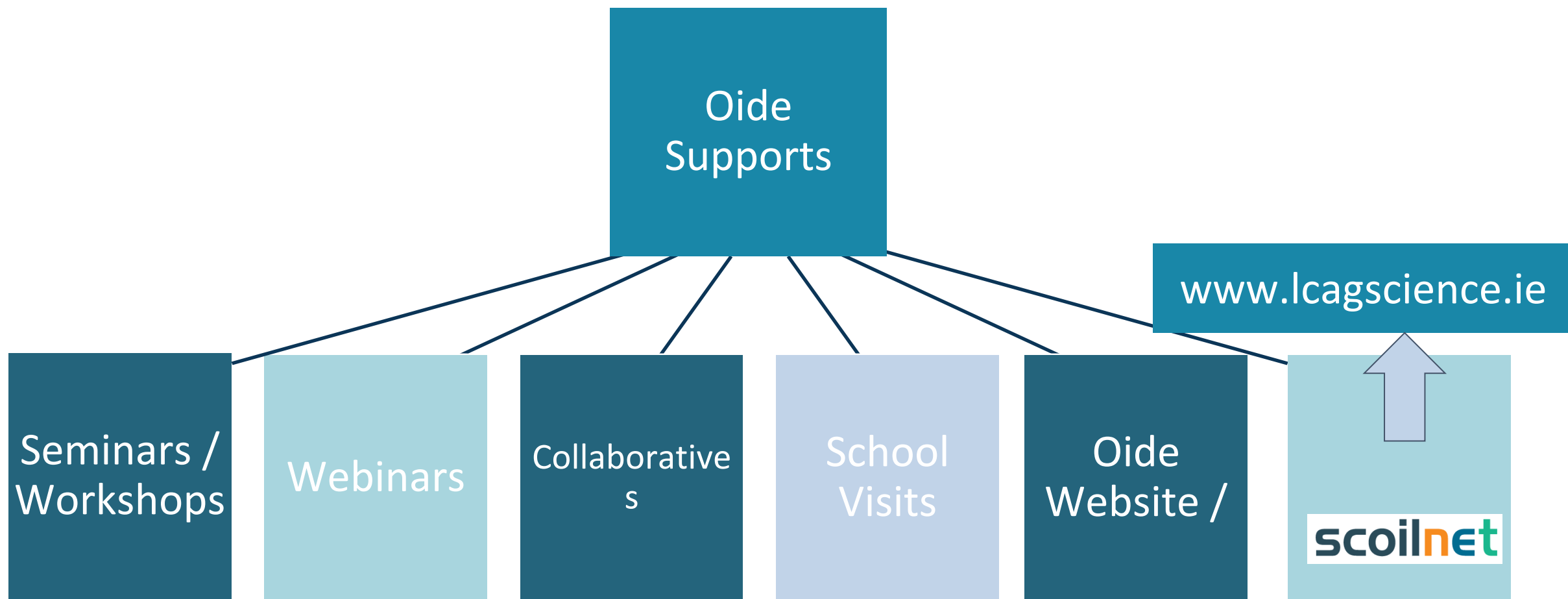Junior Cycle Science: https://www.jct.ie/science/science

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Supporting the Professional
Learning of School Leaders
and Teachers

Oide Supports

Overview of the Evening

Time	Outline
19:00 - 19:50	Session 1: Analysing data sets: exploring different types of graphs and data analysis that students might use
19:50 - 20:00	Tea/Coffee
20:00- 20:50	Session 2: Processing information from exam papers in tabular, graphical or pictorial form
20:50 - 21:00	Evaluation

Key Messages

Enhance and develop teachers' ability to use pedagogical approaches that better enable and better support students to:

- Interpret and analyse information in its various forms (numerical, graphical, written and pictorial) and see its relevance to their own studies.
- Use information in pictorial format to spark curiosity and act as a stimulus for hypothesising or for assessment.
- Engage with data in a diversity of forms developing students' ability to present their own primary data from investigations in varied formats.

Session 1

Analysing data sets: exploring different types of graphs and data analysis that students may use

Session 1: Learning Intentions

By the end of this session participants will:

Gain an understanding of the range of statistical analysis students have from engaging with Junior Cycle Maths.

Develop an understanding of a range of possible data analysis methods that students could engage with in their investigations.

Recap on Information Processing 1

In March 2023 teachers worked on:

- Presenting data: features of quality

- Summarising scientific texts

- Referencing scientific texts

- Evaluating the reliability and validity of a scientific claim

Leaving Certificate
Agricultural Science
Information Processing Workshop

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

pdst.ie

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Rationale

"Candidates should consider how best to represent their data. They should choose the type of graph, table, or other presentational form which best suits the data they wish to display. Replication of similar information in many formats should be avoided. One judiciously chosen representation (or perhaps two – one being tabular and the other graphical) is much more effective. "

(SEC, 2021 p5)

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Coursework

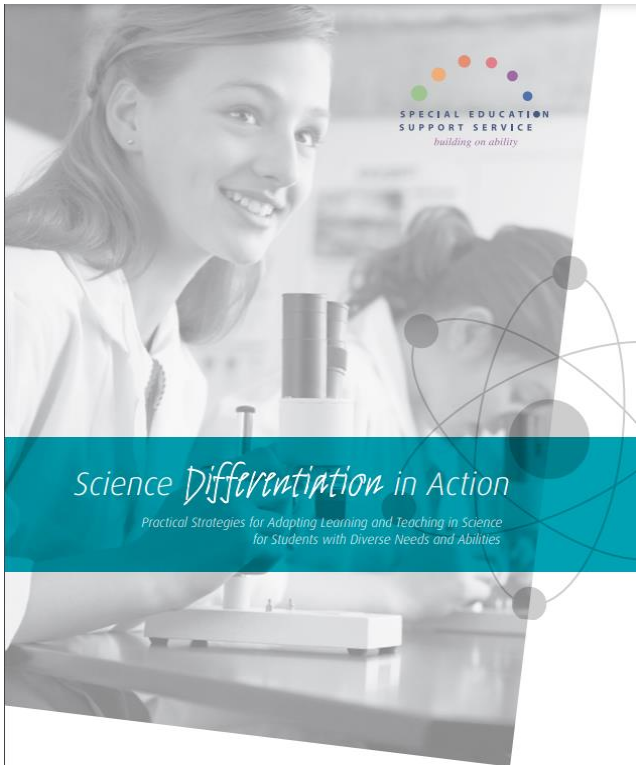Information note for four Leaving Certificate subjects with new subject specifications

- Agricultural Science – Individual Investigative Study
- Computer Science – Coursework Project
- Economics – Student Research Project
- Physical Education – Physical Activity Project

Prior Knowledge - JC Key Skills
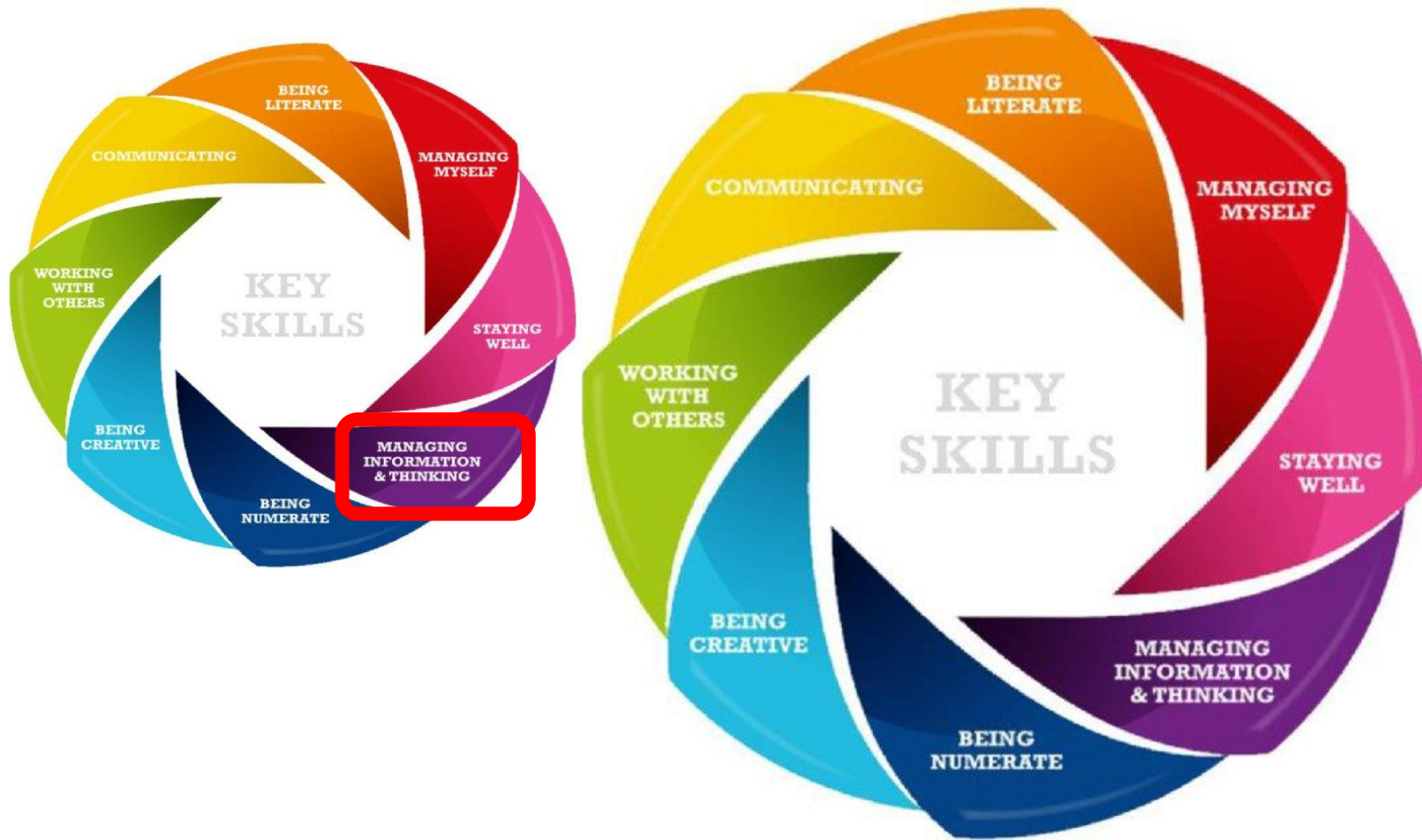
Skills Pathways in Investigations

Skill

Progression

| Analysing Evidence	Draw/discuss work in everyday terms Record (with support) in tables provided by the teacher	Compare results Record independently in tables provided by the teacher	Use different ways to display results Make statements about what the results show	Present results clearly Explain results clearly

(NCSE, 2008, p. 108)

Prior Knowledge - JC Maths

SP.3 carry out a statistical investigation which includes the ability to:

a. generate a statistical question

b. plan and implement a method to generate and/or source unbiased, representative data, and present this data in a frequency table

c. classify data (categorical, numerical)

d. select, draw and interpret appropriate graphical displays of univariate data, including pie charts, bar charts, line plots, histograms (equal intervals), ordered stem and leaf plots, **and ordered back-to-back stem and leaf plots**

e. select, calculate and interpret appropriate summary statistics to describe aspects of univariate data. Central tendency: mean **(including of a grouped frequency distribution),** median, mode. Variability: range

f. evaluate the effectiveness of different graphical displays in representing data

g. discuss misconceptions and misuses of statistics

h. discuss the assumptions and limitations of conclusions drawn from sample data or graphical/numerical summaries of data
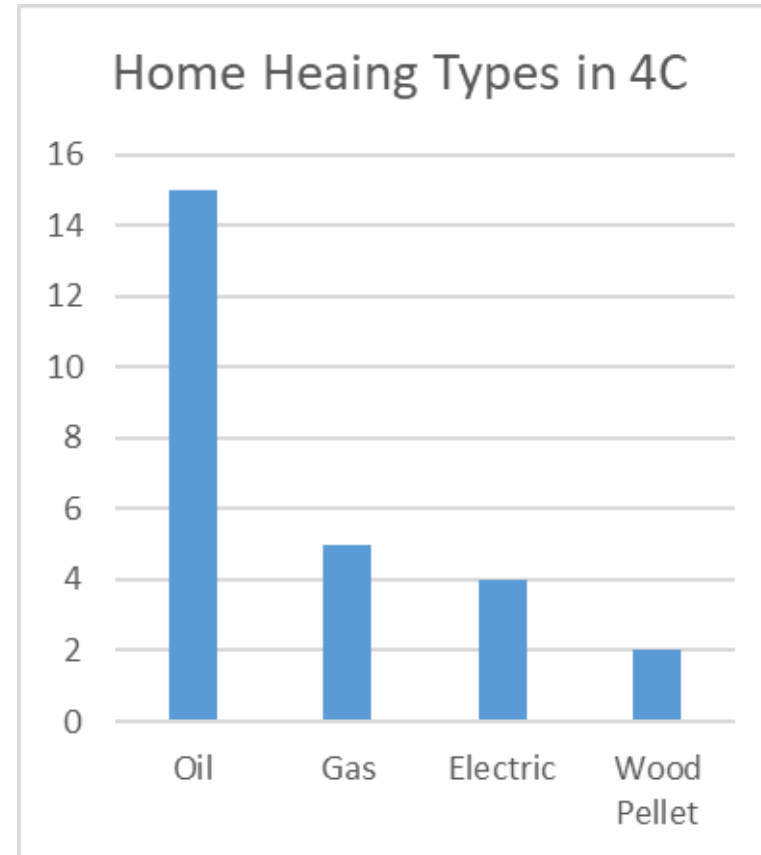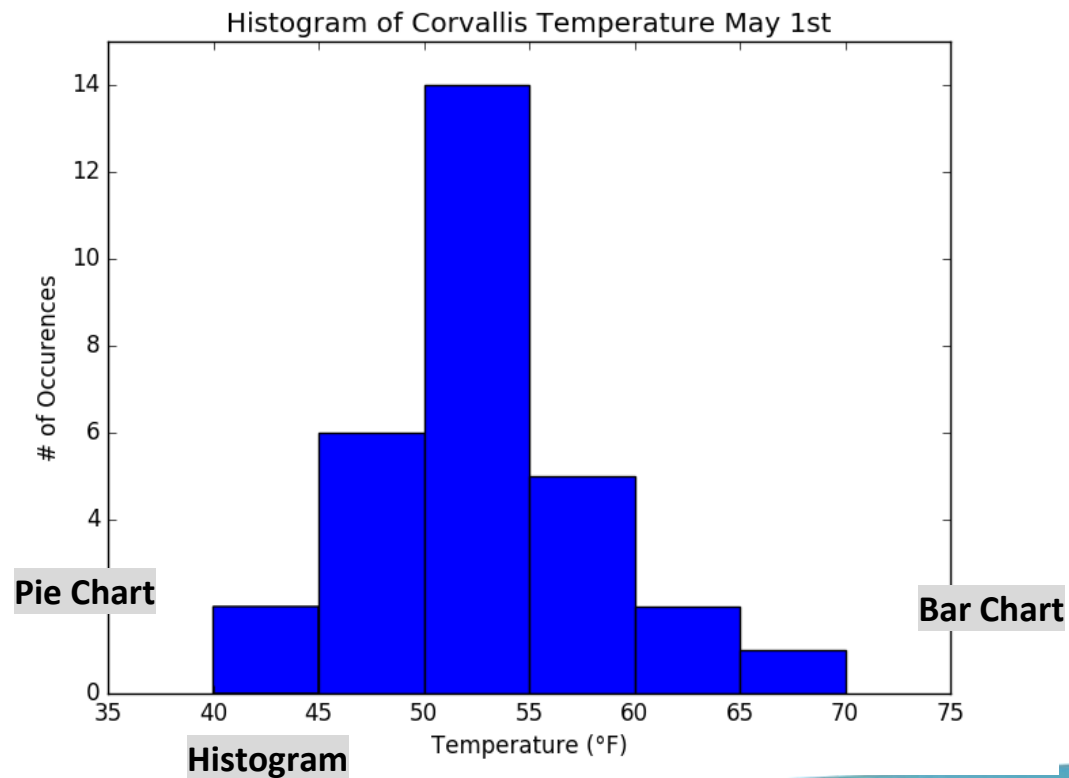
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Prior Knowledge: JC Maths Graphs

Home Heaing Types in 4C

Histogram of Corvallis Temperature May 1st

Pie Chart

Bar Chart

Histogram

Line Plot

Prior Knowledge: JC Maths Graphs

65	58	72	78	68	69	81
58	74	59	67	76	65	73
66	74	67	91	76	69	69
62	64	77	73	83		

Stem and Leaf Plot 26 values in order

58	58	59	62	64	65	65
66	67	67	68	69	69	69
72	73	73	74	74	76	76
77	78	81	83	91		

Back to Back Stem and Leaf Plot

Future Learning - LC Maths, SC Sciences, Economics....

December Temperature versus Maize Yield in Nakuru County, Kenya

Correlation Coefficient is -0.81
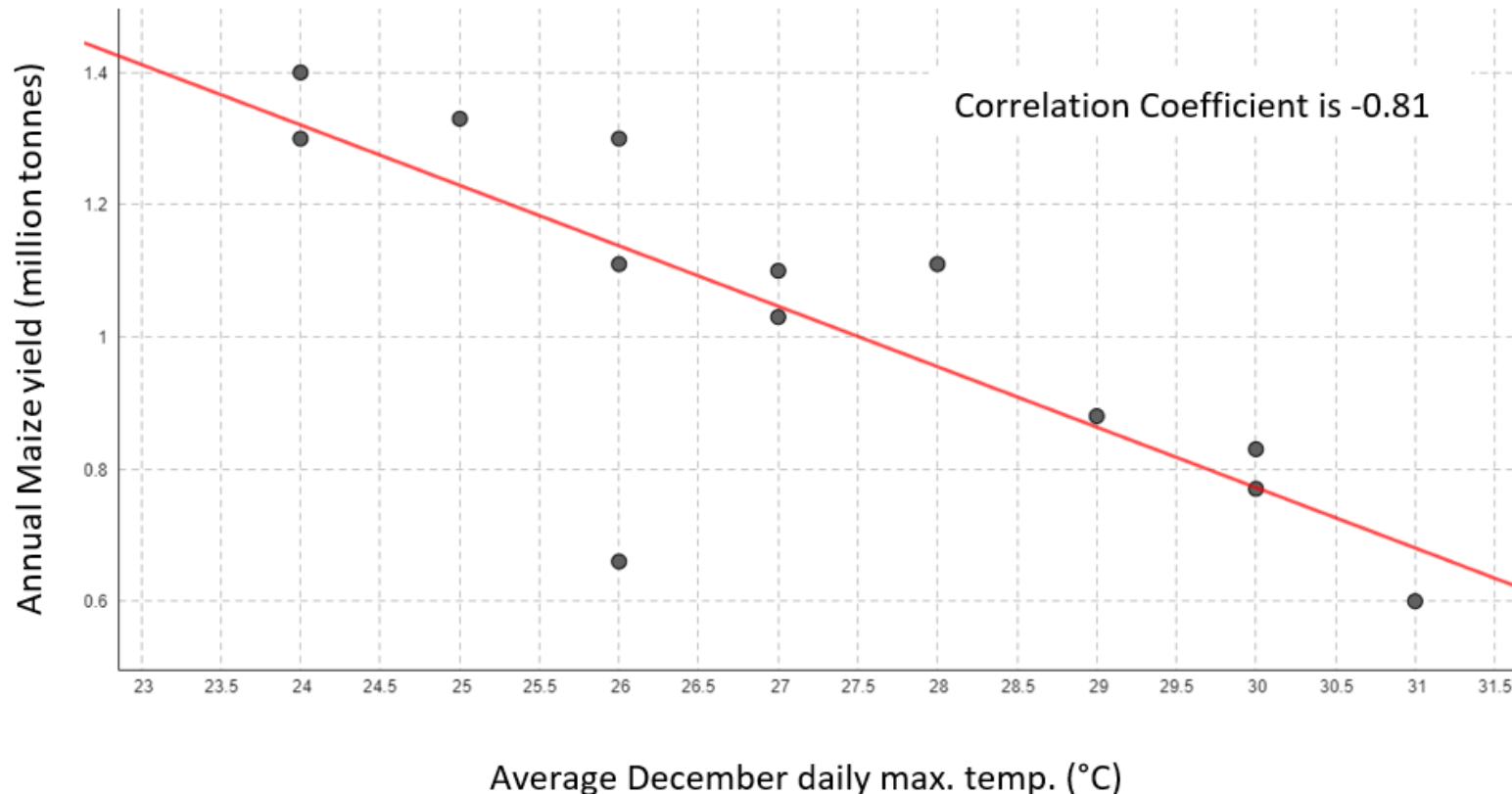
Scatter Plot

- 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

Prior Knowledge - JC Maths

Statistical Enquiry Cycle

An tSraith Shóisearach do Mhúinteoirí
JuniorCYCLE for teachers

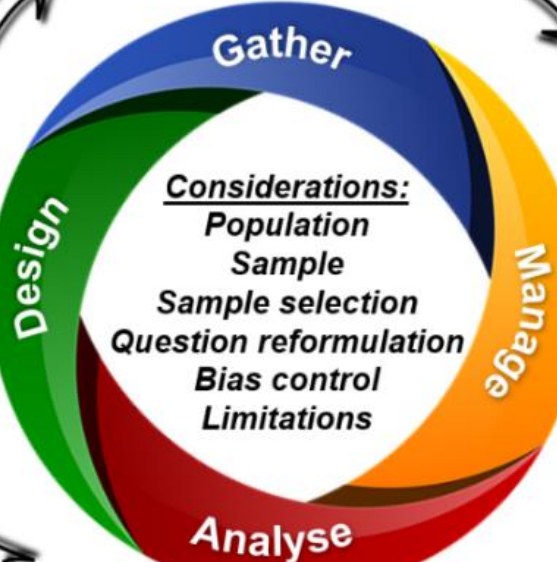**IDENTIFY VARIABLES AND SELECT RELIABLE METHODS FOR GATHERING DATA**

➢ What variable(s) are being measured?

➢ How are the variable(s) being measured?

➢ Is the sample representative of the population?

INVESTIGATION DESIGN

➢ Is the statistical question posed concise?

➢ What are the variable(s) that may need to be measured to answer the question?

➢ Is it possible to collect the data that can answer the question?

➢ Is it possible to draw down or gather the required data in a given timeframe?

➢ Is an experiment, survey or observational study being conducted?

Gather

Design

Manage

Analyse

Considerations:
Population
Sample
Sample selection
Question reformulation
Bias control
Limitations

ORGANISE AND MANAGE DATA

➢ Is the data displayed in a table, diagram, chart and/or graph?

➢ Is the data summarised numerically, graphically, diagrammatically and/or with words?

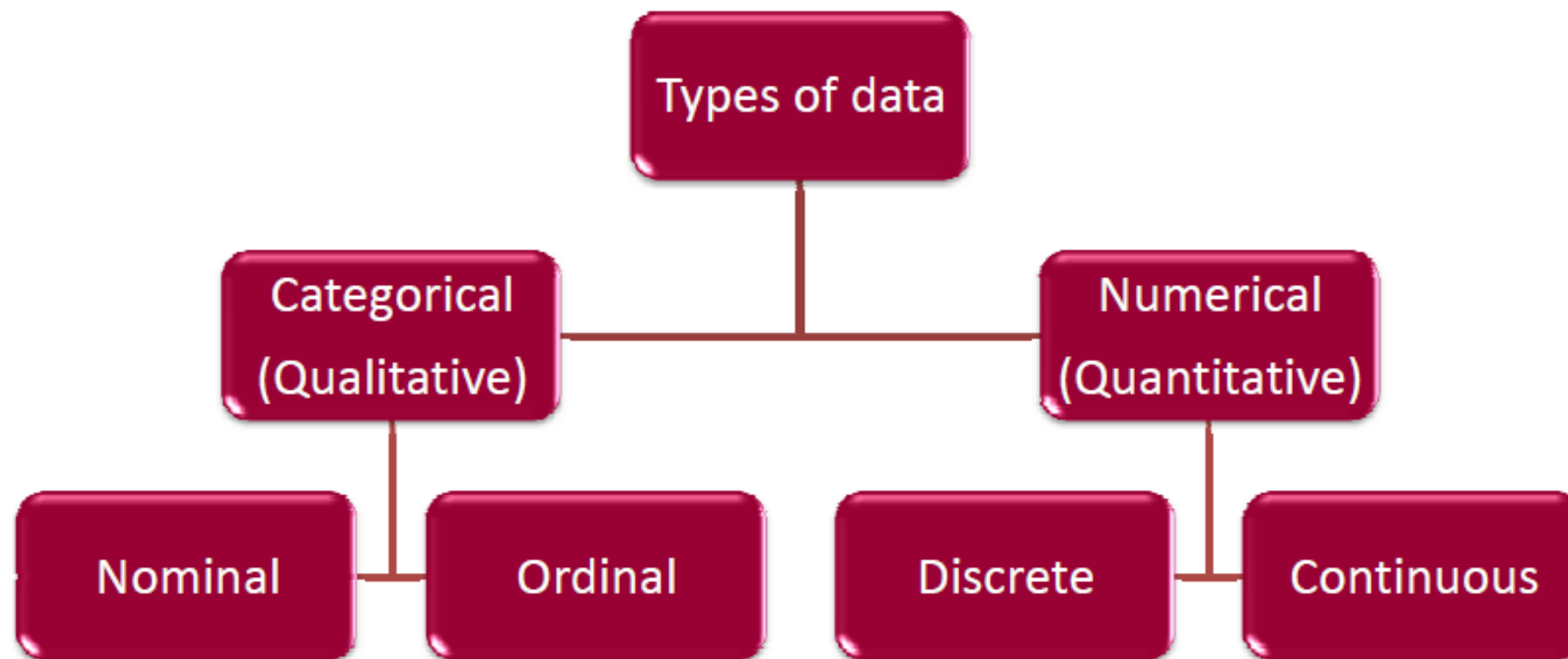➢ Is the display/summary method most appropriate?

ANALYSE AND INTERPRET DATA

➢ Is the data, display and/or summary connected to the statistical question?

➢ How could the investigation be improved?

Types of Data

(Project Maths Development Team, 2008)

Presenting Data

How data should be represented depends on the type of data, and the purpose of the investigation.

		Bar chart	Frequency Table	Histogram	Line of fit	Pie chart	Scatter plot	Stem plot
Single variable	Categories	✓	✓			✓		
	Discrete Variable	✓	✓			✓		✓
	Continuous Variable		✓	✓				✓
Paired Variable	Discrete		✓		✓		✓	
	Continuous		✓		✓		✓	

Students could try out different representations, using bar charts, stem plots, histograms, scatter plots etc. and see which is best and why. Using software here could help.

Ag Science Example 1

A student completed an IIS by measuring the biomass of PRG above the ground under 3 different conditions:
a) no addition (the control)
b) with clover
c) with 10-10-20

The student then decided to analyse the data for all 3 treatments to identify:
1-The median value
2-the maximum and minimum values
3-any outliers
4-compare the range of data

Ag Science Example 1

	Sample Number	Biomass above ground	Average
Control	1	3.7 grams	3.28 grams
	2	3.9 grams	
	3	3.8 grams	
	4	3.6 grams	
	5	2.0 grams	
	6	2.7 grams	

	Sample Number	Biomass above ground	Average
Grass with clover	1	4.3 grams	4.32 grams
	2	4.3 grams	
	3	5.2 grams	
	4	4.7 grams	
	5	3.3 grams	
	6	4.1 grams	

	Sample Number	Biomass above ground	Average
Grass with 10:10:20	1	5.7 grams	6.02 grams
	2	5.0 grams	
	3	7.3 grams	
	4	6.7 grams	
	5	5.3 grams	
	6	6.1 grams	

Graph of biomass above ground
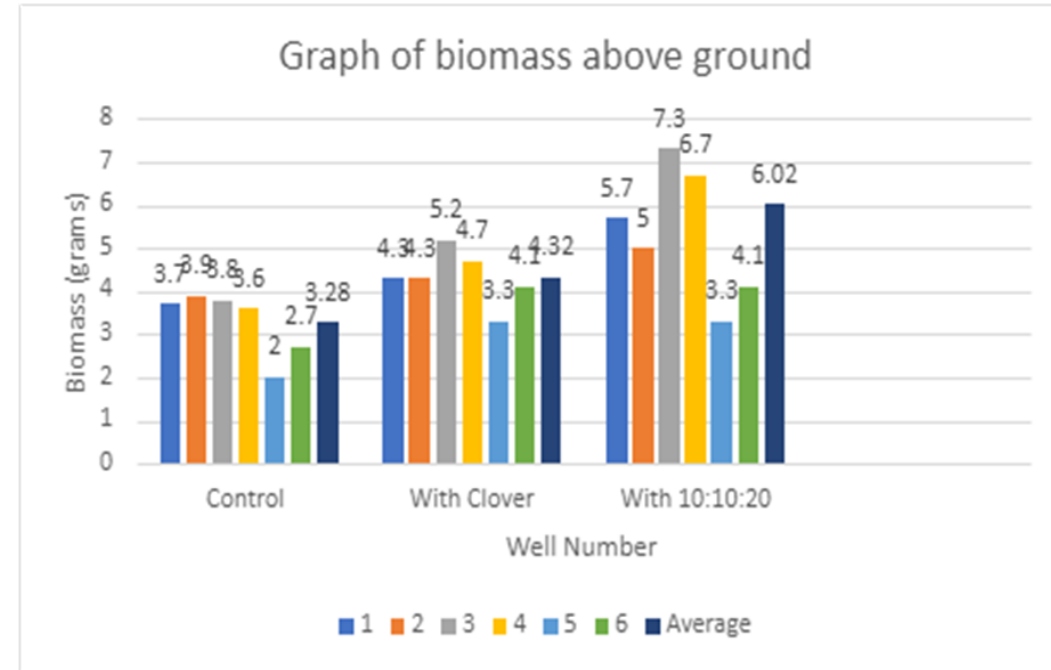
Spreadsheet software's recommended chart (first on list).
What does it tell us?

Ag Science Example 1

	Sample Number	Biomass above ground	Average
Control	1	3.7 grams	
	2	3.9 grams	
	3	3.8 grams	3.28 grams
	4	3.6 grams	
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	4	4.7 grams	
	5	3.3 grams	
	6	4.1 grams	

	Sample Number	Biomass above ground	Average
Grass with 10:10:20	1	5.7 grams	
	2	5.0 grams	
	3	7.3 grams	6.02 grams
	4	6.7 grams	
	5	5.3 grams	
	6	6.1 grams	

Stem and Leaf of biomass above the ground (g)

Control	Stem	Grass with clover
7 0	2	
9 8 7 6	3	3
	4	1 3 3 7
	5	2
	6	
	7	

Avg:3.28g   Avg:4.32g

Control	Stem	Grass with 10-10-20
7 0	2	
9 8 7 6	3	
	4	
	5	0 3 7
	6	1 7
	7	3

Avg:3.28g   Avg:6.02g

Key: 3 | 3= 3.3

Stem and leaf diagram.
What does it tell us?

Ag Science Example 2

A student completed an IIS by measuring the biomass of PRG above the ground under 3 different conditions:
a) no addition (the control)
b) with clover
c) with 10-10-20

The student then carried out some basic statistical analysis to include
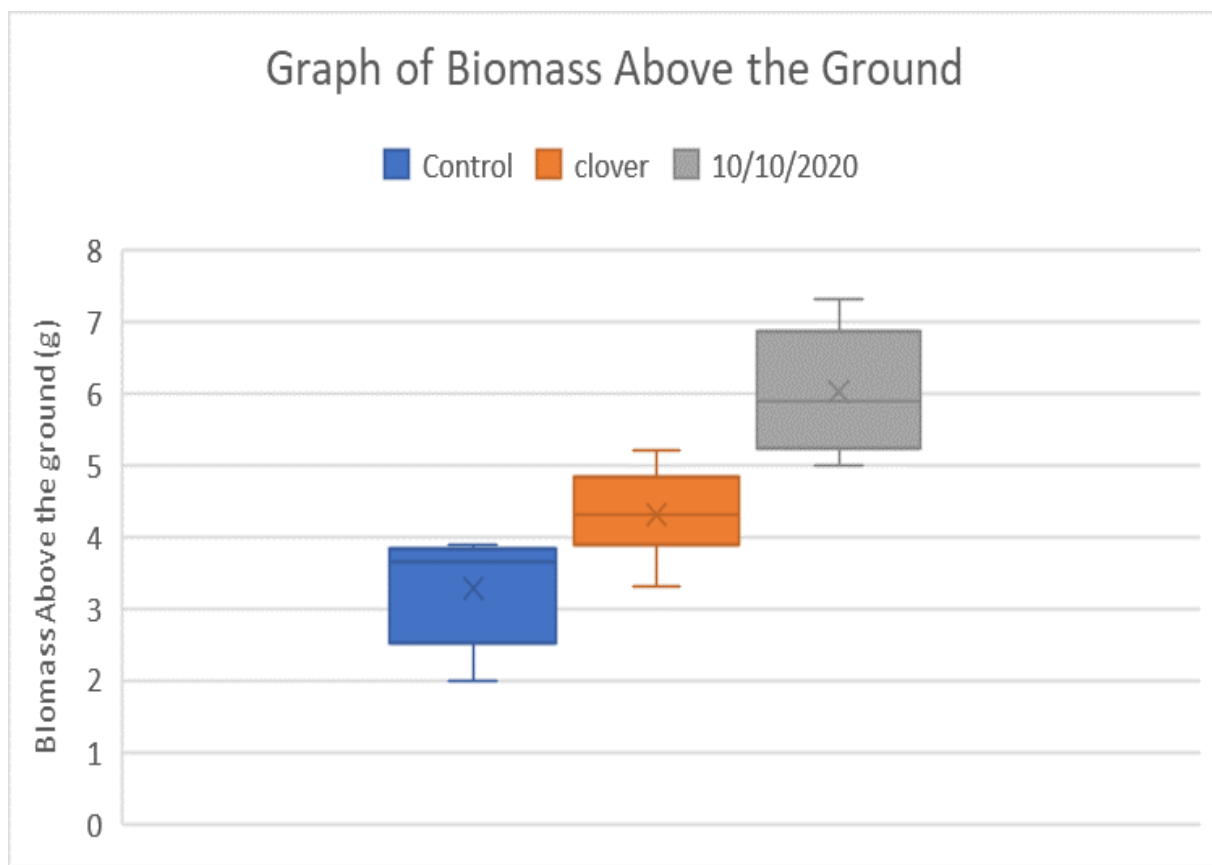-listing the min, max and median values
-calculating the mean and interquartile range

Sample No	Control	clover	fertilizer 10-10-20
1	3.7	4.3	5.7
2	3.9	4.3	5
3	3.8	5.2	7.3
4	3.6	4.7	6.7
5	2	3.3	5.3
6	2.7	4.1	6.1
Min	2	3.3	5
Max	3.9	5.2	7.3
Mean	3.28	4.31	6.01
Median	3.65	4.3	5.9
1st Q	2.52	3.9	5.22
3rd Q	3.825	4.825	6.85
IQR	1.3	0.925	1.625

Ag Science Example 2

Where do you see the data from the table represented on the graph?

Graph of Biomass Above the Ground

■ Control ■ clover ■ 10/10/2020

Sample No	Control	clover	fertilizer 10-10-20
1	3.7	4.3	5.7
2	3.9	4.3	5
3	3.8	5.2	7.3
4	3.6	4.7	6.7
5	2	3.3	5.3
6	2.7	4.1	6.1
Min	2	3.3	5
Max	3.9	5.2	7.3
Mean	3.28	4.31	6.01
Median	3.65	4.3	5.9
1st Q	2.52	3.9	5.22
3rd Q	3.825	4.825	6.85
IQR	1.3	0.925	1.625

Ag Science Example 2

Activity 1

Part A: Choose appropriate graph(s) and calculation(s) to represent the data and question the reliability of the data?

Part B: Consider what SPAs or other investigations might be suitable to present using stem and leaf diagrams and box plots?

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Supporting the Professional
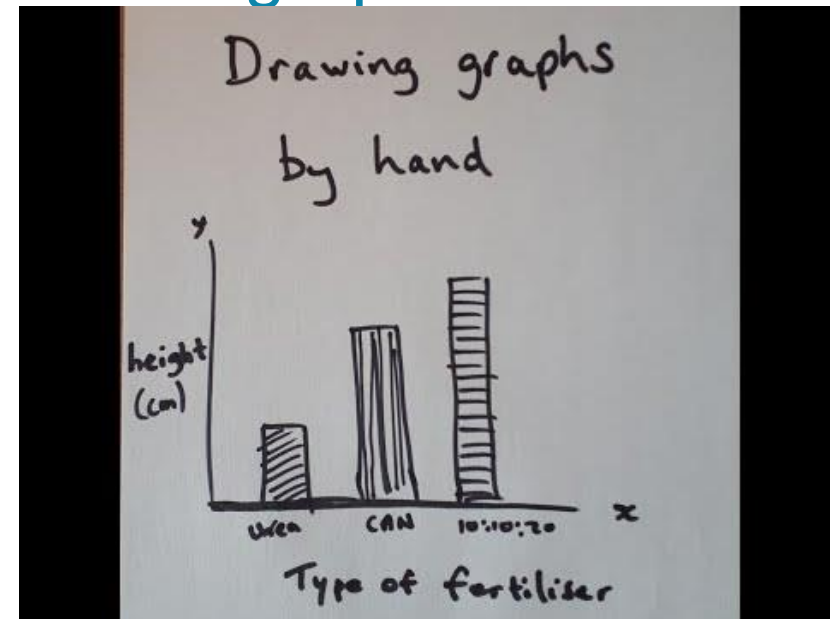Learning of School Leaders
and Teachers

Supports to Help With Data Analysis

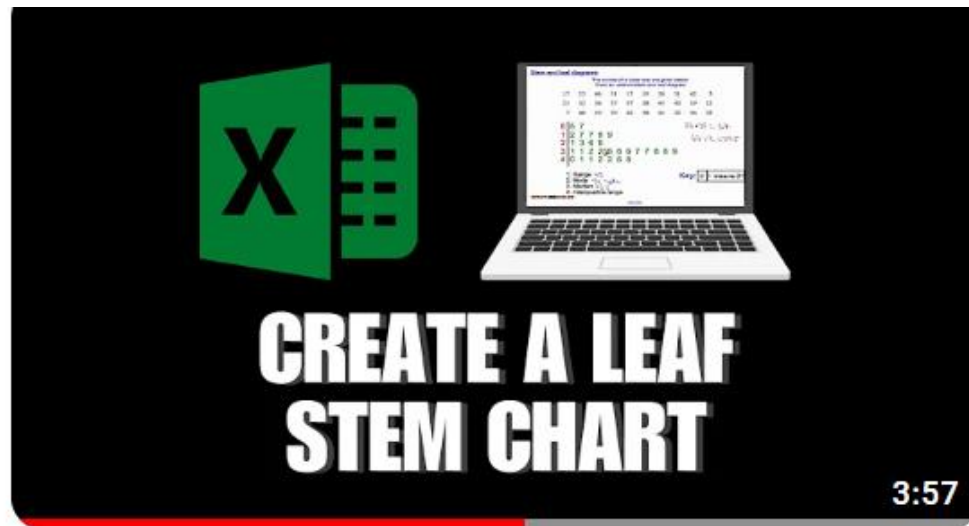A "how-to" Guide for Excel for Teachers and Students of Agricultural Science

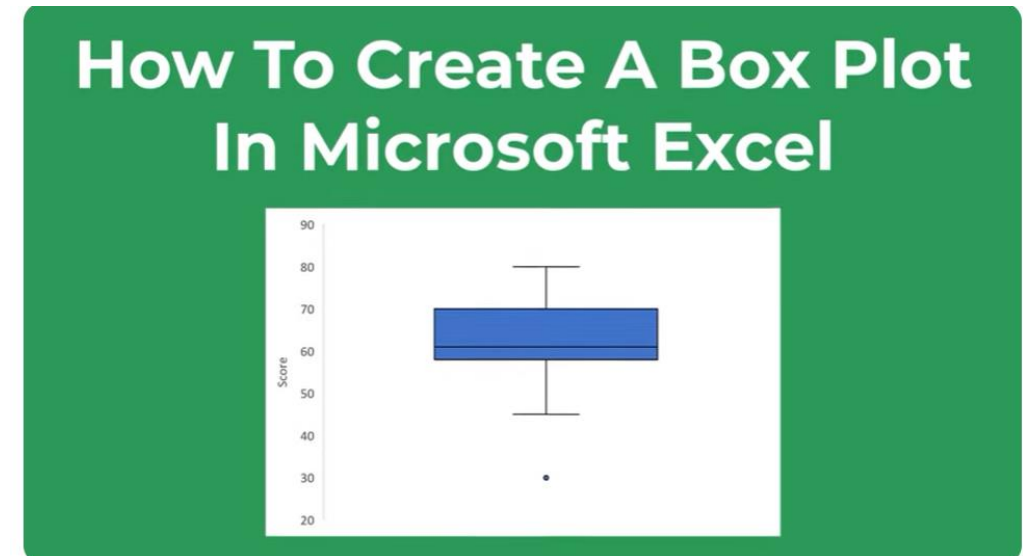A "how-to" Guide for uploading images of hand-drawn graphs

All five videos are available here. They progress in difficulty for the user as they go along.

Supports to Help With Data Analysis

How to create stem
and leaf diagrams
in Excel

How to create box
plots in Excel

Session 1: Plenary

Participants have:

Gained an understanding of the range of statistical analysis students have from engaging with Junior Cycle Maths.

Developed an understanding of a range of possible data analysis methods that students could engage with in their investigations.

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Coffee Break

Session 2: Learning Intentions

By the end of this session participants will:

> Enhance and develop their ability to use pedagogical approaches incorporating information presented in multiple formats to support teaching, learning and assessment and development of key skills.

Rationale

"To support candidates' understanding of the use of secondary data, a range of secondary data sources could be incorporated into classroom learning. This will help to familiarise candidates with their use and how they should be interpreted, understood and analysed."

(SEC, 2021 p5)

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Coursework

Information note for four Leaving Certificate subjects with new subject specifications

- Agricultural Science – Individual Investigative Study
- Computer Science – Coursework Project
- Economics – Student Research Project
- Physical Education – Physical Activity Project

Rationale

Learning Outcome 1.4

"Read and evaluate scientific information related to agriculture, drawing on a variety of sources: media, websites, agri-food event and other agricultural resources- including people involved in the agri-food industry."
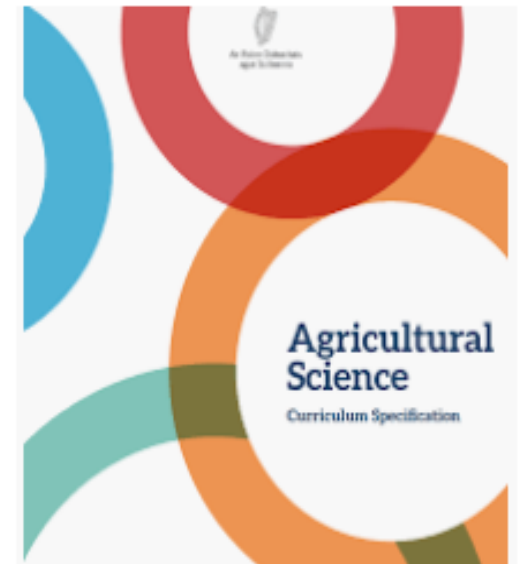
(NCCA, Ag Science Specification, 2019, p. 17)
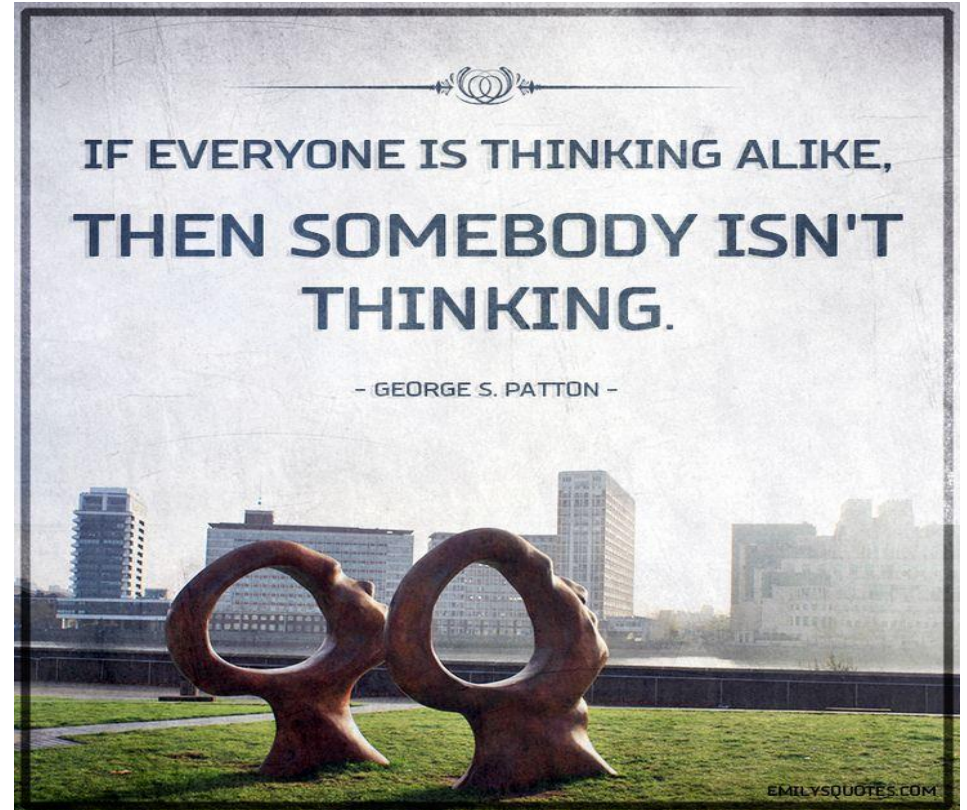
Information Provided in Table Format

Silage Quality				
% Dry Matter Digestibility (DMD %)	75	70	65	60
Harvest date	20 May	2 June	15 June	28 June
Silage tonne Dry Matter per ha	4.6	6.0	7.0	7.7
Intake (kg/day)	9.0	8.3	7.6	7.0
Liveweight gain (kg/day)	0.83	0.66	0.49	0.31

(Adapted from Teagasc, 2021)

SEC, 2022 HL Paper,Q12(a)

Engaging with Key Skills

IF EVERYONE IS THINKING ALIKE,
THEN SOMEBODY ISN'T THINKING.

– GEORGE S. PATTON –

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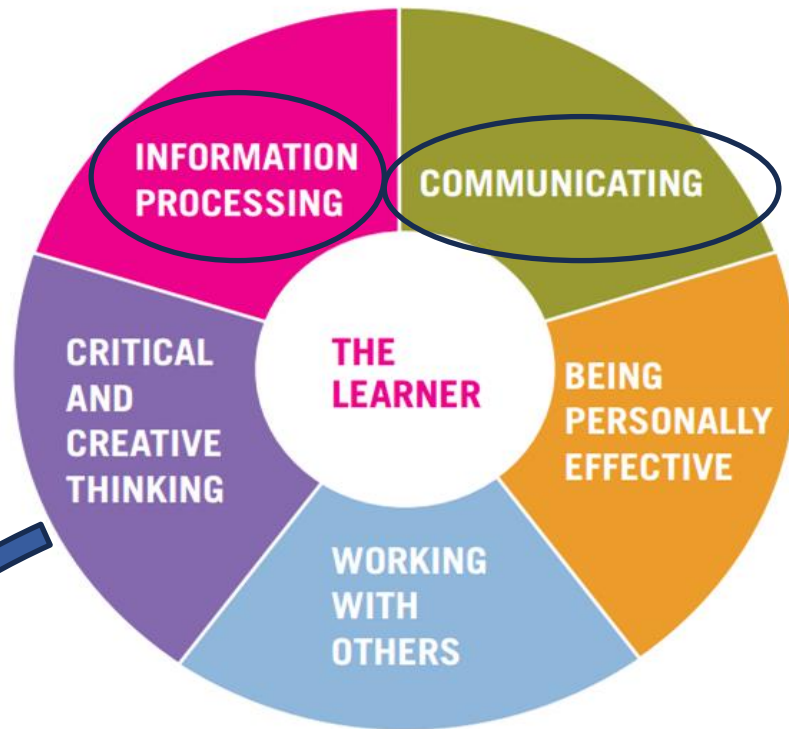
Alternative Format 1

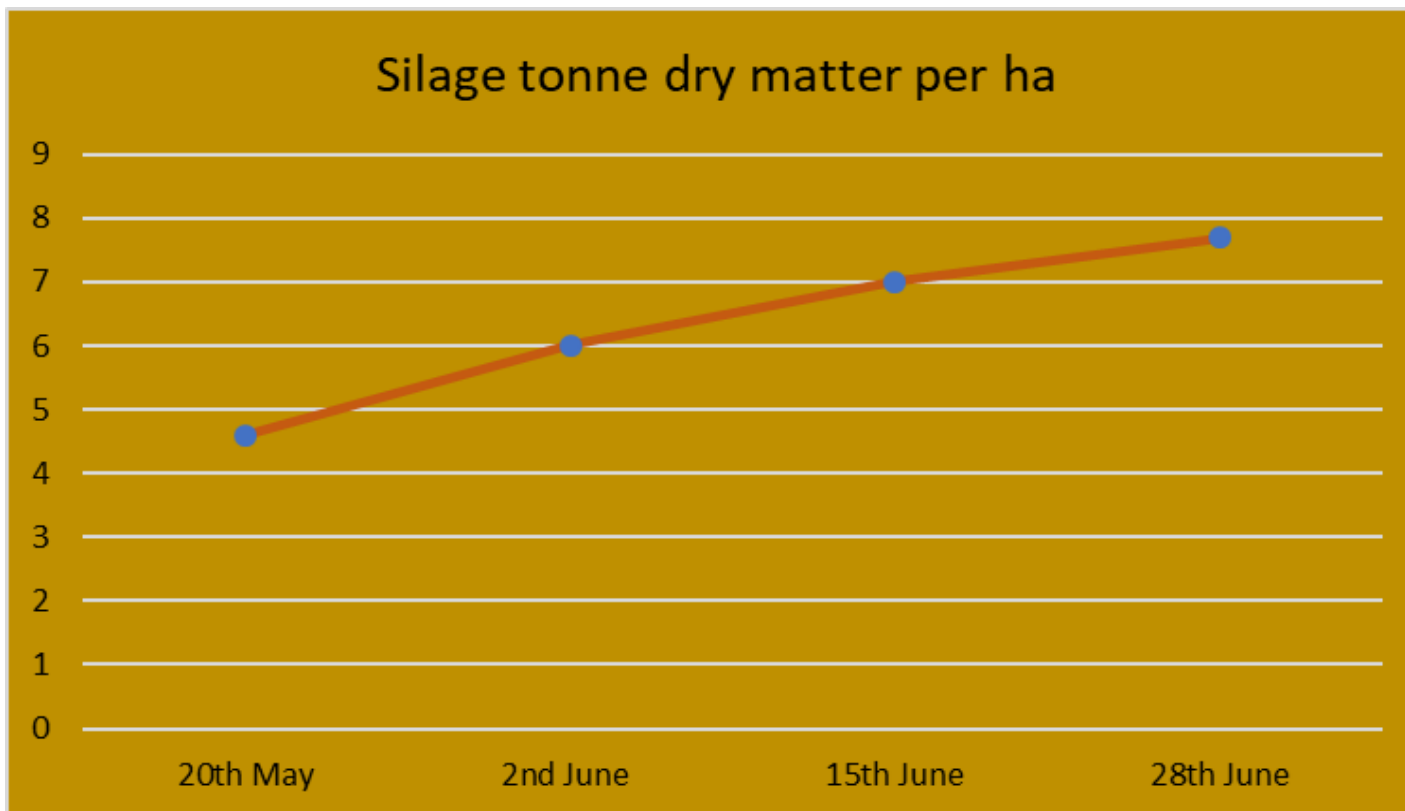| Silage Quality				
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Liveweight gain (kg/day)	0.83	0.66	0.49	0.31

(Adapted from Teagasc, 2021)

Silage tonne dry matter per ha

Alternative Format 2

Silage Quality				
% Dry Matter Digestibility (DMD %)	75	70	65	60
Harvest date	20 May	2 June	15 June	28 June
Silage tonne Dry Matter per ha	4.6	6.0	7.0	7.7
Intake (kg/day)	9.0	8.3	7.6	7.0
Liveweight gain (kg/day)	0.83	0.66	0.49	0.31

(Adapted from Teagasc, 2021)
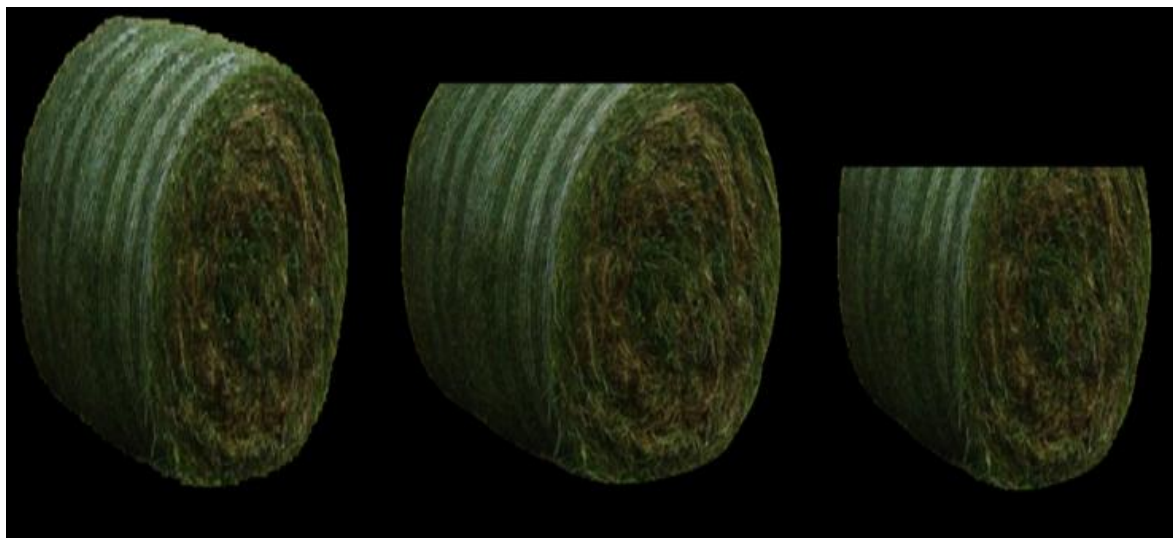
Regular silage bale

May 20th: 75% useable by the cow

June 28th: 60% useable by the cow

May 20th: 25% undigestible

June 28th: 40% undigestible

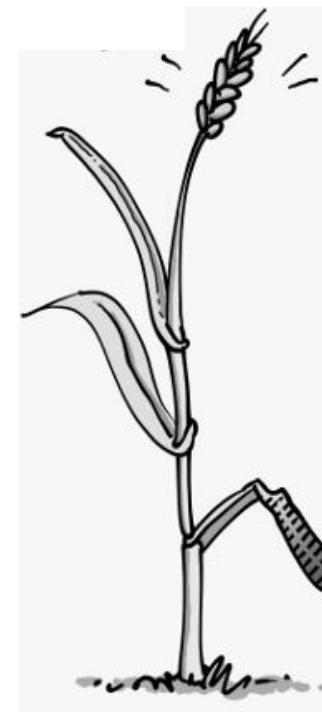# Alternative Format 3

Silage Quality				
% Dry Matter Digestibility (DMD %)	75	70	65	60
Harvest date	20 May	2 June	15 June	28 June
Silage tonne Dry Matter per ha	4.6	6.0	7.0	7.7
Intake (kg/day)	9.0	8.3	7.6	7.0
Liveweight gain (kg/day)	0.83	0.66	0.49	0.31

(Adapted from Teagasc, 2021)

Identify the key learning?

Factors that affect silage quality are:
  - % Dry Matter
  - % Dry Matter digestibility
  - Cutting Date

This affects:
  Intake and Liveweight gain

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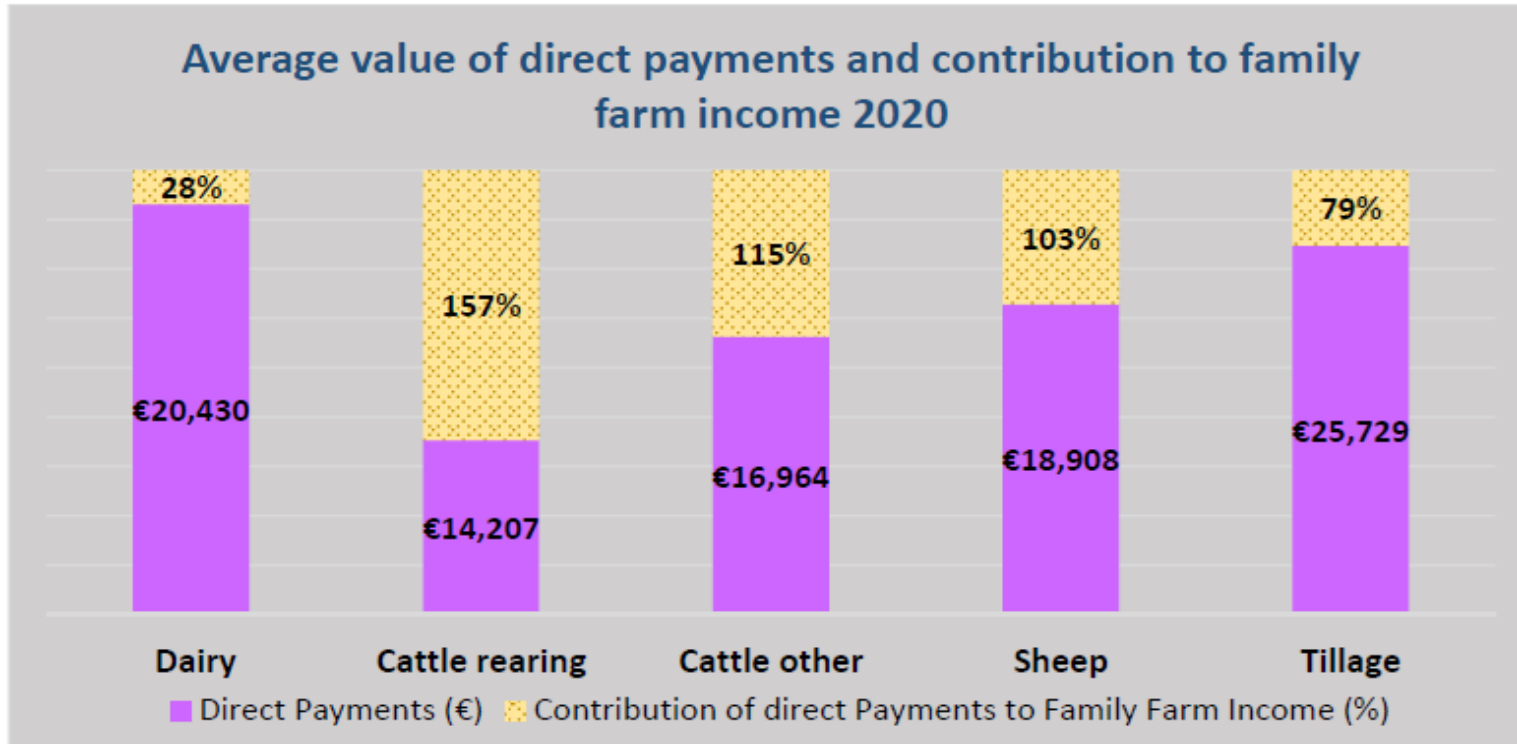
Information Provided in Graphical Format

(c) Analyse the graph on the contributions direct payments from the EU made to the family farm income per agricultural enterprise.

Average value of direct payments and contribution to family farm income 2020

- Dairy: 28%, €20,430
- Cattle rearing: 157%, €14,207
- Cattle other: 115%, €16,964
- Sheep: 103%, €18,908
- Tillage: 79%, €25,729

■ Direct Payments (€)   ⬚ Contribution of direct Payments to Family Farm Income (%)

(Adapted from Teagasc National Farm Survey, 2021)

(i) Identify which enterprise relies heaviest on direct payments. State a reason for your answer.
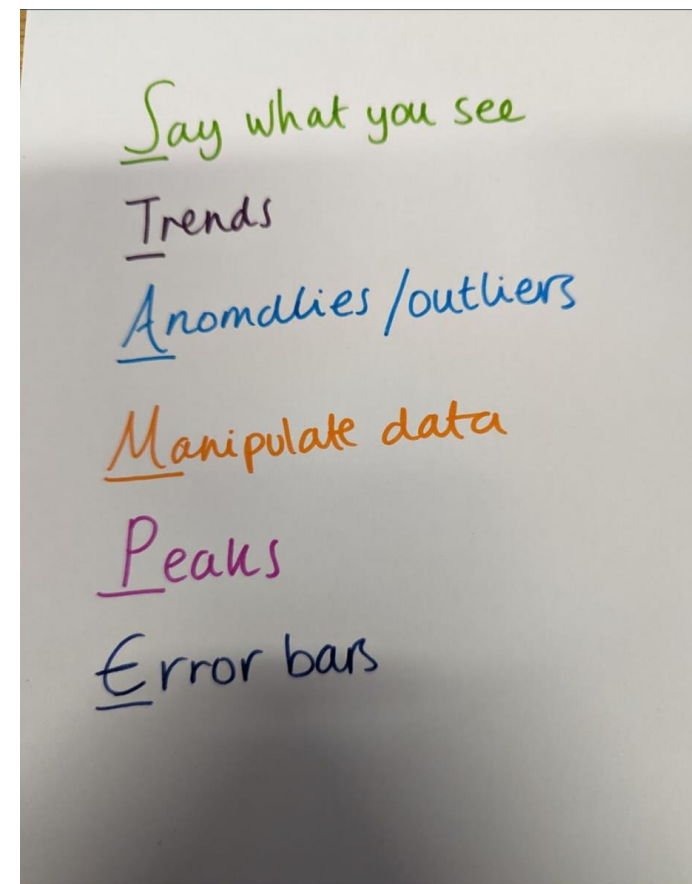
An Approach to Interpreting and Analysing a Dataset

Taking a dataset and analyse the data.

Answer questions such as:
- What trends do you see?
- What do you think is causing this trend?
- Are there any outliers, anomalies?
- What statistical analysis could help your analysis?
- Use the acronym STAMPE for example

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Information Provided in Pictorial Format

(c) Analyse the picture of calf housing below and answer the questions which follow.

(i) Identify **three** aspects of the shed which make it a suitable environment for calves and provide a reason for each aspect identified.


SEC, 2022 HL
Paper,Q14 c

Pitfalls to Avoid when using Pictures

1. Ensure they are not hazy or pixelated.
2. Ensure that they are not out of shape.
3. Check that the angle makes the photograph real e.g. overhead shots confuse.
4. Ensure that there is no ambiguity.
5. Consider copyright issues.

Tips for using Pictures as a Resource

Oide

Create
Evaluate
Analyse
Apply
Understand
Remember
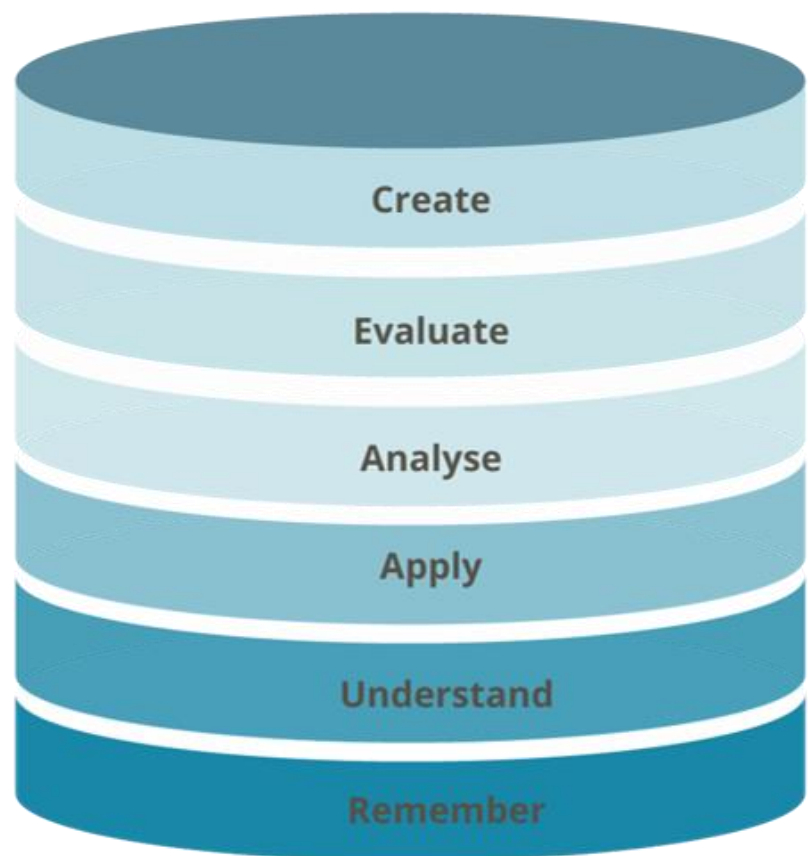
- Get high quality photos e.g. Teagasc is a good source.

- Get photos that show exactly what you are looking for (no extras in the photo).

- Clarify anything that might be uncertain with captions, labels or extra information

- Use the photo to scaffold the questions starting with lower order but developing to higher order questions, in line with Bloom's Taxonomy.

Pictures Build Curiosity

Analyse the photograph

List three things you notice.

Outline two things you found interesting.

State one further question you still have.

Activity 2

Part A: Work collaboratively to engage with photo-based activities.

Part B: Consider what areas of the specification might you use of data in various formats to support teaching, learning and assessment in the agricultural science classroom

Feedback

What was your experience of engaging with information processing in different formats this evening?

What practices from this evening's workshop will you use with your students?

How have you previously engaged with information processing in your classroom?

Supports to help with Individual Investigative Study (IIS)

A document containing helpful information for teachers and students about completing the written report of the IIS.

It contains tips for completing each section as well as links to:

- Referencing tools

- Literacy supports

- SEC Information Note and Marking Criteria

- Supportive informative videos

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References

Image on slide 38:https://emilysquotes.com/if-everyone-is-thinking-alike-then-somebody-isnt-thinking/

Image on slide 43: https://twitter.com/Nicolelogier22/status/1598705081645379584/photo/1

Image on slide 45: https://news.cgtn.com/news/3d596a4d7951444e/share_p.html

Image on slide 46: https://www.teagasc.ie/news--events/daily/grassland/grassland---mixing-it-up.php

Image on slide 47: https://www.farmersjournal.ie/beef/breeding-and-health/when-to-intervene-when-calving-the-cow-598768